

2019-20

Chandra's<sup>®</sup> 

BLUE BOOK

Name Yashwanth J. K  
Class C-SEC (1AMISCS221)  
Subject ML Lab  
~~clg~~  
School AMCEC

# C O N T E N T S

Sl. No.	Date	Particulars	Date of Submission	Marks Obtained	Initials of Staff	Page
		I Internal		23	<del>JK</del>	
		II "		25	<del>JK</del>	
		<hr/> avg		12		
				Revs 6		
				<hr/> 18		

## CERTIFICATE

*This is to certify that Smt/Sri.....  
satisfactorily completed the course of assignment prescribed by the.....  
.....University for the Semester.....degree  
Course in the Year 20.....20.....*

Marks	
Max	Obtained
20	18

  
 Signature of the Student

Head of the Department

  
 Signature of Staff Member incharge of the Batch

② CEA *Vivek*

Date \_\_\_\_\_ Page \_\_\_\_\_

```
2. import numpy as np
import pandas as pd
```

```
data = DataFrame(data = Pd.Csv_reader("filename"))
```

```
concepts = data np.array(data.iloc[:, 0:-1])
```

```
target = np.array(data.iloc[:, 1])
```

```
def learn(concepts, target):
```

```
    h specific_h = concepts.copy()
```

```
    print("Initialization of specific-h and  
          general-h")
```

```
    print(specific_h)
```

```
    general_h = [{"?" for i in range(specific_h)]  
                for i in range(specific_h)]
```

```
    print(general_h)
```

```
    for i, h in enumerate(concepts):
```

```
        if (target[i] == 'YES'):
```

```
for x in range(len(specific-h)):
```

```
specific-h[x] = "?"
general-h[x] = "?"
```

```
if target == "NO":
```

```
if h[x] != specific-h[x]:
    specific-h[x] = "?"
    general-h[x][x] = "?"
```

```
if target[i] == 'NO':
```

```
for x in range(len(specific-h))
```

```
if h[x] != specific-h[x]:
```

```
general-h[x][x] = specific-h[x]
```

```
else
```

```
general-h[x][x] = "?"
```

```
print("Step of Alg are", i+1)
```

```
print(specific-h)
print(general-h)
```

```
indices = [i for i, v in enumerate(general-h)
            if val == ["?", "?", "?", "?", "?"]]
```

```
for i in indices:
```

```
general-h.remove(["?", "?", "?", "?", "?"])
```

```
return specific-h, general-h
```

```
s-final, g-final = learn(concepts, target)
```

```
print("Final s-h", s-final, sep="\\n")
print("Final G-h", g-final, sep="\\n")
```

*Proceed*

*Partially ordered*

$w \cdot E = \frac{4}{9}$   
 $\frac{14}{18}$

$\frac{3}{3}$

$\frac{23}{25}$

*Done*  
27/11/19

2018-19

JAI PRAKASH

# BLUE BOOK

## INTERNAL ASSESSMENT BOOK

Name ..... Pavithra B.S (IAM16CS113) .....

Subject ..... Machine Learning LAB Class ..... 7<sup>th</sup> sem "B" .....

Sl. No.	PARTICULARS	Test Date	Page No.	Marks Awarded	Signature of Staff Incharge
1	TEST - I			29/25	
2	TEST - II			17/25	
3	TEST - III				
4					
5					

### CERTIFICATE

This is to certify that Smt. / Sri ..... has satisfactorily completed  
the course of Assignment prescribed by the ..... University for the semester  
..... Degree Course in the year 20 - 20

MARKS	
MAX	OBTAINED
20	17

Signature of the Student

Signature of  
H.O.D.

Signature of the Staff Member  
(Incharge of the Batch)

I - Internal marks - 20/25

II " " " 17/25

Reduced -  $\frac{20+17}{50} \times 12$

= 6

$\frac{37}{50} \times 12$

= 8.8

≈ 9/12

Record - 8

Total - ~~12~~ 8+9

~~8~~ =  $\frac{17}{20}$

5 ~~20/11/19~~

```
(def estimateProbability (x mean stdev)
  (let [exponent (math/exp (- (math/pow (x-mean) 2)
    (2 * math/pow (stdev) 2)))]
    (return (1/math/sqrt (2 * math/pi) * stdev) *
      exponent)))
  )
  )

test-most = test-p subset-p test-x most-x
```

```
def predict ( Summaries, testVector)
    bestprob, bestlabel = none, -1
    P = {}
    for (bl, mean_std, in Summaries.item())
        P[bl] = 1
    for i in range (len (mean_std)):
        mean, stdev = mean_std[i]
        x = testVector [i]
        p[bl] = estimateProbability (x, mean, stdev)
        if (bestlabel is none or > bestprob)
            bestprob = p[bl]
            bestlabel = bl
    return bestprob
```

```
def do_classification_compute_accuracy (summaries, test_x, test_y)
    correct = 0
    for i in range (len (test_x)):
        result = predict (summaries, test_x[i])
        if result == test_y[i]:
            correct = correct + 1
    accuracy = (correct + float (len (test_x))) * 100.0
    return accuracy
```

```
df = pd.read_csv ("labs.csv", headers = None)
cols = [0, 1, 2, 3, 4, 5, 6]
df_x = df [df.columns [cols]]
df_y = df [df.columns [8]]
x = df_x.values.tolist ()
y = df_y.values.tolist ()
x_train, x_test, y_train, y_test = train_test
```

```
x, y = split (x, y)
print ("Total accuracy (len(x))")
print ("Total attributes present (len(x))")
for i in range (split (x, y)):
    print ("The accuracy of Naive Bayesian is: accuracy")
    for i in range (s):
        print (i+1, ':', x[i])
    print ("Training Ex[0] in testing Ex[1]. format (len(x_train), len(x_test))")
    Summaries = SummariesByClass (x_train, y_train):
    accuracy = do_classification_compute_accuracy (Summaries, x_test, y_test)
    print ("The accuracy of Naive Bayesian is: accuracy")
```

*Print*

*No output*

Ex - 13/18  
 2/18 = 1/9  
 3/18 = 1/6

20/28

20.11.19

```

Program 1:
import csv
hypo = []
with open("pavi.csv") as csv-file:
    reader = csv.reader(csv-file, delimiter=',')
    print(reader)
    data = []
    print("In the given training Examples are");
    for row in reader:
        print(row)
        if (row[-1].upper() == "Yes");
            data.append(row)
    print("The maximum specific hypothesis from the training examples are");
    print("The Positive Examples are");
    for x in data:
        print(x)
    print("\n");
TotalExamples = len(data);
i = 0
j = 0
k = 0
print("The steps to find-S algorithm are:", hypo)
list = []
p = 0
d = len(data[p]-1);
    
```

*[Faint, mostly illegible handwritten notes on the left page, possibly related to the program on the right.]*



```

for j in range(d):
    list.append(data[i][j]);
hypo = list;
i = 1;
for i in range(TotalExamples):
    for k in range(d):
        if hypo[k] != data[i][k]:
            hypo[k] = '?';
            k = k + 1;
        else:
            hypo[k] = data[i][k];
    print(hypo)
    i = i + 1;
print("The maximum specific hypothesis
from the training Examples are");
list = [];
for i in range(d):
    list.append(hypo[i]);
print(list);

```

15-10/18  
 Viva-1/19  
 Unit 3/3

~~no output~~

17/25



# AMC

## ENGINEERING COLLEGE

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18<sup>th</sup> K.M. Bannerghatta Road, Kalkere, Bengaluru - 560 083  
E-mail: principal@amccc.edu.in / hodise@amceducation.in  
Website: www.amcgroup.edu.in

Accredited by NAAC & NBA (2009-2012), Ministry of HRD, New Delhi.



### Department of Information Science and Engineering

Test	Date	Signature of Student	Signature of Invigilator
Test - I	12/9/19	<i>Aishwarya M</i>	<i>[Signature]</i>
Test - II	31/10/19	<i>Aishwarya H</i>	<i>[Signature]</i>
Test - III		← ABSENT →	

BLUE BOOK

Name : Aishwarya.M  
USN : 1AM16I5006 Semester : VII  
Program: ISE  
Section : A Class Roll No : 101  
Course : INS



## AMC ENGINEERING COLLEGE

18th K.M, Bannerghatta Road, Kalkere, Bengaluru - 560083. Phone: 27828655

### CBCS SCHEME

Student Name: Aishwarya .M USN: \_\_\_\_\_ Course-Name & Code: INS 19CS74B

Internal Assessment Test	Q1			Q2			Q3			Q4			IA Test Marks		Signature of Faculty Incharge
	a	b	c	a	b	c	a	b	c	a	b	c	Total Marks	Marks Reduce to	
CO				1	1					2					
Max marks				10	5					10			25	15	<del>15</del>
IA Test 1				10	5					10					
CO				3	3					4	4				15
Max marks				10	5					5	5		25	15	<del>15</del>
IA Test 2				10	5					5	5				
CO															
Max marks													<u>AB</u>		<del>15</del>
IA Test 3															

Assessment Tool*	CO1 ( )	CO2 ( )	CO3 ( )	CO4 ( )	CO5 ( )	CO6 ( )	Total Marks	Marks Reduced to	Signature of Faculty Incharge
AT 1	5	5	10	5	5		10		
AT 2	5	5		5	5		10	5	<del>15</del>
AT 3							10		

Final IA Marks: 15 Final AT Marks: 5

### Certificate

This is to certify that Mr./Ms. Aishwarya .M .....has satisfactorily completed the course of assignment prescribed by the Visvesvaraya Technological University for Semester V.II. Branch ISE for the academic year 2019-2020

Final Continuous Internal Evaluation (CIE) Marks Awarded 20 : (15+5)  
*\*Assignment/Quiz/Seminar/Mini-Project* Twenty only

Aishwarya .M  
Signature of Student

[Signature]  
Signature of Faculty Incharge

P. B. [Signature]  
Signature of Course Coordinator

# Information And Network Security

## I Internal Test

2a) ⇒ One Time Pad Cipher is also referred to as Verman Cipher

⇒ It is also considered as Secure Cryptosystem.

⇒ It is being used in many place and time but restricted in few situations

Consider Suppose Alice is working as a spy and she wants to encrypt a message and send using One-time pad cipher

Considering the following table consisting letter and their corresponding binary representation

letter	e	h	q	k	l	r	s	t
binary	000	001	010	011	100	101	110	110

If Alice wants to send a message "Heilhitler", she needs to first write the corresponding binary representation of it

ie 001 000 010 100 001 010 110 100 000 101

Assume some random key such as

110 010 011 101 000 010 110 101 011 010

To get the cipher text, we have to perform XOR operation to the ~~cipher text~~ plain text and the key

P <sub>T</sub>	001	000	010	100	001	010	110	000	101
K	110	010	011	101	000	010	110	011	010
C <sub>T</sub>	111	010	001	001	001	000	000	011	111

So Alice now can send the cipher text

Basically the criteria is

$$P_T \oplus K = C_T$$

$$K \oplus C_T = P_T$$

$$P_T \oplus C_T = K$$

Given:- Ciphertext  $\Rightarrow$  "KITLKE"

i) plaintext  $P_1 \Rightarrow$  "thrill"

ii) plaintext  $P_2 \Rightarrow$  "filler"

Binary representation of these are

$C_T \Rightarrow$  011 010 110 100 011 000

$P_1 \Rightarrow$  110 001 101 010 100 100

$P_2 \Rightarrow$  110 010 100 100 000 101

$$C_T \oplus P_T = K$$

	K	P	C	L	K	E
i) $C_T$	011	010	110	100	011	000
$P_T$	110	001	101	010	100	100

Key	101	011	011	110	111	100
	r	h	h	s		l

ii) $C_T$	011	010	110	100	011	000
$P_T$	110	010	100	100	000	101

Key =	101	000	010	000	011	101
-------	-----	-----	-----	-----	-----	-----

b. Discuss a taxonomy of cryptanalysis.

50 The major goal of cryptanalysis is to find plaintext and key or both

⇒ Ciphertext Only attack

If the attacker knows only the algorithm and the ciphertext then he must perform ciphertext only attack

⇒ Known plaintext attack

If the attacker knows some part of the plaintext of the ciphertext and then he proceeds to match the plaintext-ciphertext and he can know the key

⇒ Chosen plaintext attack

Example If a attacker sends some message which is encrypted from Alice system during her lunch break when she is not around, this type of "lunchbreak attack" is called chosen plaintext attack. There is also an adaptive plaintext attack

⇒ Related key attack

If the attacker knows about the system, he can relate and get to know the key

⇒ Forward search attack (using public key cryptography)

If an attacker intercepts an encrypted message and guesses if the plain text is yes or no and encrypts with the public key, he can match and get to know the plaintext.

49 Tiger Hash

59 ⇒ It is "fast and strong"

⇒ Designed by Ross Anderson and Eli Biham - leading cryptographers

⇒ Design criteria

\* Secure

\* Optimized for 64-bit processor

\* Easy to replace of SHA-1 or MD5.



- ⇒ The Input is divided into 512 bit blocks
- ⇒ The Output is 192 bit (three 64 bit)
- ⇒ The intermediate rounds are also 192 bit
- ⇒ 4 S boxes (Substitution boxes) are used, which maps 8 to 64 bit
- ⇒ Key scheduling is used since there is no key in the input.

### First Outer Round:

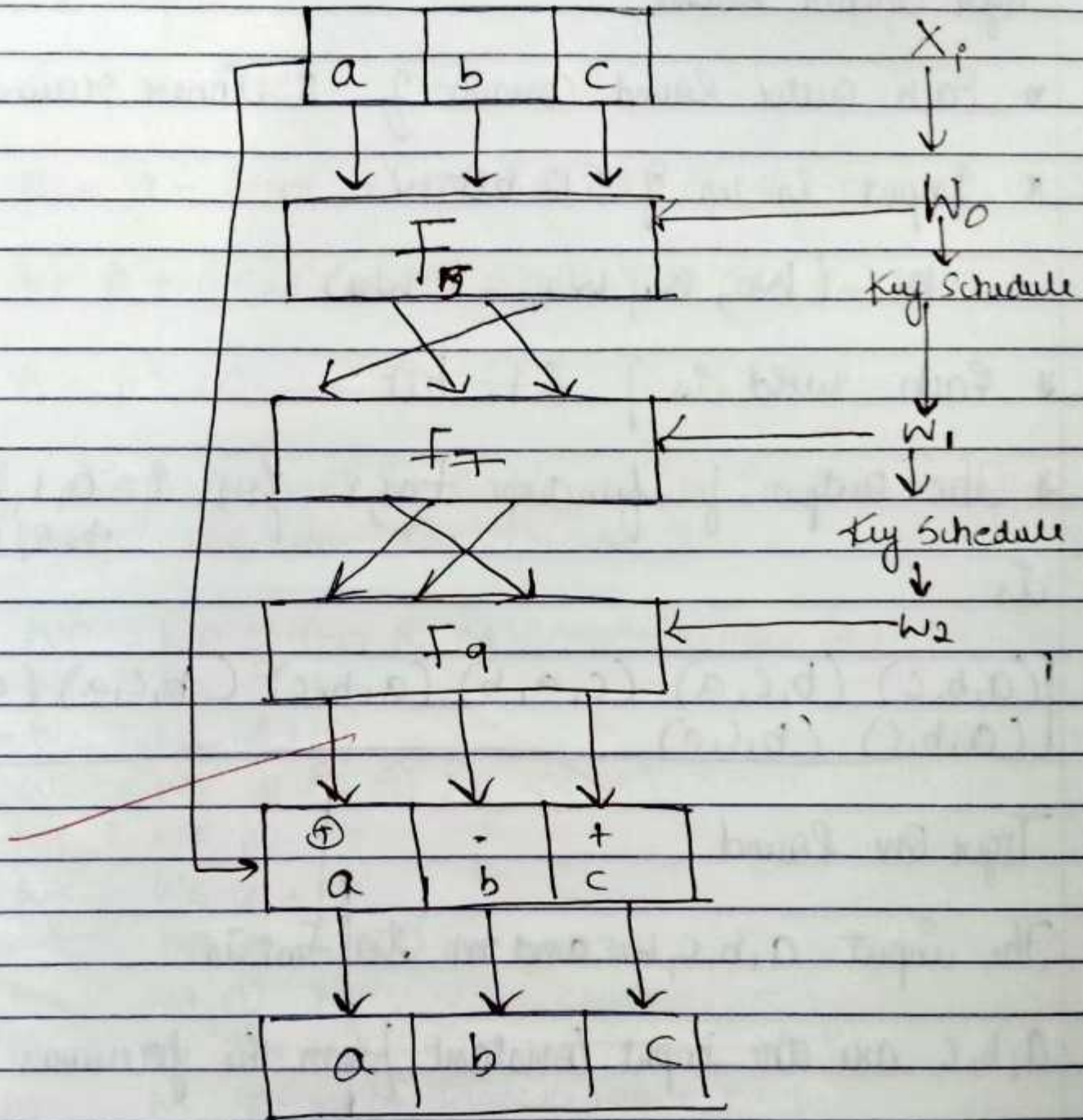
⇒ The input  $X$  is divided to 512 bit block and is written as:-

$$X = (X_0, X_1, \dots, X_{n-1})$$

⇒ Each  $X$  is assigned to every outer round

⇒ Initial (a, b, c) constant

⇒ The final output of first outer round triple is input to the subsequent round and the final output of the final outer round is 192 bit hash value



Tiger Outer Round.

Output of  $F_5$  is input  $F_7$  as  $(c, a, b)$ . and for  $F_9$   $(b, c, a)$

## Tiger Inner Round

\* Each outer round consist of 8 inner round

\* Input is  $w_i$  of 512 bit  $W$

$$W = (w_0, w_1, w_2, \dots, w_7)$$

\* Each word is of 64-bit

\* The output of function  $F_{m,i}$  for  $i = 0, 1, 2, 3, 4, 5, 6, 7$

is

$$\begin{matrix} (a, b, c) & (b, c, a) & (c, a, b) & (a, b, c) & (b, c, a) & (c, a, b) \\ (a, b, c) & (b, c, a) & & & & \end{matrix}$$

## Tiger One Round

The input  $a, b, c, w_i$  and  $m$  to  $f_{m,i}$  is

$a, b, c$  are the input constant from the previous round

$w_i$  is the 64 bit word of 512 bit block

The subscript  $m$  is the multiplier  
 $C = (c_0, c_1, c_2, c_3, \dots, c_7)$



The output is

$$C = C \oplus W_i$$

$$a = a - (S_0(C_0) \oplus S_2(C_2) \oplus S_2(C_4) + S_3(C_7))$$

$$b = b + (S_3(C_0) \oplus S_2(C_2) \oplus S_1(C_4) \oplus S_0(C_6))$$

$$b = b + M$$

A single change in the X result in the great change in the key schedule

$$W_0 = W_0 \oplus (W_7 \oplus 0 \times 0 \times 0 \times 0 \times 0 \times 0 \times 0 \times 0 \times 0 \times 0 \times 0 \times 0 \times 0 \times 0 \times 0 \times 0)$$

$$W_1 = W_2 \oplus W_0$$

$$W_2 = W_2 \oplus W_1$$

$$W_3 = W_3 \oplus (W_2 \oplus W_1 \ll 19)$$

$$W_4 = W_4 \oplus W_3$$

$$W_5 = W_5 \oplus W_4$$

~~$$W_6 = W_6 \oplus (W_5 \oplus \overline{W_5} \gg 23)$$~~

$$W_7 = W_7 \oplus W_6$$

$$W_0 = W_0 \oplus W_7$$

$$W_1 = W_1 \oplus (W_0 \oplus \overline{W_7} \ll 19)$$

$$W_2 = W_2 \oplus W_1$$

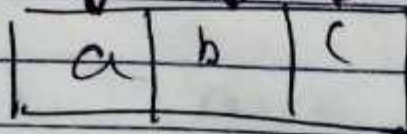
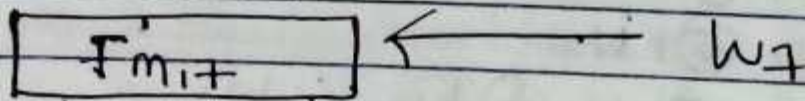
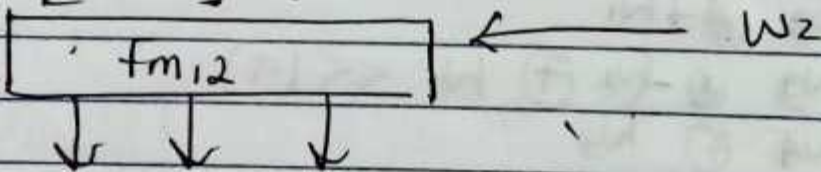
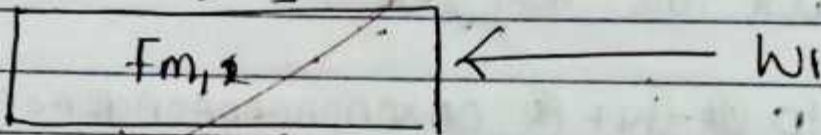
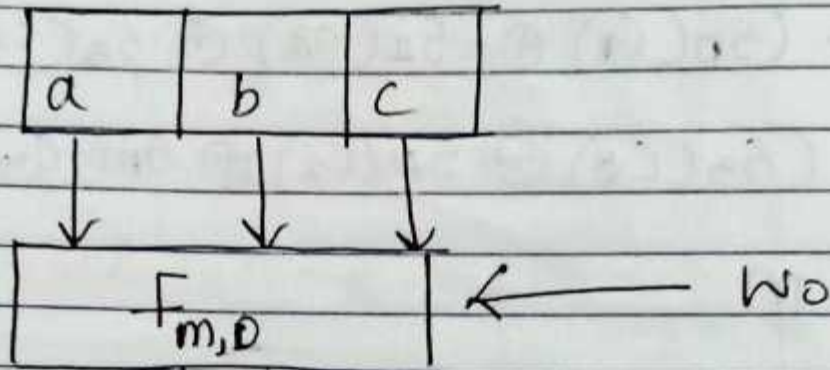
$$W_3 = W_3 \oplus W_2$$

$$W_4 = W_4 \oplus (W_3 \oplus \overline{W_2} \gg 23)$$

$$W_5 = W_5 \oplus W_4$$

$$W_6 = W_6 \oplus W_5$$

Tiger hash also uses conjunction and defunion properties



2a-10  
 b-5  
 4a-10

~~25~~  
 28

~~10~~  
 15/9/19

Tiger Inner Round

## II<sup>nd</sup> Internal Test VII SEM BE

2a) The two approaches of generating random numbers:

The randomness is a idea of unpredictability and uncertainty.

The random number is generated by applying a series of statistical test.

The two approaches of generating random numbers are

- 1) Deterministic Generator
- 2) Non-Deterministic Generator.

⇒ Non-Deterministic Generator is based on the idea of randomness of physical phenomena.

Since it is of physical phenomena the source of it is of "true randomness" which means the source is hard to control and replicate.

The non-deterministic generator is of type hardware and software.

## Hardware Non-deterministic Generator :-

The hardware non-deterministic generator rely on randomness of physical phenomena

It requires a special hardware

The examples of it are:-

⇒ Measurement of time interval caused by the radio-active decay of nuclear atoms.

⇒ Measurement of semi conductor diode activity due to motion of electron.

⇒ Instability of the moving oscillator

⇒ White noise emitted by the electronic component

⇒ Quantum measurement of the single photon reflected by the mirror.

The hardware non-deterministic generator generates the random continuous output until the power required for it is sustained or until a certain condition arises.

Since it requires special hardware, its implementation is costly.

Software Non-deterministic Generator :-

This generator relies on the randomness of physical phenomena detected by the hardware consisting in a computer device.

Examples :-

- ⇒ Key stroke timing
- ⇒ Output of system clock
- ⇒ Movement of mouse
- ⇒ Time interval of mouse click etc.

The software non-deterministic generators are easy, fast and not expensive to implement.

Disadvantage of Non-deterministic Generator

⇒ It is costly to implement

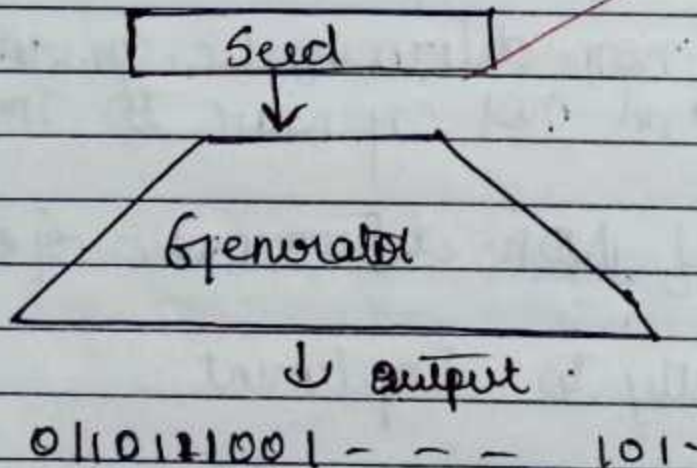
⇒ Since it is of physical phenomena, it is impossible to generate same random string at different phase



## ⇒ Deterministic Generator

### Basic Model of deterministic Generator.

- \* The deterministic generator produce a pseudorandom bit string that is a string bit with no apparent structure.
- \* The output of deterministic generator are certainly not random. If anyone knows the input key then the corresponding output produced is easy to identify.
- \* The input is known as the seed which is to be kept secret.



\* If the seed is kept secret then with proper design generator program a pseudorandom bit string is obtained.

**Seed:** The secret information that is fed to the deterministic generator is often referred to as seed. The seed is to be kept secret from the attacker and is to be protected and frequently changed.

**Generator:** The generator is the generating algorithm of the pseudorandom bit string.

The deterministic generator overcomes the problems of non deterministic generator.

\* It is not expensive as the non-deterministic generator & is easy to implement.

\* Two identical bit strings can be obtained at different phases provided the seed is same.

b Cryptographic password protection.

57

~~The secret key is~~

Consider an example of a large organization which wishes to authenticate many users to its internal system.

There are two possible ways:-

\* Using a system which does verify the offered password and that which is stored in the centralized password database.

The password database contains the list of the username and password attributes

The admin of the system will receive the entire list of content which is not needed.

\* The area in which the Cryptology can be used to help the system to ~~secure~~ password database.

Consider the example of UNIX operating system's password database

It is identified by /etc/passwd.

Here the user contains 2 piece of information  
12 bit

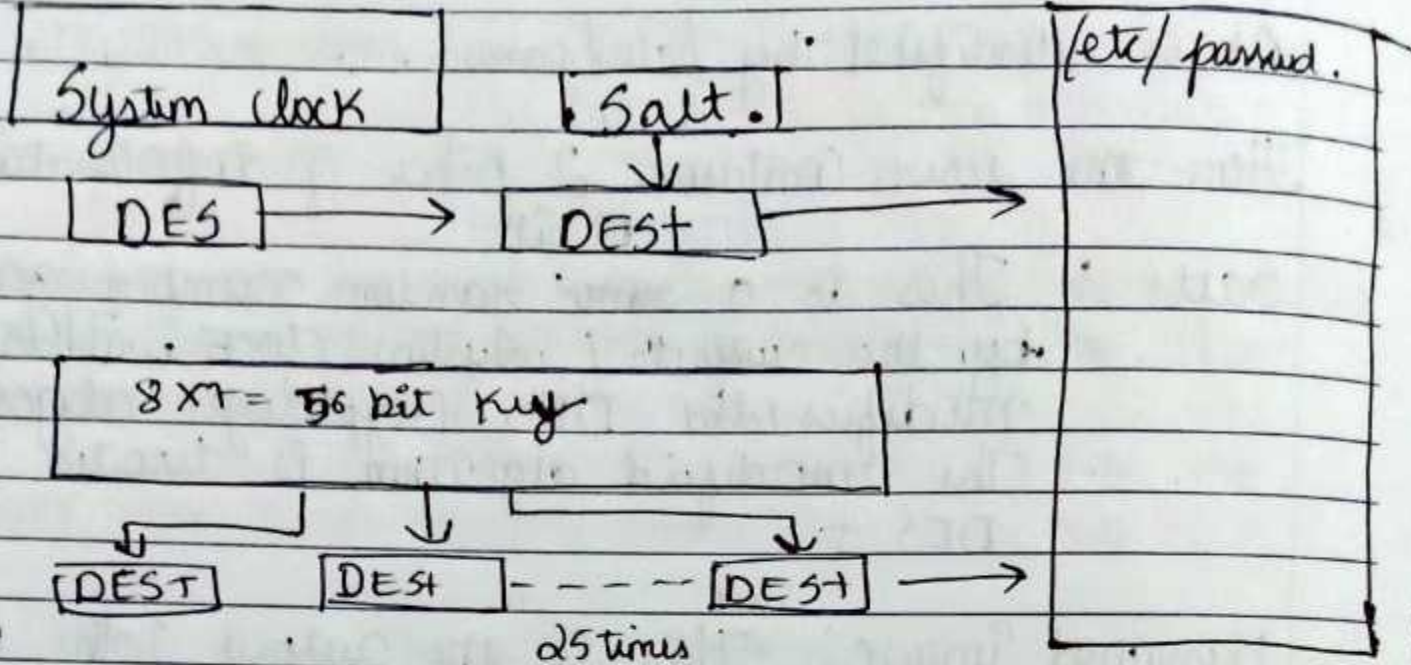
Salt :- This is a ~~word~~ random number generated by the output of system clock. This modifies the DES cryptologic algorithm. The modified algorithm is denoted as DES +.

password image :- This is the output of the output of the following steps.

\* Convert the 8-bit ASCII character into 56 bit which is straight forward as a bit of ASCII is 7 bit

\* Encrypt the plain text containing all zero using the modified DES+ algorithm with the key derived by the password

\* Repeat the last encryption upto 25 times. The last step is designed in slowing the operation in such a way that it doesn't produce inconvenience to the user and makes it difficult for dictionary attacker



## Basic Model of UNIX System Password Database

Once the user enters the password, the salt is generated and the converted bits is encrypted 25 times and check in the password database.

### HSM

The secret key should be kept secure by the owner

The Hardware secure model which does the cryptographic functionality is called the HSM which secures the key

The device which consist the Cryptographic functionality is called the tamper-resistant device of Key management functionality

This does a bulk of Cryptographic operation. It can either be as a peripheral or connected as a module to perform major role point-to-terminal

It manages the key mechanism.

The key is secured by the hardware physically. So any attack caused for example if an attacker tries to get the key from the hardware, this is detected by the tamper resistance circuitry and the key is deleted from the memory

The various technique used to provide tamper resistance are.

⇒ Micro Switches :- Here the switch gets closed if the attacker tries to open the hardware. This not much effective as in the attacker can use other methods

- Electronic mesh - It is a mesh which covers the component / the hardware. This alerts when the attackers try to drill the hardware.
- Resin - It is a hard substance which can be used with mesh. This alerts the circuitry ~~and~~ while drilling or melts the entire ~~the~~ hardware if it is attacked.
- Temperature sensor :- alerts when there is variation in the temperature of the surrounding.
- light sensor :- alerts when there is any radiation attack.
- Current & voltage sensor - Alerts when there is variation in voltage.
- Movement or tilt sensor - alerts when there is physical movement of the hardware.

## 4b Public Key Certificate.

Public Key Certificate encrypts the data of public key and its corresponding data of the insurance details.

The contents of a public key certificate :-

⇒ The Owner name

The certificate consist of the name of the owner of the public key.

The name should be unique in the environment where the public key was produced.

⇒ Validity time

The certificate should contain the time in which the public key is usable and mainly the expiry date of it.

⇒ Public key value

The public key itself return consisting a encryption algorithm.



## ⇒ Signature

The digital signature is of the public-key certificate ~~owner~~ issuer. The issuer uses the digital signature algorithm. The signature of issuer is used to ~~ever~~ know that the data provided by the public key owner is correct.

## Ex of a public key Certificate

Field	Description
Serial NO	Unique identifier
Version	Version of the Certificate
Subject	Owner of public key
Signature	Digital signature algorithm
Validity	expiry date
Subject ID	Unique ID for owner
Issuer ID	Unique ID for issuer
Extensions	

25  
/  
25

Excellent

4/11/19



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*"To be a Leader in Imparting Value Based Technical Education and Research for the Benefit of Society"*

### Mission of the Institution

M1	To Provide State of the art Infrastructure facilities.
M2	To Implement modern Pedagogical methods in delivering the Academic programs with Experienced and Committed faculty.
M3	To Create a vibrant ambience that promotes Learning, Research, Invention and Innovation.
M4	To Undertake Skill Development Programs for Academic Institutions and Industries.
M5	To Enhance Institute Industry Interaction through Collaborative Research and Consultancy.
M6	To Relentlessly pursue Professional Excellence with Ethical and Moral Values.

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Website: www.amcgroup.edu.in

M209



# AMC ENGINEERING COLLEGE

Affiliated to Visvesvaraya Technological University, Belagavi,  
Approved by Government of Karnataka, Recognized by AICTE, New Delhi.

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### Department of Electronics and Communication Engineering

Test	Date	Signature of Student	Signature of Invigilator
Test - I	11/09/18	Vind	Vineel
Test - II	21/10/18	Vind	bil
Test - III	27/11/18	Vind	Anghu 27/11/19

BLUE BOOK

Name : VINDYA VK  
USN : 2AM16EC149 Semester : VII  
Program: DIGITAL IMAGE PROCESSING (DIP)  
Section : 'B' Class Roll No : -  
Course : DIGITAL IMAGE PROCESSING (DIP)



## Department of Electronics and Communication Engineering

### Vision of the Department

"To develop outstanding Electronics and Communication Engineers to meet the ever changing Social and Technological needs of the Society"

### Mission of the Department

M1	To provide State-of-the-Art infrastructure in Electronics and Communication Engineering.
M2	To disseminate strong theoretical and practical exposure to meet the emerging trends in the industry.
M3	To promote a free thinking environment with innovative teaching-learning pedagogy.
M4	To develop value based socially responsible professionals for the betterment of the Society.

### Program Educational Objectives (PEOs)

PEO 1	Develop and excel in their chosen profession on technical front and/or progress towards advanced continuing education, Inter-disciplinary Research and Entrepreneurship.
PEO 2	Become reputed and innovative solution provider to complex system design problems or challenges relevant to Electronics and Communication.
PEO 3	Progress as effective team members and achieve a leadership position with trust, mutual respect and professional ethics.
PEO 4	Become responsible and pro-active citizens for the overall welfare and progress of the Society.



## AMC ENGINEERING COLLEGE

18th K.M, Bannerghatta Road, Kalkere, Bengaluru - 560083. Phone: 27828655

### CBCS SCHEME

Student Name: <b>VINDYA VK</b>		USN: <b>1AM16EC149</b>		Course-Name & Code:											
Internal Assessment Test	Q1			Q2			Q3			Q4			IA Test Marks ( )		Signature of Faculty Incharge
	a	b	c	a	b	c	a	b	c	a	b	c	Total Marks	Marks Reduce to	
CO	6	8								2	0			16	<i>[Signature]</i>
Max marks															
IA Test 1															
CO															
Max marks															
IA Test 2	7	8								6	1			22	<i>[Signature]</i>
CO															
Max marks															
IA Test 3	7	8					5	5						25	<i>[Signature]</i>
CO															
Max marks															
Assessment Tool*	CO1( )	CO2( )	CO3( )	CO4( )	CO5( )	CO6( )	Total Marks( )	Marks Reduced to	Signature of Faculty Incharge						
AT 1															
AT 2															
AT 3															
Final IA Marks	<b>18</b>						Final AT Marks								

### Certificate

This is to certify that Mr./Ms. **Vindya VK** has satisfactorily completed the course of assignment prescribed by the Visvesvaraya Technological University for Semester.....

Branch.....**EC**.....for the academic year 2019 - 20 20

Final Continuous Internal Evaluation (CIE) Marks Awarded ( ) :

\* Assignment/Quiz/Seminar/Mini-Project

*[Signature]*  
Signature of Student

*[Signature]*  
Signature of Faculty Incharge

*[Signature]*  
Signature of Course Coordinator

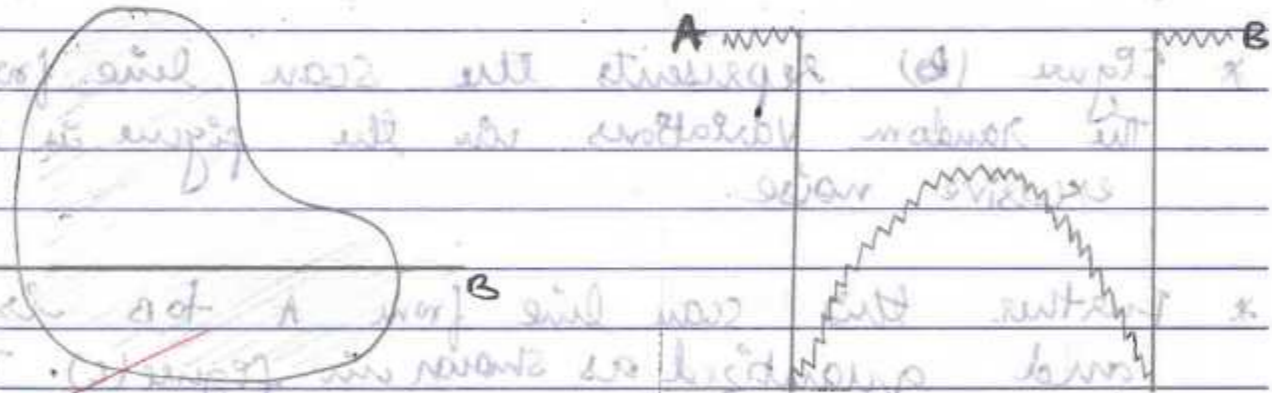
1 a) SAMPLING AND QUANTIZATION

\* The process of converting a continuous signal/data into digital form involves 2 important steps :-

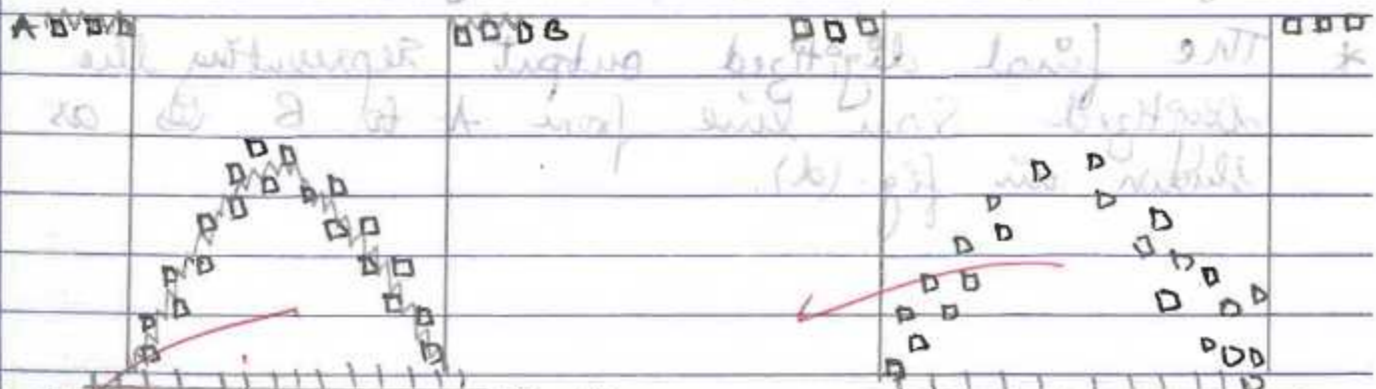
(i) Sampling.

(ii) Quantization.

\* The process of Sampling and Quantization, with an example is as shown below :-



(a) A continuous image (b) a scan line from A to B.



(c) Sampling & Quantization

An image can be continuous wrt  $x$  and  $y$  coordinates as well as wrt the amplitude. Therefore it is necessary to digitize the image in both coordinates and amplitude.

Digitizing the coordinates is called as Sampling, where as, digitizing the amplitude is called as quantization.

The figure (a) shows a continuous image from A to B.

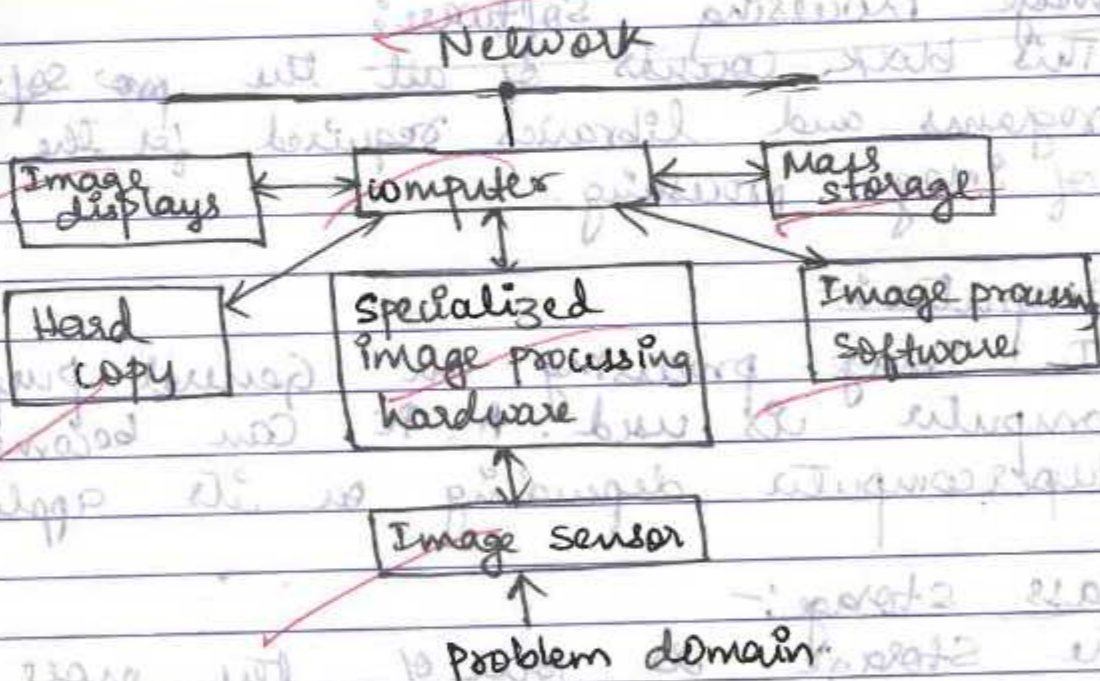
Figure (b) represents the scan line from A to B. The random variations in the figure is the excessive noise.

Further this scan line from A to B is sampled and quantized as shown in figure (c). The image is divided into small squares of samples to get a digitized output.

The final digitized output representing the digitized scan line from A to B is as shown in fig. (d).

## 1b) COMPONENTS OF GENERAL PURPOSE IMAGE PROCESSING SYSTEM:

\* The block diagram of the general purpose image processing system is as shown below:



\* A typical image processing system consists of the above blocks. Each block has its own importance as described further.

**1) Image Sensor:**  
It is a device which is sensitive to the energy produced by the source of the image. It is used to take the input of the image processing system.



i) Specialized image processing Hardware:  
 This block consists of the main hardware of the IP system, which is pre-programmed for the user convenience.

ii) Image Processing Software:  
 This block consists of all the software programs and libraries required for the process of image processing.

iii) Computer:  
 In image processing a general purpose computer is used. A PC can become a supercomputer depending on its application.

Mass storage:  
 The storage is one of the most important block in image processing. Since a  $256 \times 256$  image with 8 bits of pixels needs 1 mega byte of data space.

iv) Image display:  
 Lately for image display devices, colour TV monitors are used since they give a better and clear output.



(vii) Hard copy:  
 The hard copy is obtained from the ink jet printers, laser jet printers, etc...

op

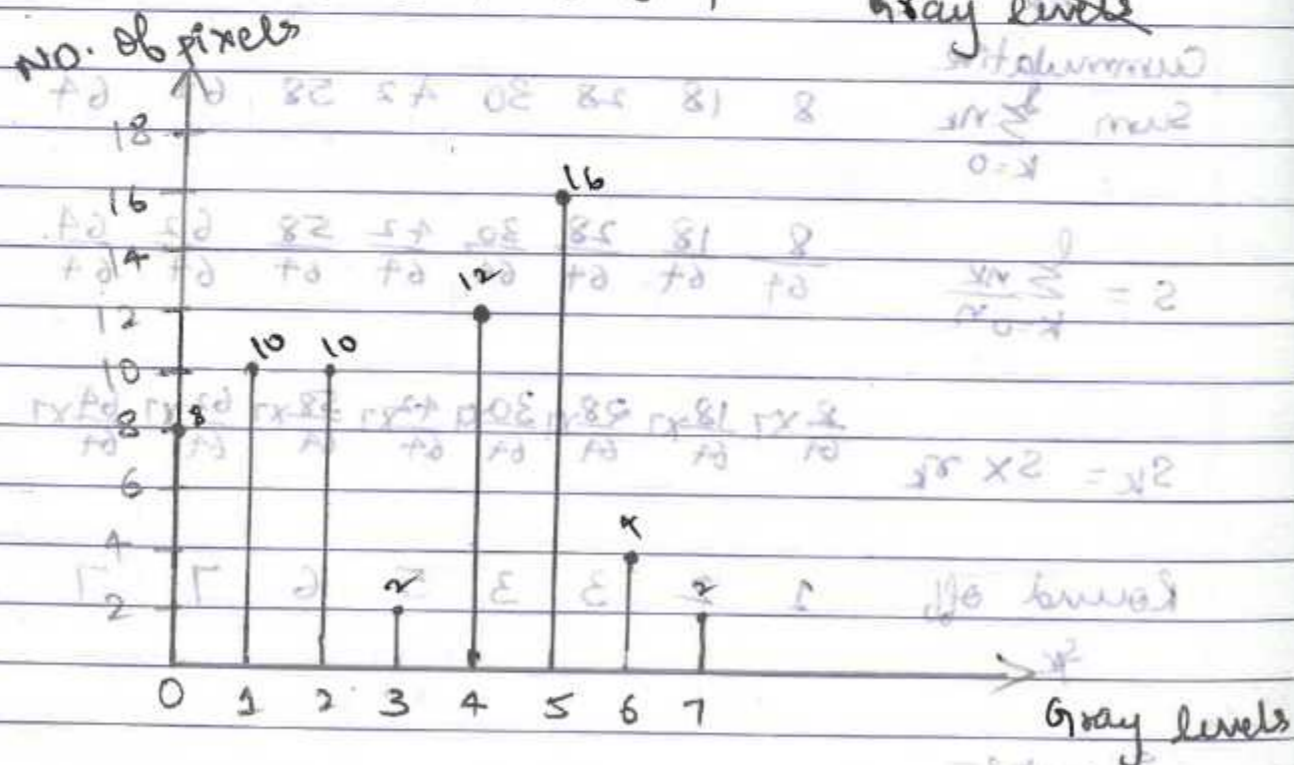
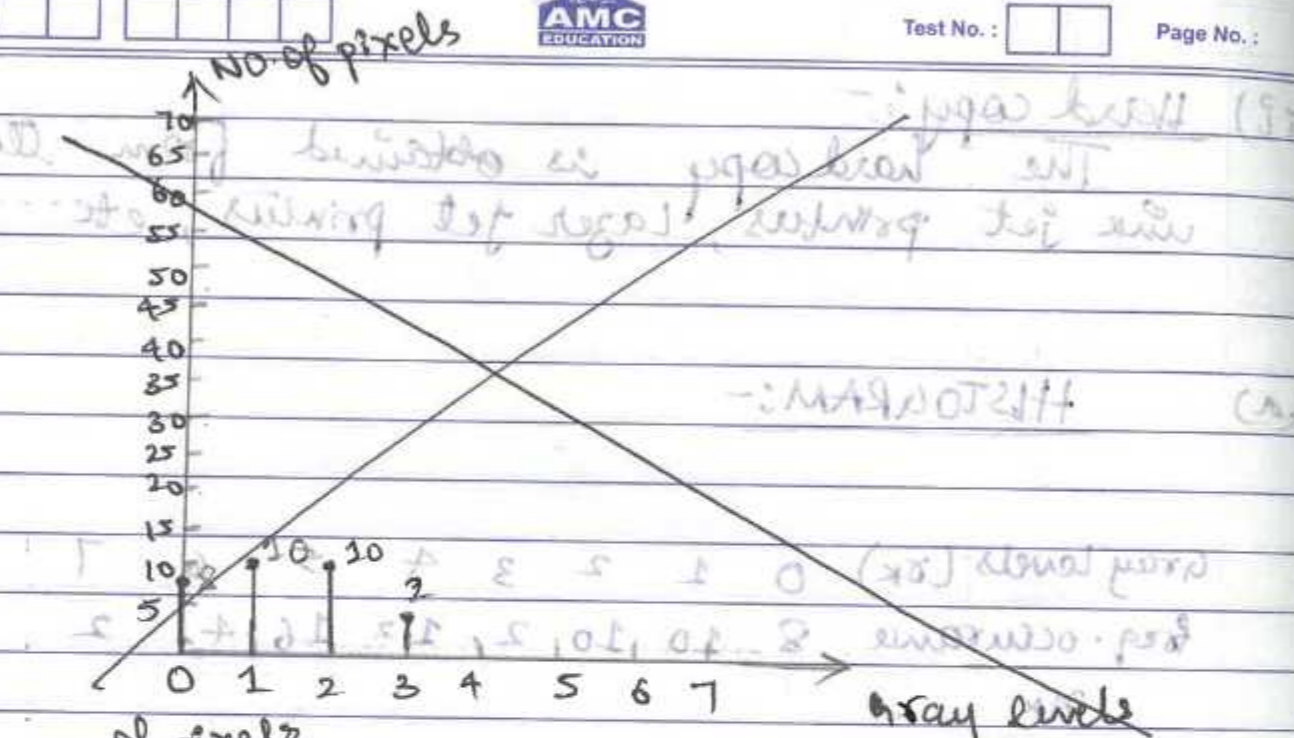
4(a) HISTOGRAM:

Gray levels ( $r_k$ )	0	1	2	3	4	5	6	7
freq. occurrence	8	10	10	2	12	16	4	2
Cummulative Sum $\sum_{k=0}^r n_k$	8	18	28	30	42	58	62	64
$S = \frac{\sum_{k=0}^r n_k}{64}$	$\frac{8}{64}$	$\frac{18}{64}$	$\frac{28}{64}$	$\frac{30}{64}$	$\frac{42}{64}$	$\frac{58}{64}$	$\frac{62}{64}$	$\frac{64}{64}$
$S_k = S \times r_k$	$\frac{8 \times 0}{64}$	$\frac{18 \times 1}{64}$	$\frac{28 \times 2}{64}$	$\frac{30 \times 3}{64}$	$\frac{42 \times 4}{64}$	$\frac{58 \times 5}{64}$	$\frac{62 \times 6}{64}$	$\frac{64 \times 7}{64}$
Round off	1	2	3	3	5	6	7	7

Heis

Input:

0-8	5-16
1-10	6-4
2-10	7-22
3-2	
4-12	

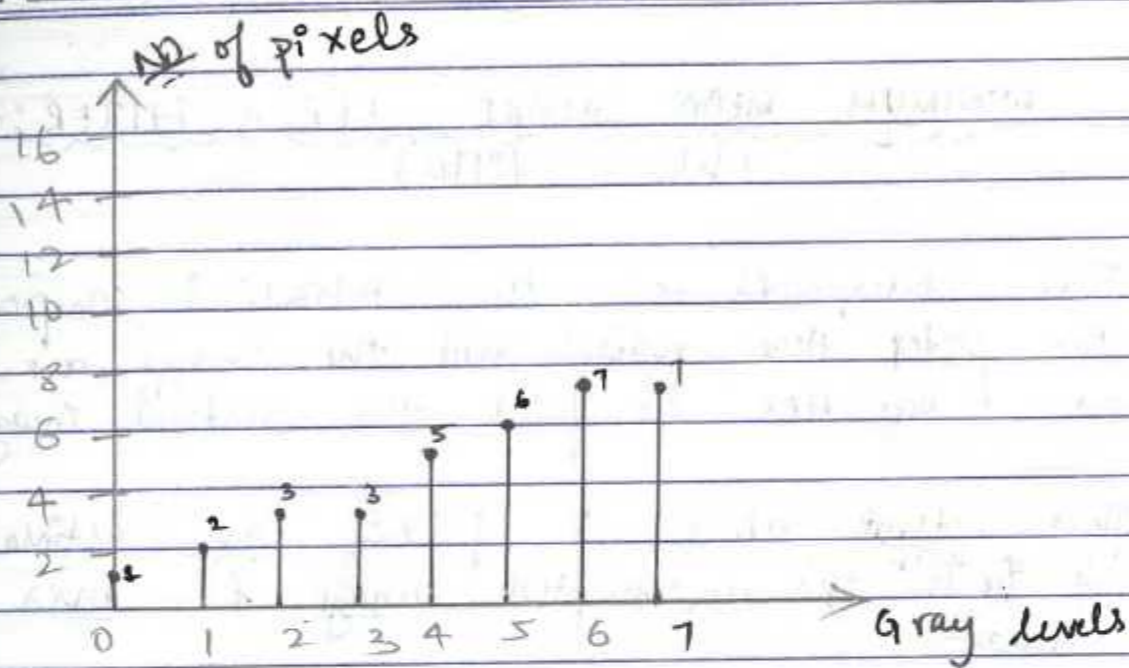


output:-

- 0 - 1
- 1 - 2
- 2 - 3
- 3 - 3

- 4 - 25
- 5 - 16
- 6 - 7
- 7 - 7

- 8 - 0
- 9 - 0
- 10 - 0
- 11 - 0
- 12 - 0



4b) (i) Image negative :-

In this process the 2 extreme shades of gray are enhanced. - 0 and 255. Brightness level is increased.



MINIMUM MEAN SQUARE ERROR FILTER:-  
 (Winer filter)

This corresponds to the statistical components of the filter. Here noise and the image are considered as variables to find the restored image.

This method aims at finding an estimate of  $\hat{f}$  with the uncorrupted image  $f$  over an area.

Therefore,  $\hat{f}(u,v)$  is given as, assuming that the noise and the image are uncorrelated and one of them is equal to zero.

$$\hat{f}(u,v) = \frac{H^*(u,v) \cdot S_f(u,v)}{S_f(u,v) \cdot |H(u,v)|^2 + S_n(u,v)} \cdot G(u,v) \quad (1)$$

dividing all the terms by  $S_f(u,v)$  we get,

$$\hat{f}(u,v) = \frac{H^*(u,v)}{|H(u,v)|^2 + \frac{S_n(u,v)}{S_f(u,v)}} \cdot G(u,v) \quad (2)$$

Now, multiplying and dividing equation (2) by  $H(u,v)$ ,

$$\hat{f}(u,v) = \frac{1}{H(u,v)} \cdot \frac{|H(u,v)|^2}{|H(u,v)|^2 + \frac{S_n(u,v)}{S_f(u,v)}} \cdot G(u,v) \quad (3)$$



where,

$H(u,v)$  = degraded image.

$H^*(u,v)$  = complex conjugate of the degraded image.

$\hat{f}(u,v)$  = Restored image.

$S_n(u,v) = |N(u,v)|^2$  = Power spectrum of Noise

$S_f(u,v) = |F(u,v)|^2$  = power spectrum of original image

Equation (3) is the representation of the minimum mean square (Winer) filter.

\* If the noise in the filter becomes zero then the Winer filter acts as an inverse filter.

\* The signal to noise ratio of the Winer filter in frequency domain is represented as follows,

$$SNR = \frac{\sum_{u=0}^{M-1} \sum_{v=0}^{N-1} |F(u,v)|^2}{\sum_{u=0}^{M-1} \sum_{v=0}^{N-1} |N(u,v)|^2} \quad (4)$$

\* The mean square error considering noise as the difference b/n the restored image and original image is as follows,





$$MSE = \sum_{x=0}^{M-1} \sum_{y=0}^{N-1} |\hat{f}(x,y)|$$

$$MSE = \sum_{x=0}^{M-1} \sum_{y=0}^{N-1} [\hat{f}(x,y) - f(x,y)]$$

$$MSE = \sum_{x=0}^{M-1} \sum_{y=0}^{N-1} [\hat{f}(x,y) - f(x,y)] \quad \text{--- (5)}$$

\* The Wiener filter representation of SNR in spatial domain considering noise as the difference between the restored image and original image is as follows,

$$SNR = \frac{\sum_{x=0}^{M-1} \sum_{y=0}^{N-1} |\hat{f}(x,y)|}{\sum_{x=0}^{M-1} \sum_{y=0}^{N-1} [\hat{f}(x,y) - f(x,y)]} \quad \text{--- (6)}$$

\* In Equation (3), the estimation of the power spectral density  $S_n(u,v)$  is difficult, hence,

we ~~replace~~ substitute the PSD with a constant 'K'.

$$\frac{S_n(u,v)}{S_f(u,v)} = K.$$



$$\hat{f}(u,v) = \left[ \frac{1}{H(u,v)} \cdot \frac{|H(u,v)|^2}{|H(u,v)|^2 + K} \right] \cdot G(u,v)$$

1b) SMOOTHING FILTERS:

\* The smoothing filters are used when there are edges and sharp transitions of high frequencies in an image.

\* The smoothing filters attenuates the sharp edges to remove the high frequency components.

\* There are mainly 3 types of smoothing filters:-

- (i) Ideal lowpass filter
- (ii) Butterworth lowpass filter.
- (iii) Gaussian lowpass filter.

(i) Ideal lowpass filter:

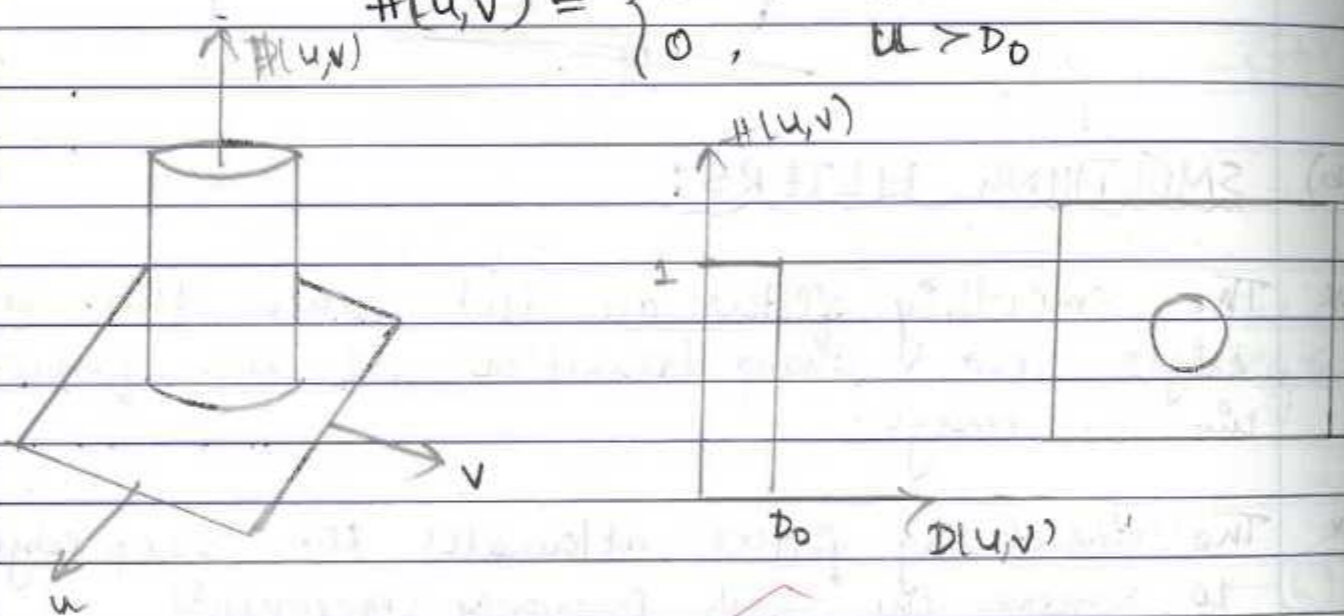
\* This is one of the most popular filters for smoothing.

\* The ideal filters allow all the frequencies passing through the circle of radius  $D_0$  from the origin, and cutoff the frequencies outside the

circle.

The transfer function of ideal low pass filter is given as,

$$H(u,v) = \begin{cases} 1, & u \leq D_0 \\ 0, & u > D_0 \end{cases}$$



Ringing effect is more in ideal lowpass filter.

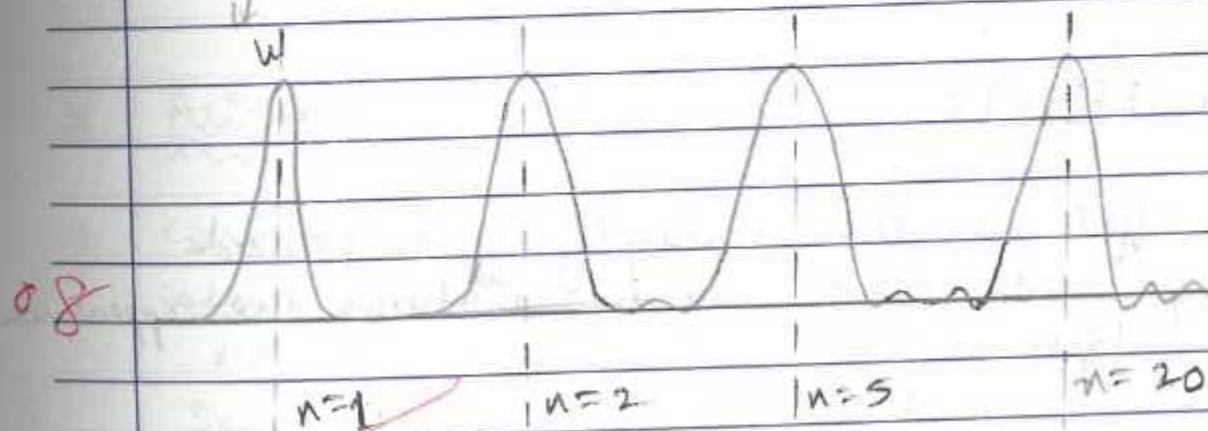
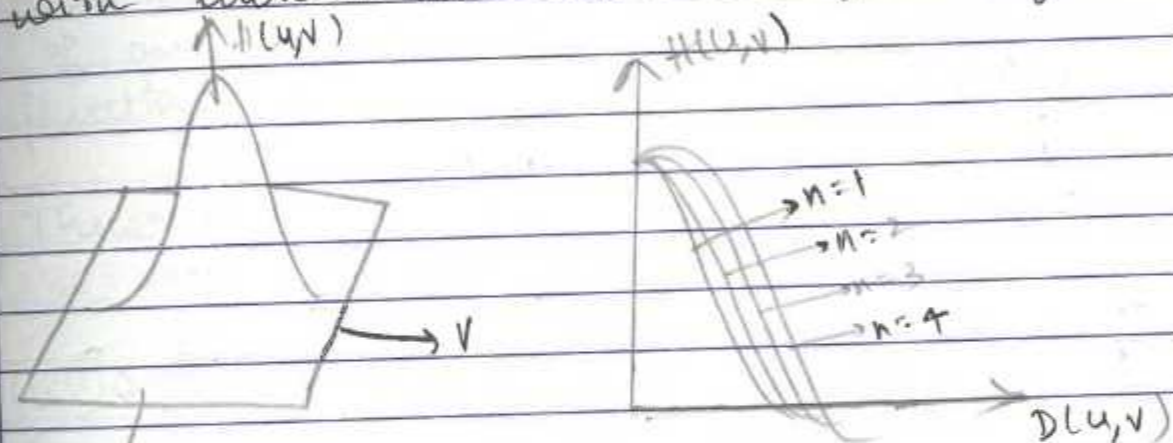
Butterworth lowpass filters

In butterworth filter there is no clear separation between the frequencies encompassed in the circle and the frequencies that are cutoff.

The transfer function of butterworth LPF is given by,

$$H(u,v) = \frac{1}{1 + D(u,v)}$$

\* In a butterworth filter of order = 1, there is no ringing effect. But the ringing effect increases with increase in the order of the filter.



(Fig) :- Ringing increases as the order increases.

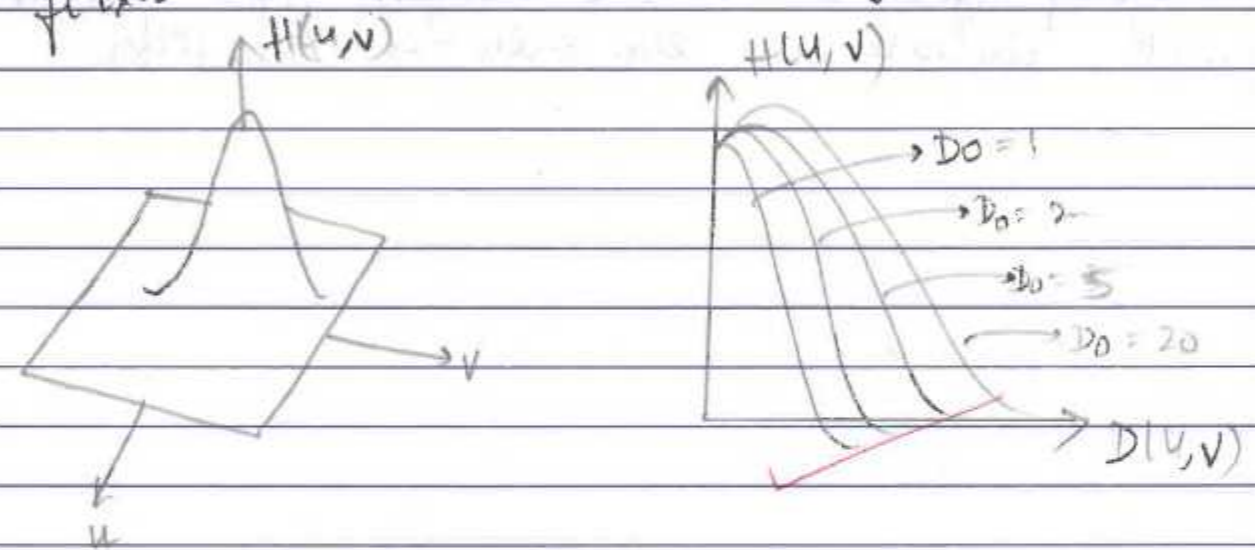
(iii) Gaussian lowpass filter:

\* The Gaussian lowpass filter has the transfer function,

$$H(u,v) = e^{-D^2/D_0}$$

$$H(u,v) = e^{-D^2/2D_0}$$

There is no ringing effect in gaussian low pass filter.



### RINGING EFFECT:

Ringing effect is the annoying effect caused in images and videos that disturbs the appearance of the edges.

Ringing is caused due to ripples caused at the edges of the image.

Ringing is usually observed after image compression or smoothing.

### 4a) MEAN FILTERS IN IMAGE RESTORATION:

\* Restoration is the process of reconstruction of an degraded image by a known degradation function.

\* There are 4 types of mean filters:

- (i) Arithmetic mean filter.
- (ii) Geometric mean filter.
- (iii) Harmonic mean filter.
- (iv) Contraharmonic mean filter.

#### \* Arithmetic mean filter:

\* Consider an image  $m \times n$  and an area  $S_{xy}$  whose value from that image is chosen.

Let  $g(x,y)$  be the degraded image in the area  $S_{xy}$ .

\* The arithmetic mean of these pixels gives us

$$\hat{f}(x,y) = \frac{1}{mn} \sum_{x=0}^{m-1} \sum_{y=0}^{n-1} g(s,t)$$

$$\hat{f}(x,y) = \frac{1}{mn} \sum_{(s,t) \in S_{xy}} g(s,t) \quad \text{--- (1)}$$

\* Here the noise removal is the result of blurring.



Geometric mean filter:

The Geometric mean filter gives excellent smoothing. The smoothing effect given by this filter is better than that of the arithmetic mean filter. But, in this process more information of the image is lost.

The restored image from geometric mean filter is given by,

$$\hat{f}(x,y) = \left[ \sum_{(s,t) \in S_{xy}} g(s,t) \right]^{1/mn} \quad \text{--- (2)}$$

Harmonic mean filter:

The harmonic mean filter is good for removing noise like gaussian noise and mixed noises.

The restored image is given by,

$$\hat{f}(x,y) = \frac{mn}{\sum_{(s,t) \in S_x} \frac{1}{g(s,t)}} \quad \text{--- (3)}$$



(N) Contraharmonic mean filter:

\* The equation for contraharmonic mean filter is given by,

$$\hat{f}(x,y) = \frac{\left[ \sum_{(s,t) \in S_{xy}} g(s,t) \right]^{Q+1}}{\left[ \sum_{(s,t) \in S_{xy}} g(s,t) \right]^Q}$$

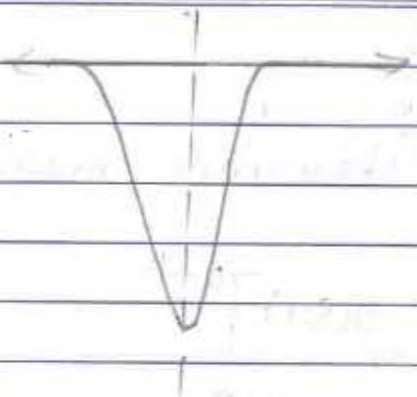
\* This filter is used to reduce salt and pepper noise. If Q is -ve, then it is used to remove salt noise. If Q is +ve, it is used to remove pepper noise.

(b) GAUSSIAN HIGH PASS FILTER

\* The Gaussian high pass filter is used to remove the combined noises.

\* The transfer function for Gaussian highpass filter is,

$$H(u,v) = 1 + e^{-D^2/2D_0}$$



\* There is no ringing effect in gaussian high pass filter.

1a) DETECTION OF ISOLATED POINTS AND LINE DETECTION:

\* Detection of isolated points:

\* For this operation, the Laplace equation is used.

$$\nabla^2 f(x, y) = \frac{\partial^2 f}{\partial x^2} + \frac{\partial^2 f}{\partial y^2} \quad \text{--- (1)}$$

\* Taking partial derivative

\* The partials of the above equation is given as follows: (2nd derivatives)

$$\frac{\partial^2 f}{\partial x^2} = f(x+1, y) + f(x-1, y) - 2f(x, y) \quad \text{--- (2)}$$

$$\frac{\partial^2 f}{\partial y^2} = f(x, y+1) + f(x, y-1) - 2f(x, y) \quad \text{--- (3)}$$

\* Adding the (2) and (3) equations, we arrive at the 2nd derivative of Laplacian given by,

$$\nabla^2 f(x, y) = f(x+1, y) + f(x-1, y) + f(x, y+1) + f(x, y-1) - 4f(x, y) \quad \text{--- (4)}$$



{mask (1)} = 
$$\begin{bmatrix} 1 & 1 & 1 \\ 1 & -4 & 1 \\ 1 & 1 & 1 \end{bmatrix}$$

We use the laplacian mask to better detect the isolated points along with their direction.

{mask (2)} = 
$$\begin{bmatrix} 1 & 1 & 1 \\ 1 & -8 & 1 \\ 1 & 1 & 1 \end{bmatrix}$$
, Laplacian mask = 
$$\begin{bmatrix} 1 & 1 & 1 \\ 1 & -8 & 1 \\ 1 & 1 & 1 \end{bmatrix}$$

We can observe that the laplacian mask is same as that of the mask (2).

When we use that mask against the original image, the exact point of isolation is determined.

When the laplacian mask is used and an edge is detected, the output  $g(x,y)$  will be greater than the threshold value. Otherwise it will be zero.

This can be represented in the form of equation as follows:

$$g(x,y) = \begin{cases} 1 & R(x,y) \geq T \\ 0 & \text{elsewhere.} \end{cases}$$



where,  $T$  is the threshold.

\* Line detection:-

\* Since the isolation point detection doesn't give desired and accurate results, we take the second derivative of the laplacian mask.

\* Taking the second derivative reduces the thickness of the edge, resulting in thin edges.

\* But, this may sometimes cause the effect called as "double line effect".

\* Usually it is assumed that by considering the absolute value of the laplacian mask will reduce this effect. But, this will cause the line to ~~thicken~~ thicken which is worst.

\* Hence, instead of taking absolute values of the mask, by considering only the +ve values of the laplacian mask, the double line effect can be removed.

\* Consider different masks as shown below:-

-1	-1	-1	-1	2	-1	2	-1	-1	-1	-1	2
2	2	2	-1	2	-1	-1	2	-1	-1	2	-1
-1	-1	-1	-1	2	-1	-1	-1	2	2	-1	-1

(a) (b) (c) (d)

\* Figure (a) shows the mask which allows detects horizontally.

Figure (b) shows the mask that detects vertically.

\* Figure (c) shows the masks that detect diagonally. (+45° and -45°)

The weights of the pixels in the required direction is always more than the weights of other pixels.

## 2) GRADIENT AND ITS PROPERTIES:

The Gradient of an image is simply a tool used to detect the edge, segmentation and edge direction at location (x,y).

It is represented as  $\nabla g(x,y)$ .

\* It can be written as,

$$\nabla g(x,y) = \begin{bmatrix} g_x \\ g_y \end{bmatrix} = \begin{bmatrix} \frac{\partial g}{\partial x} \\ \frac{\partial g}{\partial y} \end{bmatrix} \quad \text{--- (1)}$$

\* where  $g_x$  is the gradient at x and  $g_y$  is the gradient at y.

\* The magnitude of the gradient can be determined by the following equation.

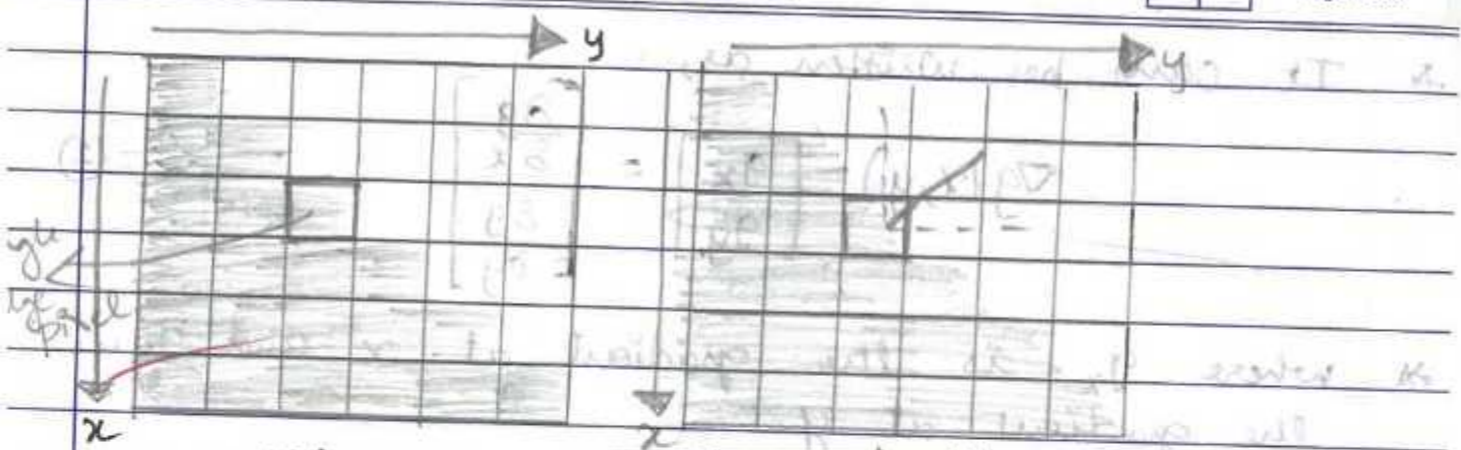
$$Mag(x,y) = Mag = \sqrt{g_x^2 + g_y^2} \quad \text{--- (2)}$$

\* The gradient angle  $\alpha$  is determined by the following equation.

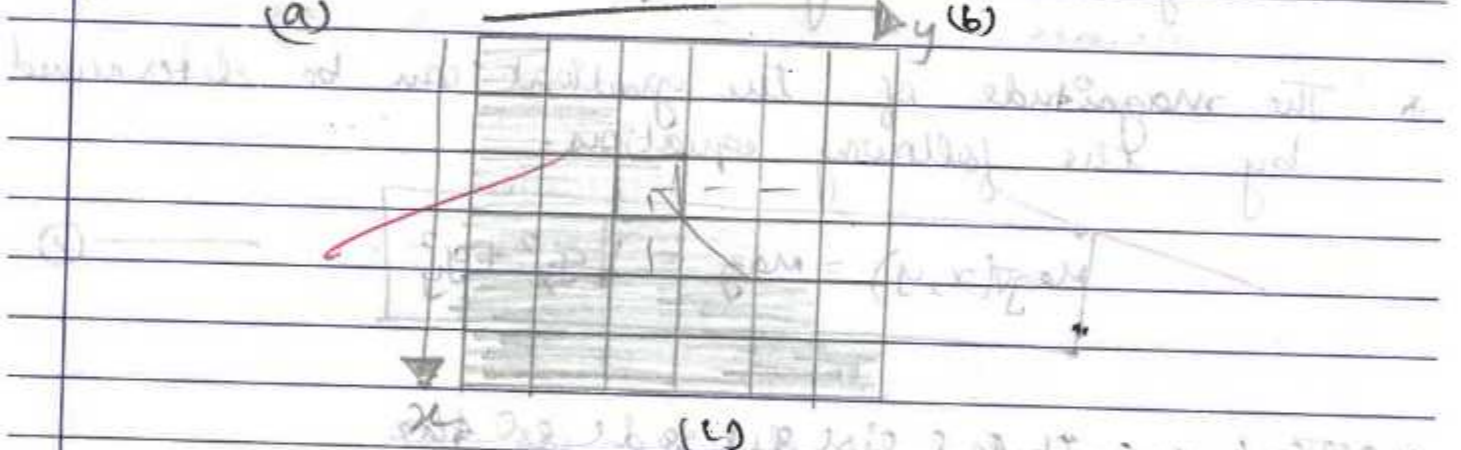
$$\alpha = \tan^{-1} \left[ \frac{g_y}{g_x} \right] \quad \text{--- (3)}$$

### \* EXAMPLE:

Consider an example of an image with 6x6 matrix.



(a)



(b)

Consider an edge pixel in a 6x6 pixel matrix. Calculating its gradients in x and y direction as shown above, we get,

$$g_x = -2, g_y = 2.$$

$$\therefore \nabla g(x,y) = \begin{bmatrix} -2 \\ 2 \end{bmatrix}$$

To calculate the magnitude we substitute the above values in equation (2).



$$\text{Mag}(x,y) = \sqrt{(-2)^2 + (2)^2}$$

$$= \sqrt{8}$$

$$\text{Mag}(x,y) = 2\sqrt{2}$$

\* To calculate the gradient angle  $\alpha$ , we substitute in equation (3),

$$\alpha = \tan^{-1} \left[ \frac{g_y}{g_x} \right] = \tan^{-1} \left[ \frac{2}{-2} \right]$$

$$\alpha = -45^\circ \text{ or } 315^\circ$$

3a) DILATION AND EROSION:

(i) EROSION:

\* Erosion is the process of ~~reducing~~ compressing and reducing the size of the image.

\* The erosion operation is represented with  $\ominus$ .

$$A \ominus B = \{ Z \mid (B)_z \subseteq A \}$$

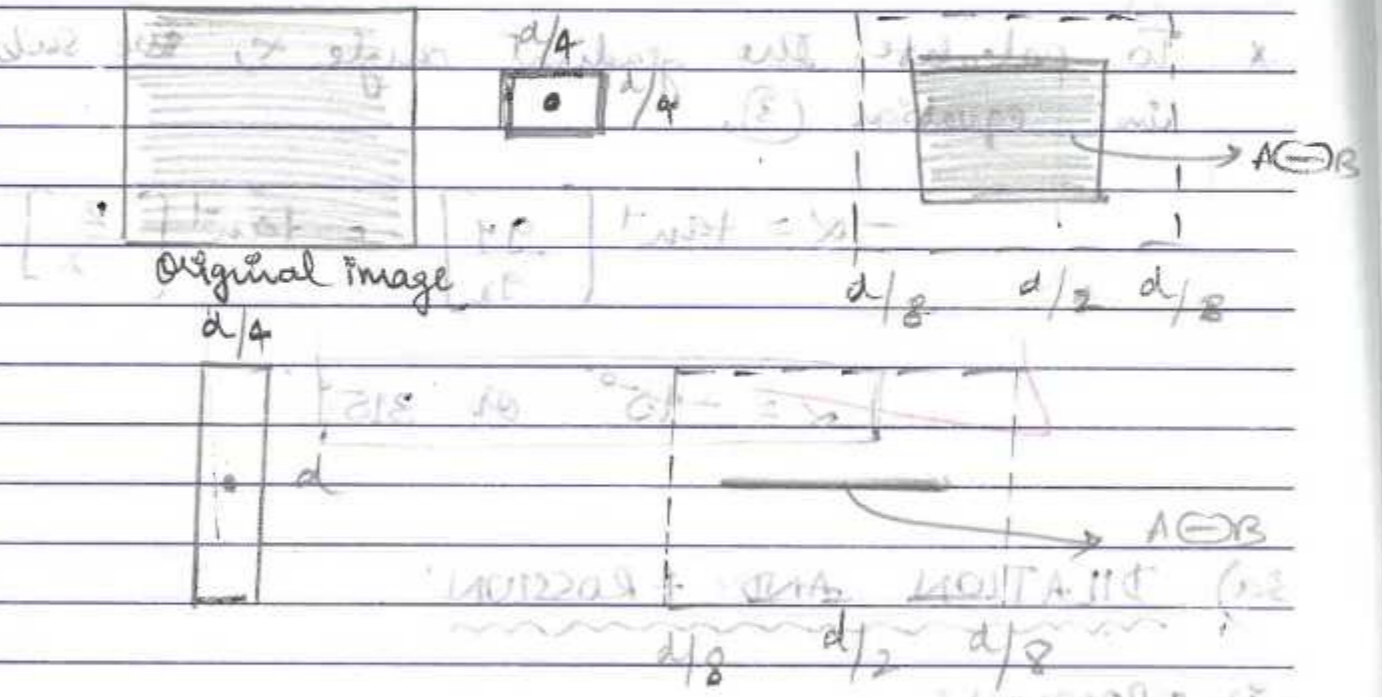




where A and B belong to the set  $Z^2$ .

A and B with a null set is represented as,

$$A \ominus B = \{z \mid [(B)_z \cap A] = \phi\} \quad \text{--- (2)}$$



As seen in the above figure, the size of the images has reduced after the process of erosion.

DILATION

In erosion, since B is a subset of A. If A does not share a common element with the background, then even B will not share any common element with the background.



ii) DILATION

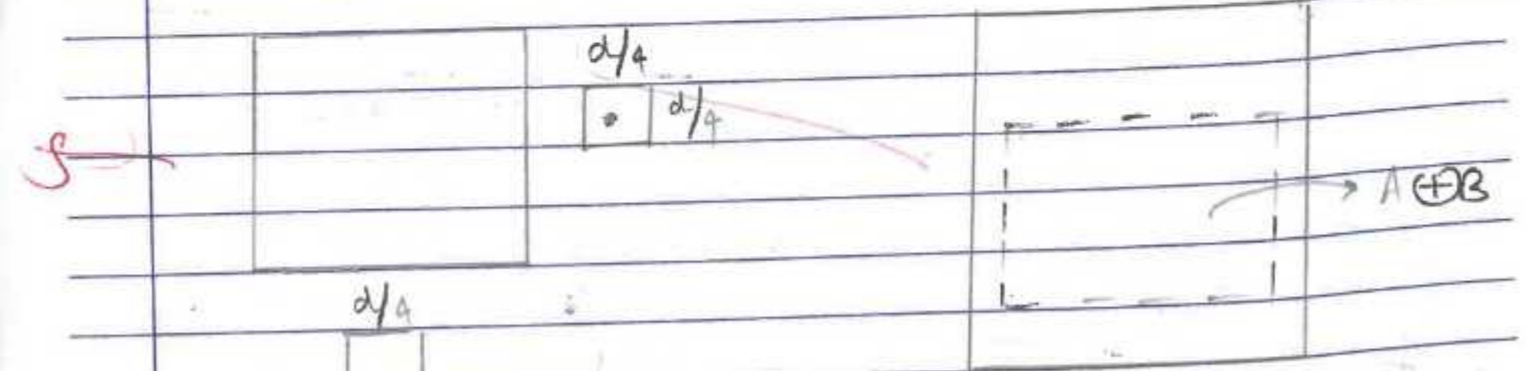
\* Dilation is the process of expanding an image by expanding the boundaries.

\* The dilation operation is represented with  $\oplus$ .

$$A \oplus B = \{z \mid [(B)_z \cap A] \neq \phi\} \quad \text{--- (1)}$$

\* where A and B belong to the set  $Z^2$ .

$$A \oplus B = \{z \mid [(B)_z \cap A] \subseteq A\} \quad \text{--- (2)}$$

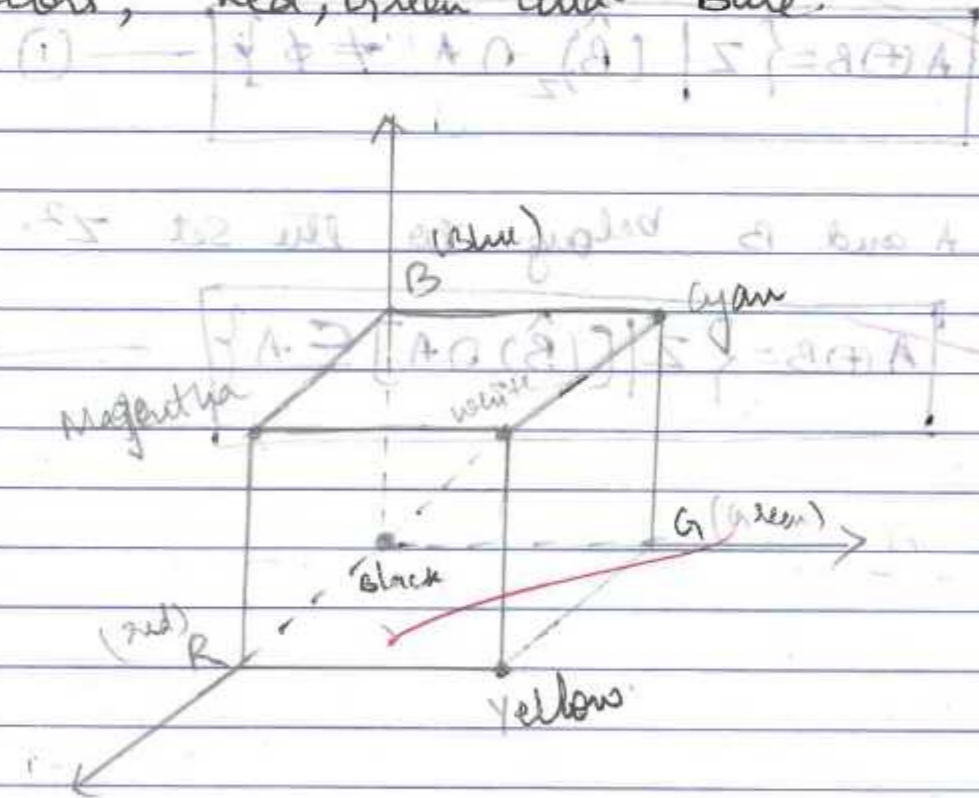


The figure shows the original image and its dilation. The dilation operation expands the boundaries of the original image by a distance of d/2, resulting in a larger image with a width of d/8.

1) RGB, CMY, And HSI COLOR MODEL:

RGB color model

RGB stands for Red, Green and Blue. RGB color model mainly consists of the 3 colors, Red, Green and Blue.

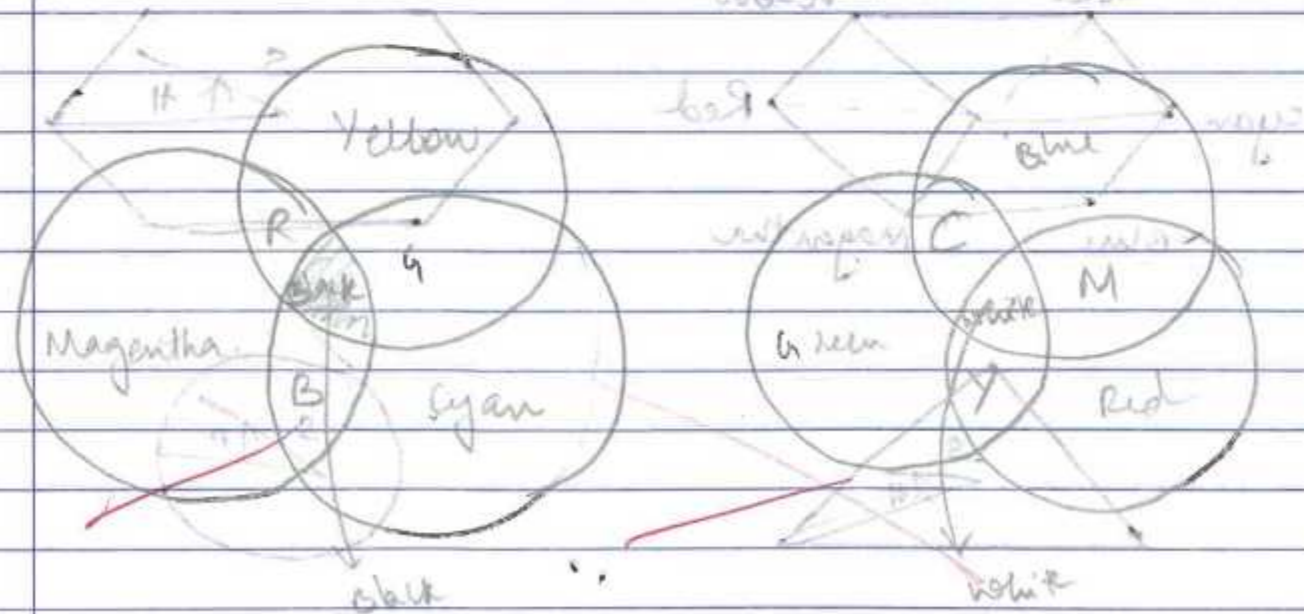


The above diagram represents the RGB color model cube.

The RGB - red, green, blue are called as the primary colors of the spectrum. where as CMY, - cyan, Magenta and yellow are called as secondary colors.

- The RGB are placed at 3 corners on the cube, and the CMY are placed at the other 3 corners of the cube.
- Black is placed at the origin and white is placed at the corner far away from the origin.
- The line leading from black to white represent the gray scales.

\* CMY color model



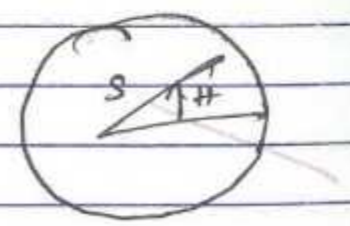
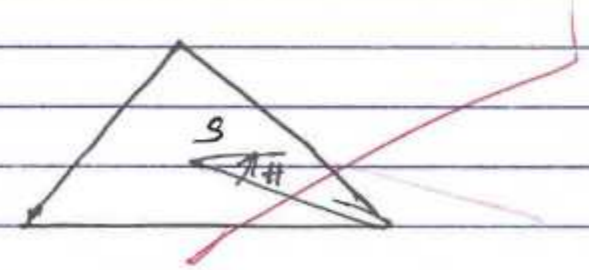
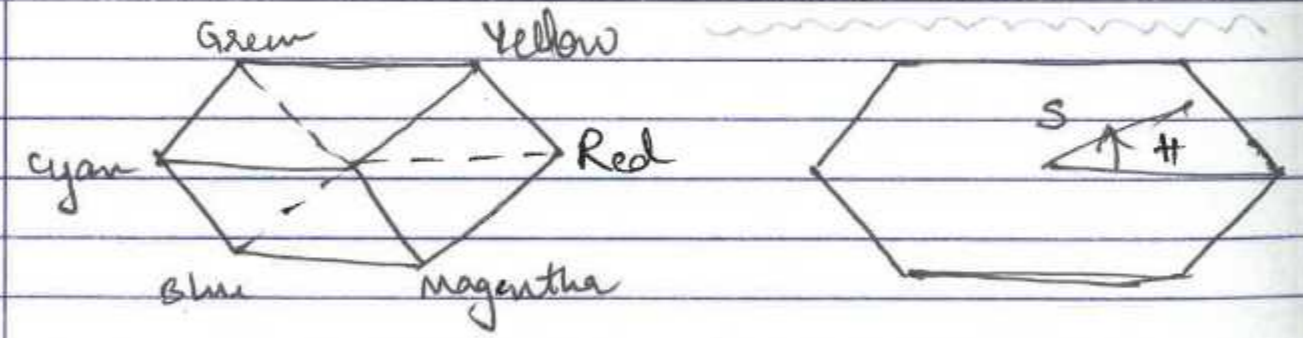
\* The mixture of cyan primary colors and CMY gives the output as an off-Black color.

\* This is usually used in color printers where black is needed.

- A printer named by CMYK is used, where K represents black. It is called as 4 color printer.

HSI color model:

The HSI model is the Hue, Saturation and Intensity color model.



The Hue, is the pure color of the image like pure blue, pure red, etc.

\* Saturation is The degree at which the the image is diluted with the white light.

\* Intensity is basically impossible to measure. But it is calculated based on the brightness level.



# AMC

## ENGINEERING COLLEGE

Affiliated to Visvesvaraya Technological University, Belagavi,  
Approved by Government of Karnataka, Recognized by AICTE, New Delhi.

18<sup>th</sup> K.M. Bannerghatta Road, Kalkere, Bengaluru - 560 083  
E-mail: principal@amcec.edu.in, hodmech@amceducation.in  
Website: www.amcgroup.edu.in

Accredited by NAAC & NBA (2009-2012), Ministry of HRD, New Delhi.



### Department of Mechanical Engineering

Test	Date	Signature of Student	Signature of Invigilator
Test - I	11/9/19	Vishwa	[Signature]
Test - II	21/10/19	Vishwa	[Signature]
Test - III	27/11/19	Vishwa	[Signature]

BLUE BOOK

Name : Vishwa Rudra N  
USN : 1A1M15ME211 Semester : VII  
Program: Energy engineering  
Section : A Class Roll No : \_\_\_\_\_  
Course : Energy engineering



# AMC ENGINEERING COLLEGE

18th K.M, Bannerghatta Road, Kalkere, Bengaluru - 560083. Phone: 27828655

## CBCS SCHEME

Student Name: Vishwa Surya R USN: 1AM15ME011 Course-Name & Code: 15ME21

Internal Assessment Test	Q1			Q2			Q3			Q4			IA Test Marks ( )		Signature of Faculty Incharge
	a	b	C	a	b	c	a	b	c	a	b	c	Total Marks	Marks Reduce to	
CO	1	1	-	1	1	-	1	1	-	1	1	-			
Max marks	8	7	-	8	7	-	5	5	-	5	5	-	16		
IA Test 1	8	-	-	8	7	-	0	1	-	-	-	-	25		
CO	1	1	-	2	2	-	2	2	-	2	2	-	24		
Max marks	8	7	-	8	7	-	5	5	-	5	5	-	25		
IA Test 2	7	7	-	-	-	-	-	-	-	5	5	-	25		
CO	3	3	-	3	3	-	4	4	-	4	4	-	20		
Max marks	10	5	-	10	5	-	5	5	-	5	5	-	25		
IA Test 3	-	-	-	8	4	-	4	4	-	-	-	-			

Assessment Tool*	CO1( )	CO2( )	CO3( )	CO4( )	CO5( )	CO6( )	Total Marks( )	Marks Reduced to	Signature of Faculty Incharge
AT 1	5	5	-	-	-	-	5	5	
AT 2	-	-	5	5	-	-	5	5	
AT 3	-	-	-	-	5	5	5	5	

Final IA Marks: 22/25 Final AT Marks: (2+2) = (05)

### Certificate

This is to certify that Mr./Ms. Vishwa Surya R.....has satisfactorily completed the course of assignment prescribed by the Visvesvaraya Technological University for Semester VI... Branch M.E.....for the academic year 2019-2020

Final Continuous Internal Evaluation (CIE) Marks Awarded ( ) : 13.2 + 5 = 16 + 2 = 18

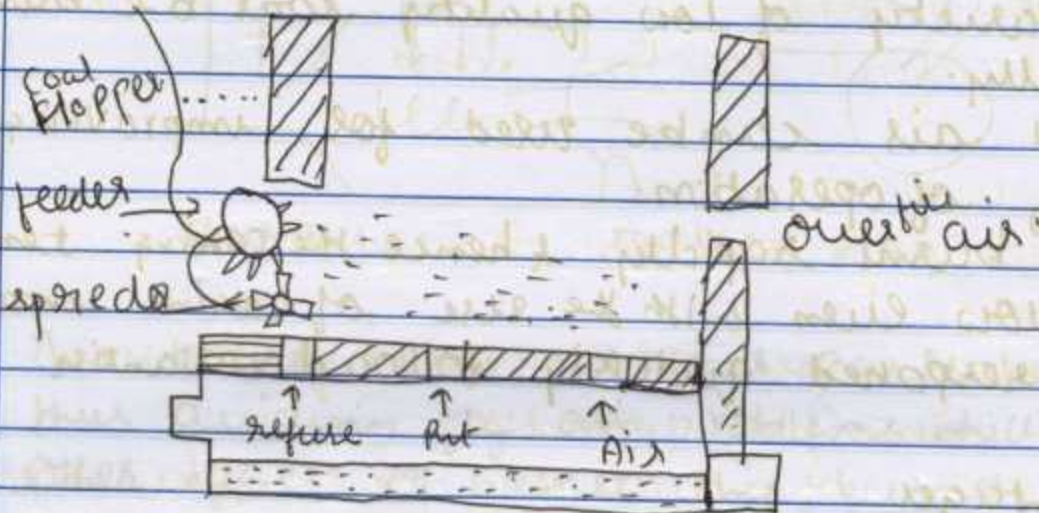
\*Assignment/Quiz/Seminar/Mini-Project

Signature of Student

Signature of Faculty Incharge

Signature of Course Coordinator

2001



\* In this type stoker coal from the hopper is fed to the rotating feeder which in turn feeds the to a spreader and feed according to the requirement feed via rotating drum filter the to the refuse to with blades on the periphery other type feeder such as reciprocal endless belt or which in turn distributes and feeds the coal on the planes as shown in fig the fuel feed rate and the supplied to the boiler can be controlled by controlling the feed to the hopped or by controlling the spreader speed.

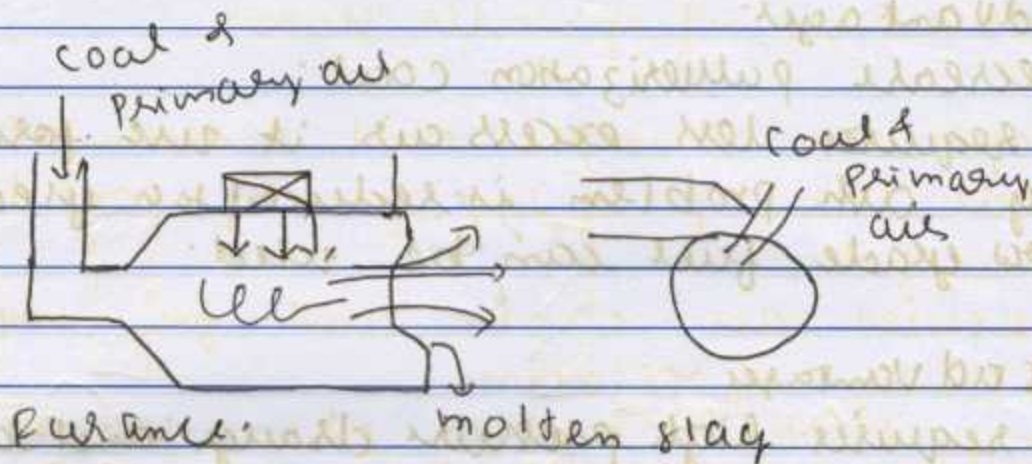
\* The arrangement of the spreader stoker. In this stoker The hopper is feed into the rotating

### Advantages of spreader stoker.

- \* It operation is simple and economical
- \* A wide variety of low quality coal be burnt successfully.
- \* Preheated air can be used for improving efficiency of operation.
- \* The fuel burns rapidly. & hence the caking tendency is very low even with the use of caking coals
- \* It can respond quickly to load variations.

### Disadvantages

- \* It is not possible to burn varying sizes of coal and ~~only~~ crushed sized coal can be used
- \* A part of charge is burnt in suspension
- \* Unburnt carbon particles may escape through the flues and reduce the combustion efficiency



This burner burns the coal particles in suspension thus avoiding fly ash problems which common in other types of burner. This burner uses coal of pulverised coal. This burner can easily burn can easily burn low grade coal with high ash & moisture content.

The cyclone burner consist of horizontal cylinder of about 3m diameter & 4m high. The cylinder wall is water cooled while inside surface is lined with chrome ore. The horizontal axis of burner is toward boiler. Coated used in cyclone based is crushed to about 6mm size coal and primary air admitted tangentially into the cylinder so as to produce a strong centrifugal motion and wall to wall furnace. So as to move turbulence coal air such burner produce high heat and temperature. Due to high temperature burning that ash melts and is drained out periodically at the bottom.



Advantages

- 1) decrease pulverization cost.
- 2) It requires less excess air it use force draught
- \* fly ash problem is reduced to a great extent
- \* low grade fuel can be used.

Disadvantages

- \* It requires high pressure draught and consumes high power.
- \* It produces more oxides of nitrogen which creates atmosphere pollution.

3b) Advantages of pulverized coal in thermal power

- \* Banking losses are less.
- \* The boiler can start at cold very rapidly.
- \* Increase in pulverized coal in power plant
- \* ~~increase in pulverized coal in power plant~~

1)  $0/0$

2)  $0/0$

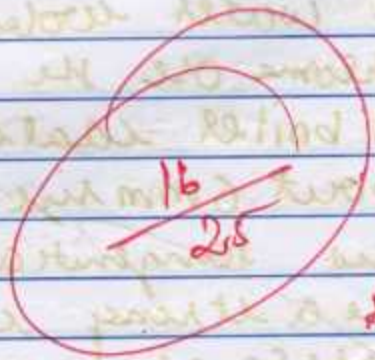
3)  $0/0$

4)  $0/0$

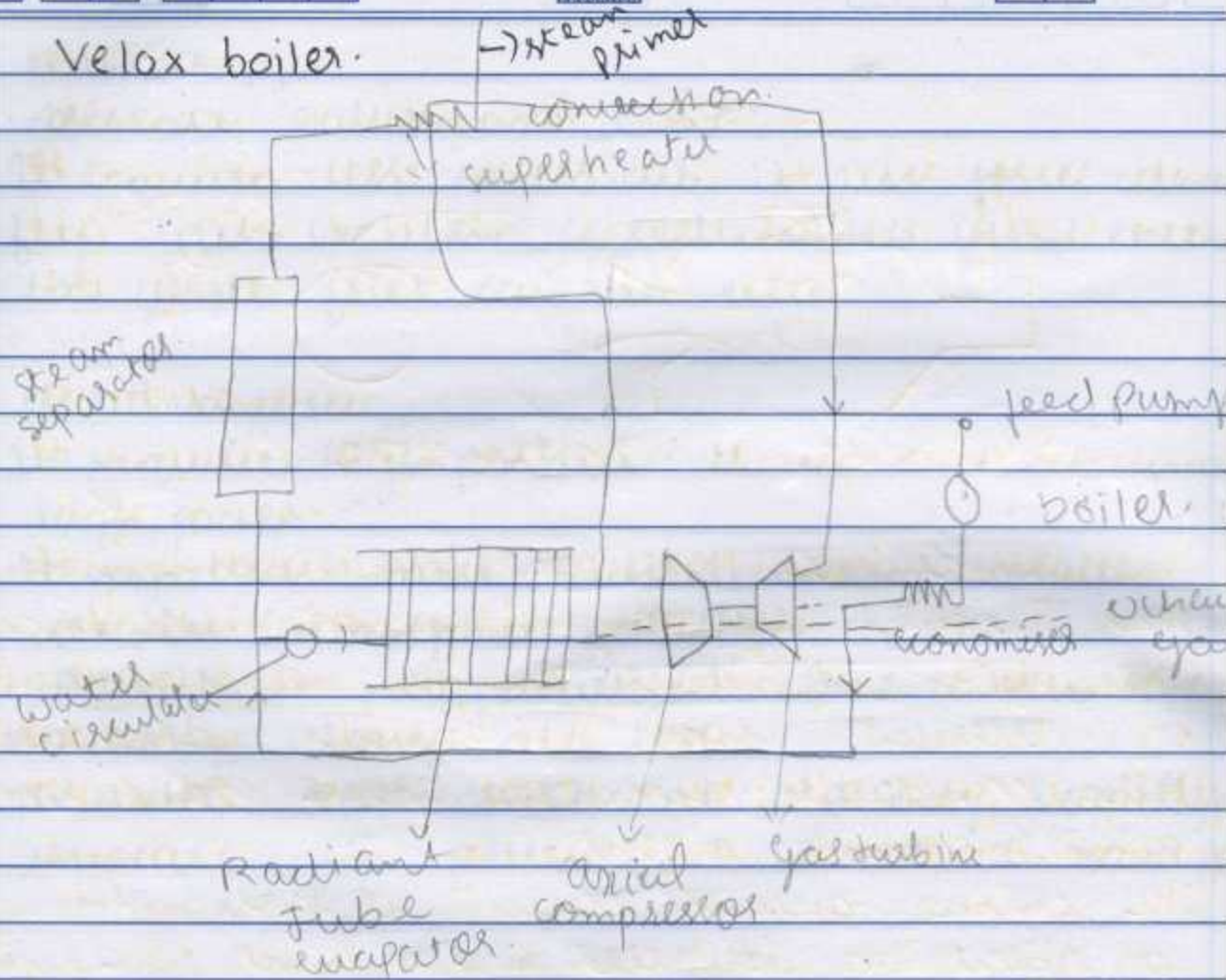
5)  $0/0$

6)  $0/0$

10



1.a) Velox boiler.



The velox boiler is a high pressure boiler so it consist of axial compressor and gas turbine which convert air to fuel gas. The feed from the pump to economiser which is pass to the vertical of the radiant tube evaporator with help of water circulator. Thus water is passed to the steam separator where steam is discharged then moved to connect Super heater.

Working: The air from drawn from the atmosphere air is press pressure up to 2.5 to 3 bar. Then it is passed radiant tube it reduce the increase the pressure and evaporate any water present in air. Then gas turbine where any air is compressed into fuel gas. The steam separator removes any steam present in the air which produces 35 to 45 million kWh from the steam prime.

### Advantage

- \* It produces 35 to 45 million of hydrolic combustion rate.
- \* less air is required.
- \* Boiler start quickly.

$$H = 26 \text{ m.}$$

$$T_a = 30^\circ\text{C} = 30 + 273 = 303 \text{ K}$$

$$T_g = 300^\circ\text{C} = 300 + 273 = 573 \text{ K}$$

$$m_a = 20 \text{ kg}$$

i) draught in mm of water.

$$h_w = H \times 353 \times \left[ \left( \frac{1}{T_a} - \frac{1}{T_g} \right) \times \left( \frac{m_a + 1}{m_a} \right) \right]$$

$$h_w = 26 \times 353 \times \left[ \left( \frac{1}{303} - \frac{1}{573} \right) \times \left( \frac{20 + 1}{20} \right) \right]$$

$$h_w = 140.99 \text{ mm.} \checkmark$$

velocity of gases passing through chimney.

$$H_1 = H \times \left( \frac{T_g}{T_a} \left( \frac{m_a}{m_a + 1} \right) - 1 \right)$$

$$H_1 = 26 \times \left( \frac{573}{303} \left( \frac{20}{20 + 1} \right) - 1 \right)$$

$$H_1 = 21.35$$

velocity of gases passing through chimney at 50%

$$C = \sqrt{2g(H_1 - h)}$$

$$C = \sqrt{2 \times 9.81 (21.35 - 0.5 \times (21.35))}$$

$$C = 14.47 \text{ m/s} \checkmark$$

4.a) The classification of hydroelectric power plant.

According to the availability of head

- \* low head power plant ✓
- \* medium head power plant ✓
- \* high head power plant ✓

According to the nature of load.

- \* Peak load ✓
- \* Base load ✓

→ According to the quantity of water available.

→ run of plant river without pondage.

→ run of plant river with pondage.

storage of plant.

hydro mini, ✓

4.b) The factors which affect run off.

→ nature of precipitation.

→ Topography of catchment area.

→ geology of area

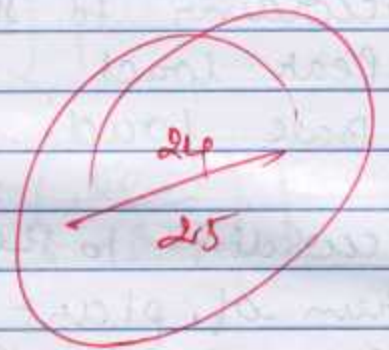
→ meteorology


→ Vegetation

→ size and shape of the area.

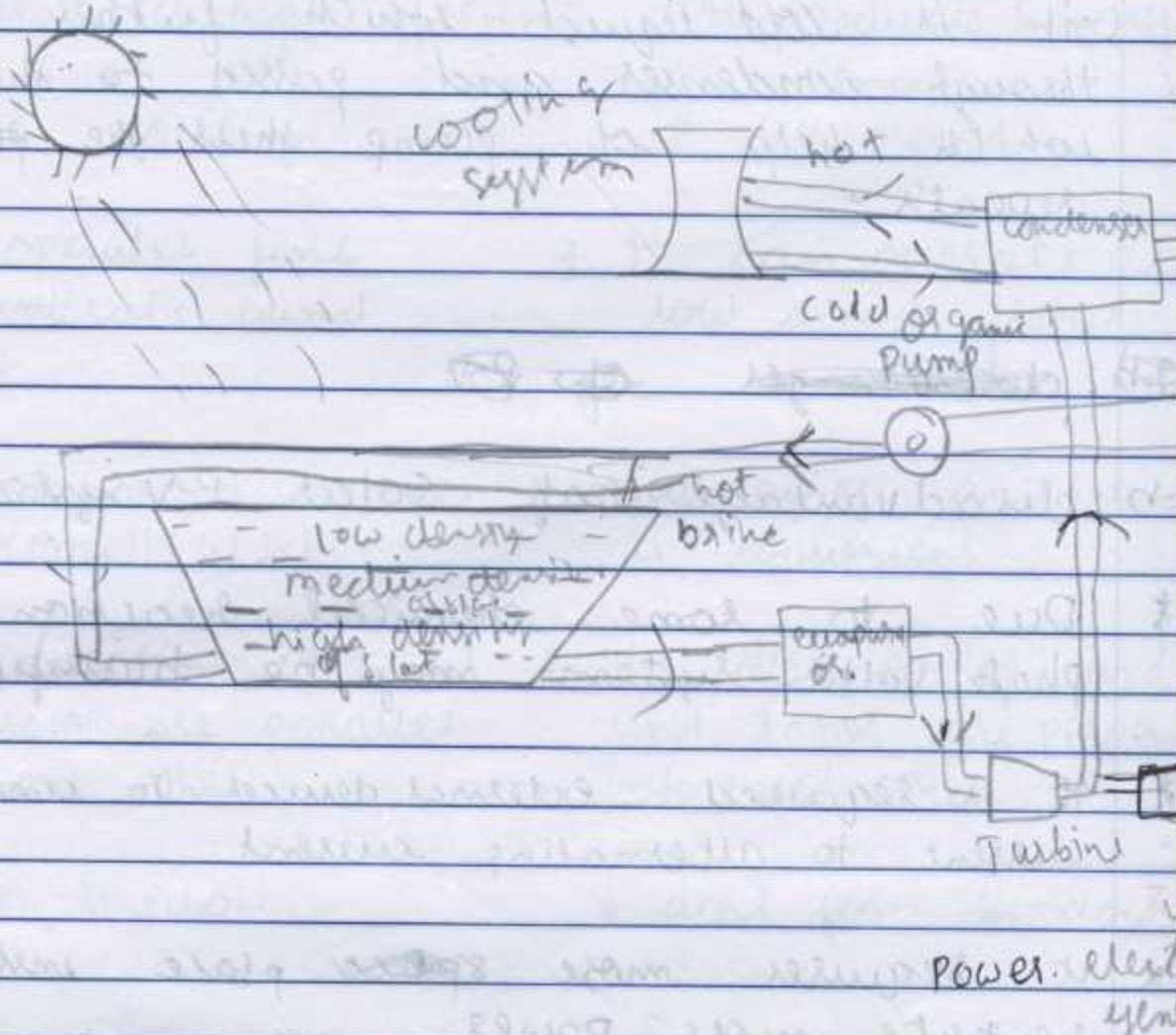
1) 7  
 2) 7  
 3) 0  
 4) 0  
 5) 5  
 6) 5

24



  
 28/10/14

2-a) solar pond electric power plant.



The low thermal energy is passed Rankin cycle of work fluid which further transfer to the turbine where electric energy is obtain in the form of mechanical energy is convert into electrical energy. The vapour from the turbine is circulated to the condenser from the turbine is where vapour is converted into liquid which further passed to the cooling where liquid cooled. However high pressure work

fluid is passed through evaporator then turbine which is come out from cooling coil is cold liquid which further passed through condenser and passed to the pump which help of pump thus the ~~process~~ repeat's.

~~Q.7) ~~disadvantage of solar P.V system~~~~

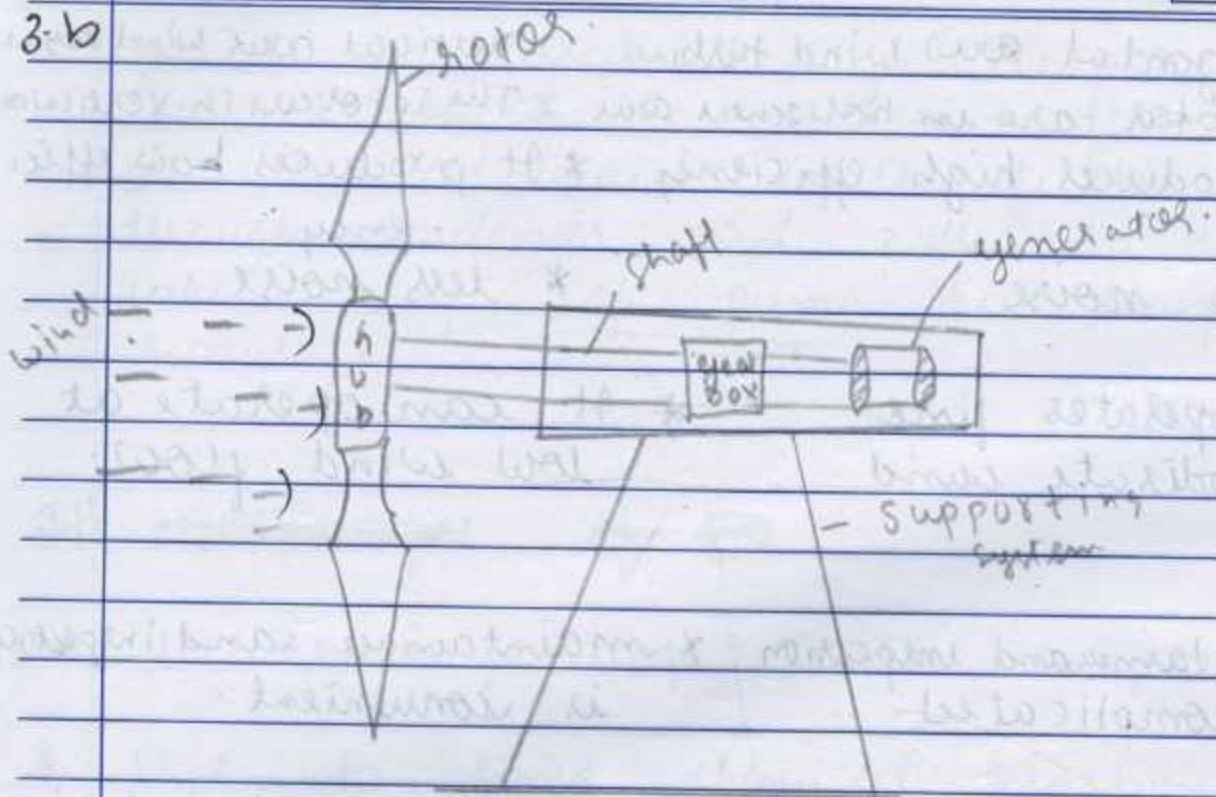
2.b disadvantage of solar P.V system.

- \* Due to some chemical reaction in photo voltaic system may be harmful.
- \* It is required external devices to convert direct current to alternating current.
- \* It requires more ~~space~~ place install to generate more power.
- \* ~~It~~ It cannot generate electricity when there is cloudy and at night because don't shine.
- \* less efficiency compared to other solar d



- 3-Q) Horizontal axis wind turbine      vertical axis wind turbine
- \* The rotor are in horizontal axis      \* The rotor are in vertical axis
  - \* It produces high efficiency      \* It produces low efficiency
  - \* more noise      \* less noise
  - \* It operates fine in moderate wind flow      \* It can operate at low wind flow.
  - \* maintenance and inspection is complicated      \* maintenance and inspection is convenient.
  - \* The direction of wind and rotor are parallel to each other      \* The direction of wind and rotor are perpendicular to each other
  - \* forms shadow      \* don't form shadow.

3-b



horizontal axis wind turbine.

It consists of rotor, shaft, generator, supporting system. The gear box is used to speed of shaft is 90-90 rpm. generator is used to convert the mechanical energy into electrical energy. Shaft is used for the rotational motion for the rotor and generate the energy. supporting system is the ~~rigid~~ rigid body which gives support for the horizontal axis wind turbine.

1) a) - 0

b) - 0

2) a) - 8

b) - 4

3) a) - 4


b) - 4

4) a) - 0

b) - 0

20

20/25

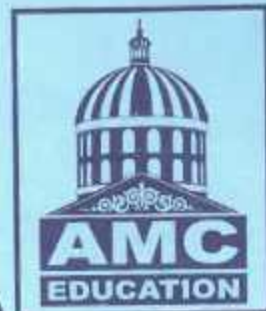
 28/11/19

## VISION

To be a Leader in imparting Value based Technical Education and Research for the benefit of society

## MISSION

- To Provide State of the Art Infrastructure Facilities.
- To Implement modern Pedagogical methods and committed faculty.
- To create a vibrant ambience that promotes Learning, Research, Invention and Innovation.
- To undertake manpower and skill development programmes for Academic Institutions and Innovation.
- To Enhance Institute Industry Interface through Collaborative Research and Consultancy.
- To Generate and Disseminate knowledge through Training Programme, Workshops, Seminars, Conferences, Publications.
- To be a more Comprehensive college in terms of the number of programs offered.
- To Relentlessly pursue professional excellence with ethical and moral values.



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# AMC

## ENGINEERING COLLEGE

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Test	Date	Signature of the Student	Signature of the Invigilator
Test - I	18-03-19	Darshan Kumar V	[Signature]
Test - II	22-04-19	Darshan Kumar V	[Signature]
Test - III	20-05-19	Darshan Kumar V	[Signature]

## BLUE BOOK

Name : ..... DARSHAN KUMAR V .....  
Branch : ..... EEE .....  
USN : ..... 1AM16EE053 ..... Semester ..... VI .....  
Section : ..... Class Roll No. ....  
Subject : ..... Control System .....



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Website : www.amcgroup.edu.in, www.amcec.edu.in

## INTERNAL ASSESSMENT BOOK

Subject ..... Control system .....

Sl. No.	Particulars	Test Date	Page No.	Max. Marks	Marks Awarded	Signature of Staff Incharge
1.	Test - I	18-03-19		50	9	
2.	Test - II	29-04-19		50	4	
3.	Test - III	21-05-19		50	13	

### Certificate

This is to certify that Mr. / Ms. DARSHAN KUMAR.V ..... has

satisfactorily completed the course of assignment prescribed by the Visveswaraya Technological University for

Semester 6<sup>th</sup> Branch EEE ..... for the academic year 20 19 - 20 20

#### FINAL MARKS AWARDED

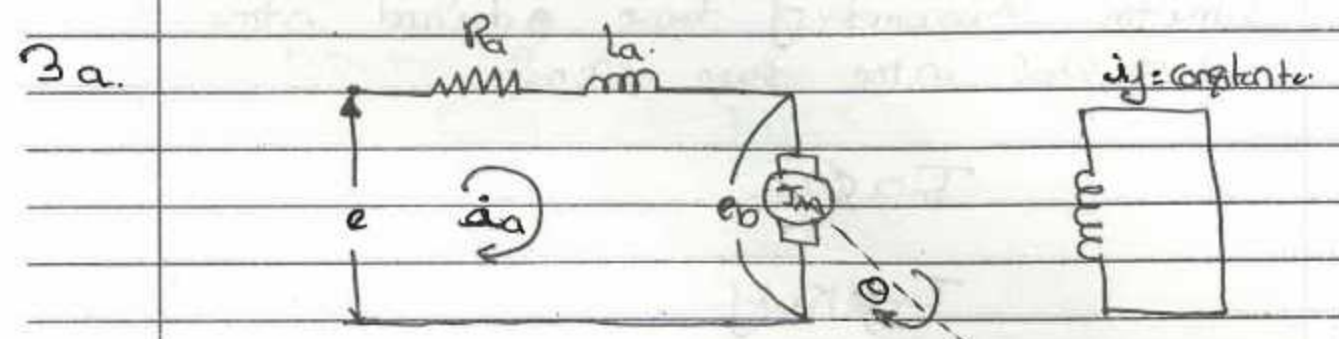
12/50  
25/50

1 A M I G E E O S 3

Signature of  
Student

Signature of  
Staff Incharge

Signature of  
H.O.D.



Jenette system

- $i_a$  = induced current
- $i_j$  = armature current
- $e$  = Applied voltage
- $e_b$  = back EMF voltage
- $R_a$  = <sup>Resistance</sup> Inductance of the armature winding
- $L_a$  = Inductance of the armature winding
- $T_m$  = Torque developed in the motor
- $\theta$  = displacement of the angular speed
- $J$  = equivalence of the viscosity in their
- $b$  = equivalent of the constant in their

Jenette system is applicable in the all the motor as in their position they motor within the constant.

~~$\phi = k i_j$~~

$\phi = K_r i_j$



character parameter of torque is developed in the  
of field in the figure circuit

$$T_{max} \propto \phi I_a$$

$$T_{max} \propto K_{\phi} I_a$$

where  
the  
 $T_{max} \propto K_{\phi} K_{\phi} I_a$

character  $K_{\phi}$  is  
constant

from dc armature of the motor in.

$$e = \frac{dx}{dt} + e_{ind} \frac{dt}{dt}$$

where the armature in the of s.

$$e \frac{dx}{dt} + e_{ind} \frac{dt}{dt} = 0$$

ind in the of  $\phi_{max}$ .

$$E_b(s) = K_{\phi} \phi(s)$$



character

$$E_b(s) = E_g - I_a s_b - I_a$$

$$E_b(s) = E_g - I_a K_{sb} I_a$$

$$= E_g - I_a K_{sb} I_a + I_a U_{sb} + K_{\phi}$$

$$= \frac{E_g - E_{ind}(s) + I_a}{(L_a + L_{sb}) + I_a}$$

$$E_b = \frac{E_g - E_{ind}(s)}{(L_a + L_{sb})}$$

$$E_g = K_{\phi} \phi$$

$$K_{\phi} = \frac{K_{\phi}}{E_g}$$

$$E_g = E_b + K_{\phi} I_a + I_a s_b + L_{sb} \frac{dI_a}{dt}$$

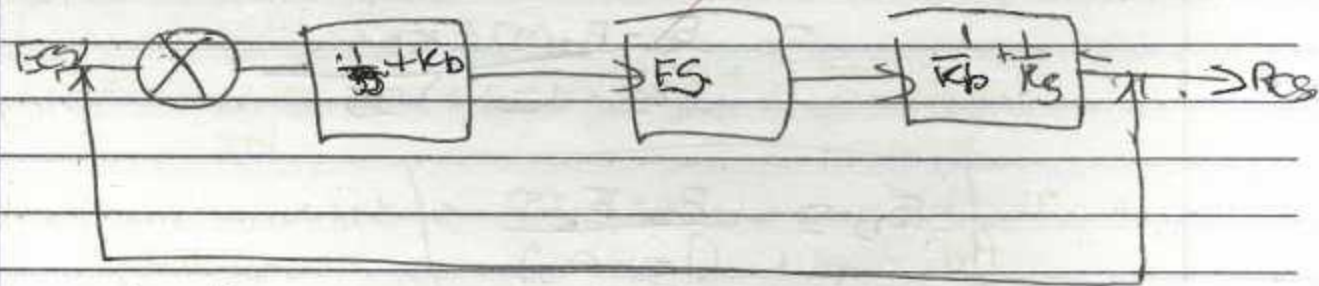
from the a.c. armature in the dc saw  
motor is controlled by in the of  $\phi_{max}$  in the.

$$E_b = \frac{E_g - E_{ind}(s)}{(L_a + L_{sb})}$$

$$E_b = E_g - E_{ind}(s) -$$

where the dc source motor is in the open loop in the.

$$E_b = K_b \omega$$



where the

$$K = \frac{E_b}{\omega} = \text{motor gain constant}$$

$$K = \frac{K_b}{K_s} \text{ motor time constant}$$

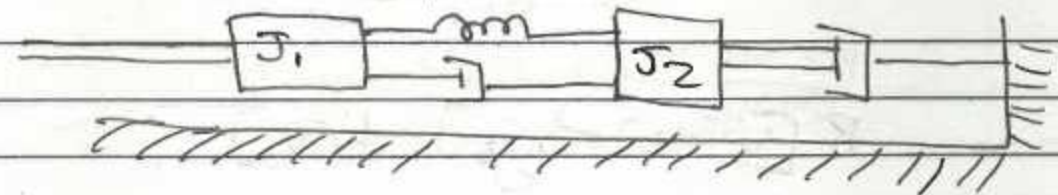
2b

open loop

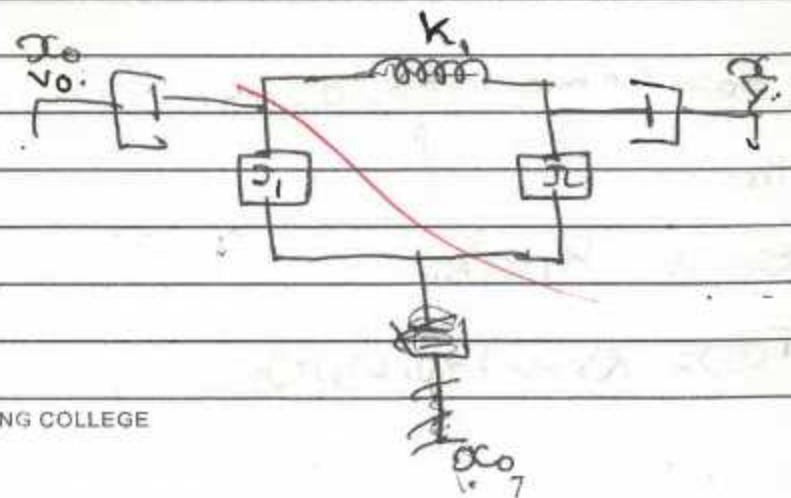
closed loop.

- |   |  |
|---|--|
| • They simple and easy.                       | • They complex and costly.                 |
| • They easy to construct                      | • They complex to construct                |
| • They consume less power                     | • They consume more power.                 |
| • They available stability more               | • They available stability less            |
| • The disturbance less than the comparability | • disturbance more than the comparability. |

2a.



Solution.







$$K(x_0 - x_1) = J_1 \left[ \frac{dx_0}{dt} - \frac{dx_1}{dt} \right] + J_2 \left[ \frac{dx_0}{dt} - \frac{dy}{dt} \right] = 0$$

Applying Laplace transform

$$K(sx_0 - x_1) - J_1 \left[ \frac{dx_0}{dt} - \frac{dx_1}{dt} \right] + J_2 \left[ \frac{dy}{dt} - \frac{dx_0}{dt} \right]$$

where their

$$J_2 \left[ \frac{dy}{dt} - \frac{dx_0}{dt} \right] = J_2(sy)$$

$$J_1 \left[ \frac{dx_0}{dt} - \frac{dx_1}{dt} \right] = J_1(sV_1)$$

$$K[V_1 - x_1] - J_1(sy) + J_2(sV_1)$$

From their we have in two divided

in the

$$\Theta(s) = K_T(s)$$

$$\text{The } F(s) = K(V - v_0) + J_1(sy) + J_2 =$$



$$T(s) = Ks^2 + S + T$$

where the transfer

$$\frac{\Theta(s)}{T(s)} = \frac{K_T(s)}{Ks^2 + S + T}$$

3(a) →

2(a) →

9/25



1.6 1.3

Ha

$$Q(s)/T(s) = \frac{1}{Js^2 + s + K}$$

$$C(s) = \lim_{t \rightarrow \infty} L(t) \cdot Q(s)/T(s)$$

~~$$= \lim_{t \rightarrow \infty} K(t) \cdot Q(s)$$~~

$$0.5 = \frac{10}{K}$$

$$K = \frac{10}{0.5}$$

$$\boxed{K = 20}$$

$$0.26 = \frac{1 \cdot \epsilon_0}{\sqrt{1 - \epsilon^2}}$$

$$\log(0.6) = \frac{\epsilon_0}{\sqrt{1 - \epsilon^2}} = \frac{2.6}{\sqrt{1 - \epsilon^2}}$$

$$\Rightarrow (1.1)^2 = \underline{\underline{0.22}}$$

$$0.06 = \sqrt{1 - \epsilon^2} \Rightarrow \sqrt{1 - \epsilon^2} = 1.10$$



$\geq 1$

$$t_p = \frac{1}{\omega_n \zeta}$$

$$t_p = \frac{1}{\omega_n \sqrt{1 - \zeta^2}}$$

$$t_p = \frac{1}{0.06 \sqrt{1 - \zeta^2}}$$

The second order form

$$T(s) = s^2 + \frac{\omega_n}{\zeta} s + K$$

$$2s^2 + 2\zeta\omega_n s + K = 0$$

where

~~$$2\zeta\omega_n + \omega_n = 5$$~~

~~$$2\zeta\omega_n = 5$$~~

~~$$2\zeta\omega_n + \omega_n^2 = 5$$~~

~~$$2\zeta + \omega_n = 5$$~~

$$\boxed{\zeta = 1.6}$$

$$\boxed{\omega_n = 1.3}$$

2. b.

$$G(s) = \frac{H}{s(s+1)}$$

$$\frac{C(s)}{R(s)} = \frac{G(s)}{1+G(s)} = \frac{\frac{H}{s(s+1)}}{1 + \frac{H}{s(s+1)}} = \frac{H}{s^2 + s + 1}$$

Comparing phase voltage in their form they in the dynamic state in their

$$2\zeta\omega_n = 1$$

$$\omega_n^2 = 1$$

$$\omega_n = \sqrt{1} = 1$$

$$2\zeta = 1$$

$$\zeta = \frac{1}{2}$$

$$\zeta = 0.5$$

$$t_p = \frac{\pi}{\omega_n \sqrt{1-\zeta^2}} = \frac{3.141}{1 \times \sqrt{1-(0.5)^2}} = 4.18$$

$$\theta = \tan^{-1} \frac{\pi}{\zeta\omega_n} = \frac{3.141}{0.5 \times 1} = 1.414$$

$$t_p = \frac{\pi}{\omega_n \sqrt{1-\zeta^2}}$$

$$= 1.414 \sqrt{1-0.5^2} = 0.18$$

where  $\theta = 0.18 \times 100 = 18$ .

and then we have

$$\frac{0.18}{10} = 0.018$$

$$0.018 \times 10 = 0.18$$

Peak time

$$T_p = \frac{\pi}{\omega_n} = \frac{\pi}{1} = 3.14$$

peak overshoot

$$T_p = \frac{\pi}{\omega_n} = \frac{\pi}{1} = 3.14$$

Qd. Type-0 Type-1 Type-2  
 where the Type 0 is some of the input present in their and multiply by these inputs ex is zero where these inputs are the present some input ramp unit ramp and parabolic inputs.

unit step	unit ramp	unit parabolic
1	1	1

Type:-1

where the Type 1 is present of two two property unit step and unit ramp is some blank unit the parabolic is difference in their end. this is the type 1's ex is

unit step	unit ramp	unit parabolic
1	2	5

Type:-2

where the type 2 is present of all unit are they different and that are different types of the unit present in their and that unit are the differ combine their each other of their and.

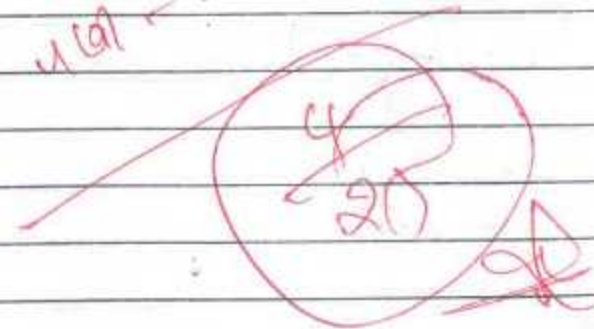
unit step	unit ramp	unit parabolic
1	3	6

1a

1b

3a

2(6) - 0  
 (3) - 2  
 4(6) - 2





1a

$$G(s) = \frac{K(s+3)}{s^2(s+2)}$$

Step 1: Identify the loci.

$$\left. \begin{array}{l} \text{no of poles} = 3 \\ \text{no of zeros} = 1 \end{array} \right\} \text{loci} = 0, 1$$

Position poles = 0, 2

Step 2: Identify the asymptotes.

$$\begin{aligned} &= p - z \\ &= 3 - 1 \\ &= 2 \end{aligned}$$

Step 3: Identify the asymptote equation.

$$\sigma = \frac{\text{number of poles} - \text{number of zeros}}{\text{number of asymptotes}}$$

$$= \frac{(3-1)}{2} = 1$$

Step 4: Identify the angles in the s-plane.

$$\theta = (2k+1) \times 180^\circ$$

$$\theta_2 = -360^\circ$$



Step 5: Identify the breakaway imaginary

$$K_1(s) = \frac{K(s+3)}{s^2(s+2)}$$

$$(s^2+2s)(s+3) + K = 0$$

$$\begin{aligned} (s^2+2s)(s+3) + K &= 0 \\ s^3 + 2s^2 + 3s + K &= 0 \end{aligned}$$

$$\frac{dK}{ds} = -3s - 2s^2 = 0$$

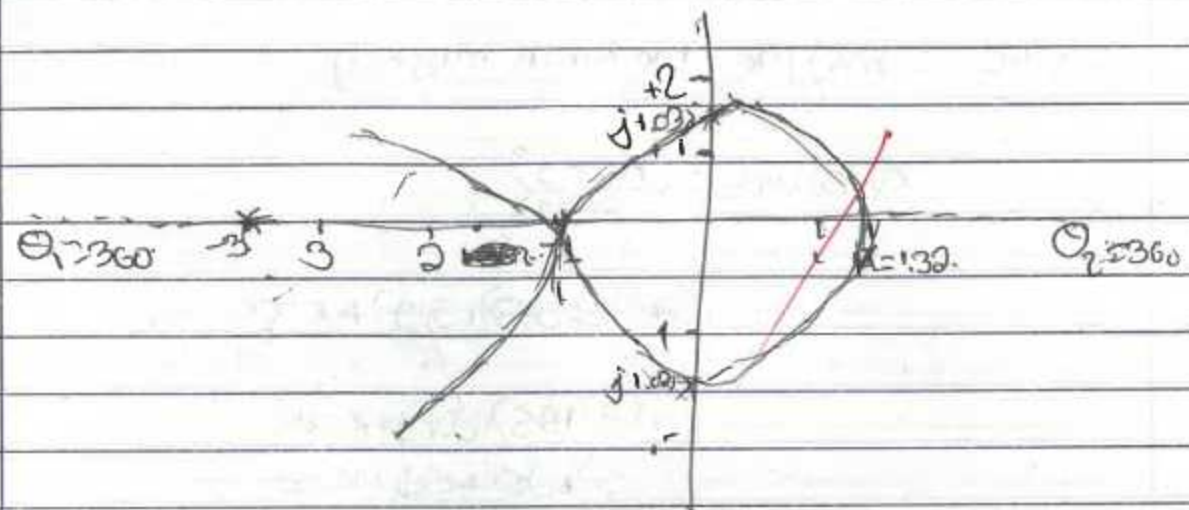
$$\frac{dK}{ds} = -1.374, -3.374$$

Step 6: Truth table in the s-plane.

$$s^3 + 2s^2 + 3s + K = 0$$

$s^3$	1	6	$12-K$	$2s^2 + K = 0$
$s^2$	2	$+2K$	2	$\pm j1.08$
$s^1$	$12-K$	0		
$s^0$	2	$K$	1	

$$\begin{aligned} s^2 + 2 &= 0 \\ s &= \pm j\sqrt{2} \\ &= \pm 1.08 \end{aligned}$$



b. Frequency peak  $M_r$  :- Frequency peak ( $M_r$ ) and their frequency their peak closed loop of their peak in their corner the overshoot of their frequency.

Resonance frequency :- Resonance frequency where the measure the frequency of their amplitude in measure the oscillation in their since the frequency is measured.

Bandwidth :- since the bandwidth to measure the bandwidth of their frequency in their and measure how through. either in the measure the amplitude of their frequency.

Cut-off :- where the slope of their amplitude in their frequency of their line below the two lines when cut in the in middle of their frequency.

Gain margin and phase margin :- where gain margin and phase margin is the margin of their frequency of angle below their origin and margin of their angle.

3a. The controller is the ~~drive~~ <sup>driver</sup> which control the function of the program in the executed in the correct type in their as shown in their ~~figure~~ program.

PID :- where the second order of their system where it is. the effect and and when the PID is effect the program of their and it is not executed the program in their and the that program where effect the the 'hold' program and it is not shown their any output in their programme in their and the output is coming.

PI :- where the PI is effect the second order of the ~~PI~~ in their programme to it is not able read the program which we have type in their second order system and did really anything? they we have type in the computer due to the PI effect and.



# AMC

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### Department of Computer Science and Engineering

Test	Date	Signature of Student	Signature of Invigilator
Test - I	12/09/2019	Abhishek Raj	Kanya
Test - II	22/10/2019	Abhishek Raj	A
Test - III	28/10/2019	Abhishek Raj	BE

BLUE BOOK

Name : Abhishek Raj  
USN : 1AM18CS004 Semester : 3<sup>rd</sup>  
Program: AOE  
Section : A Class Roll No : 04  
Course : CSE



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## AMC ENGINEERING COLLEGE

18th K.M, Bannerghatta Road, Kalkere, Bengaluru - 560083. Phone: 27828655

### CBCS SCHEME

Student Name: <i>Adhish K</i>	USN: <i>1AM1803012</i>	Course-Name & Code: <i>19C1033</i> <i>Analog and digital electronics</i>													
Internal Assessment Test	Q1			Q2			Q3			Q4			IA Test Marks ( )		Signature of Faculty Incharge
	a	b	C	a	b	c	a	b	c	a	b	c	Total Marks	Marks Reduce to	
CO	1	1								2	2				<i>SLW</i>
Max marks	10	5								10	5		9		
IA Test 1		3								5	1				<i>SLW</i>
CO	1	1				1	4								
Max marks	10	5				10	5						25		
IA Test 2	10	2				8	5								<i>SLW</i>
CO	4	4				4									
Max marks	5	10				5							20		
IA Test 3	-														
Assessment Tool*	CO1( )	CO2( )	CO3( )	CO4( )	CO5( )	CO6( )	Total Marks( )	Marks Reduced to	Signature of Faculty Incharge						
AT 1	2	3					5		<i>SLW</i>						
AT 2	2		3				5		<i>SLW</i>						
AT 3				3	2		5		<i>SLW</i>						
Final IA Marks	<i>18</i>					Final AT Marks	<i>05</i>								

### Certificate

This is to certify that Mr./Ms. .... has satisfactorily completed the course of assignment prescribed by the Visvesvaraya Technological University for Semester .....

Branch.....for the academic year 20 - 20

Final Continuous Internal Evaluation (CIE) Marks Awarded ( ) : *23/40*

\*Assignment/Quiz/Seminar/Mini-Project

*[Signature]*  
Signature of Student

*[Signature]*  
Signature of Faculty Incharge

*[Signature]*  
Signature of Course Coordinator

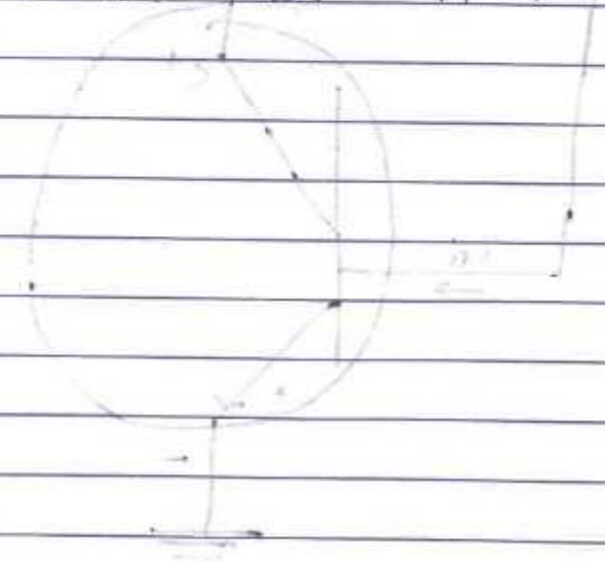


4a  $f(A, B, C, D) = \sum m(0, 2, 3, 6, 7, 9, 10, 12, 13)$

min terms	Binary terms	min terms	Binary terms	min terms	Binary terms	min terms	Binary terms
m <sub>0</sub>	0000	m <sub>0</sub> ✓	0000	m <sub>0</sub> , m <sub>2</sub> ✓	00-0	m <sub>0</sub> m <sub>2</sub> m <sub>8</sub> m <sub>10</sub>	-0-0
m <sub>2</sub>	0010	m <sub>2</sub> ✓	0010	m <sub>0</sub> , m <sub>8</sub> ✓	-000	m <sub>0</sub> m <sub>8</sub> m <sub>2</sub> m <sub>10</sub>	-0-0
m <sub>3</sub>	0011	m <sub>3</sub> ✓	1000	m <sub>2</sub> , m <sub>3</sub> ✓	001-	m <sub>6</sub> m <sub>7</sub> m <sub>14</sub> m <sub>15</sub>	0-1-
m <sub>6</sub>	0110	m <sub>3</sub> ✓	0011	m <sub>2</sub> , m <sub>6</sub> ✓	0-10	m <sub>2</sub> m <sub>6</sub> m <sub>10</sub> m <sub>14</sub>	0-1-
m <sub>7</sub>	0111	m <sub>6</sub> ✓	0110	m <sub>2</sub> , m <sub>6</sub> ✓	-010		
m <sub>9</sub>	1000	m <sub>10</sub> ✓	1010	m <sub>8</sub> , m <sub>10</sub> ✓	10-0		
m <sub>10</sub>	1010	m <sub>12</sub> ✓	1100	m <sub>8</sub> , m <sub>12</sub> ✓	1-00		
m <sub>12</sub>	1100	m <sub>7</sub> ✓	0111	m <sub>3</sub> , m <sub>7</sub> ✓	0-11		
m <sub>13</sub>	1101	m <sub>13</sub> ✓	1101	m <sub>3</sub> , m <sub>7</sub> ✓	0-11		
				m <sub>12</sub> , m <sub>13</sub> ✓	110-		

5

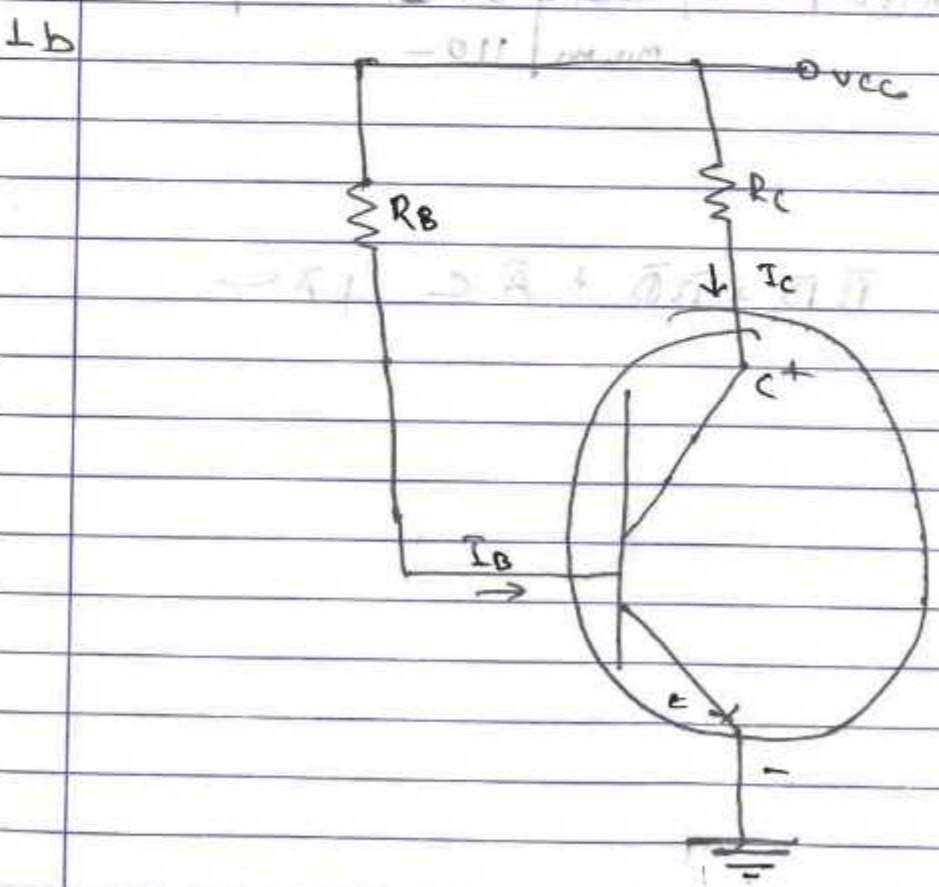
$$PI = \bar{B}\bar{D} + \bar{B}D + \bar{A}C + AC$$



4b  $F(A,B,C,D) = \bar{A}M(1,2,3,4,7,10,11)$

	$\bar{C}\bar{D}$	$\bar{C}D$	$CD$	$C\bar{D}$
$\bar{A}\bar{D}$	1	0	0	0
$\bar{A}D$	0	1	0	1
$A\bar{D}$	1	1	1	0
$AD$	1	0	1	0

$\bar{A}\bar{B}D + \bar{A}\bar{B}C + \bar{A}CD + A\bar{B}C + \bar{A}B\bar{C}D$



Applying KVL to base biased

$V_{CC} - I_B R_B - V_{BE} = 0$

$V_{CC} = V_{BE} + I_B R_B$

$I_B = \frac{V_{CC} - V_{BE}}{R_B}$

$I_C = \beta I_B$

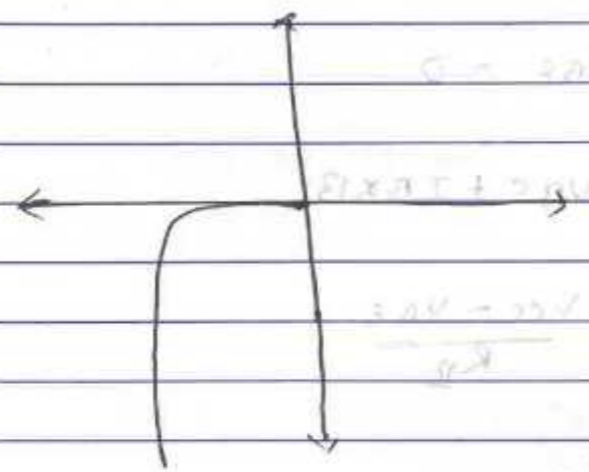
Now applying KVL to collector

$V_{CC} - I_C R_C - V_{CE} = 0$

$V_{CC} = V_{CE} + I_C R_C$

$V_{CE} = V_{CC} - I_C R_C$

1a *Handwritten notes in blue ink*



*Improve*

*Photo taken*

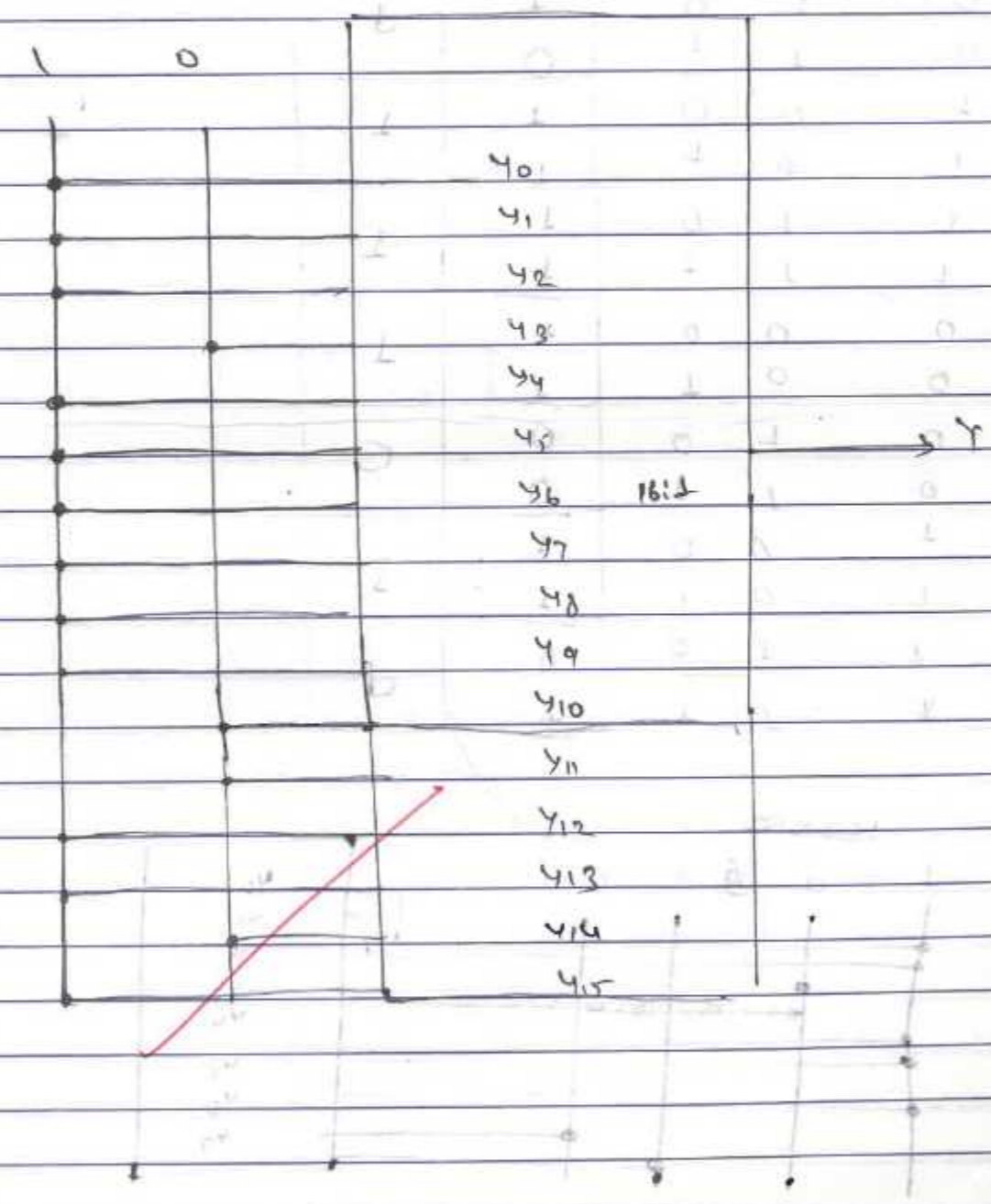
*4a - 5  
9b - 1  
13 - 3*

*9/30*

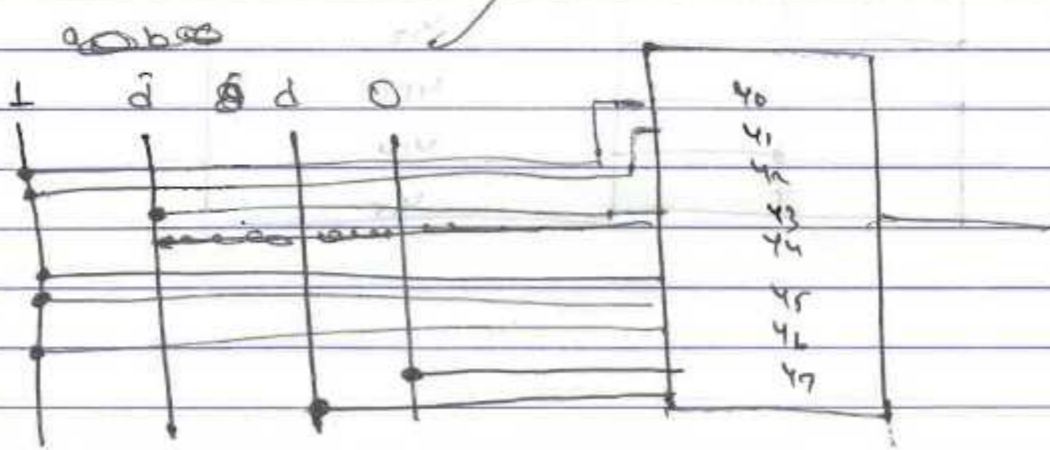
*18/9/14*

3a Multiplexer is a group of inputs and group of control inputs which gives one output.

$$f(a,b,c,d) = \sum m(1, 2, 4, 5, 7, 9, 12, 13, 15) + d_c(0, 6, 8, 9)$$



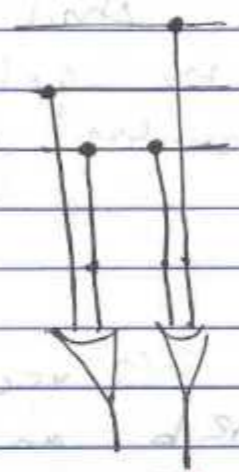
a	b	c	d	Y	med
0	0	0	0	1	1
0	0	0	1	1	1
0	0	1	0	1	1
0	0	1	1	0	1
0	1	0	0	1	1
0	1	0	1	1	1
0	1	1	0	1	1
0	1	1	1	1	1
1	0	0	0	1	1
1	0	0	1	1	1
1	0	1	0	0	0
1	0	1	1	0	0
1	1	0	0	1	1
1	1	0	1	1	1
1	1	1	0	0	0
1	1	1	1	1	1



3b

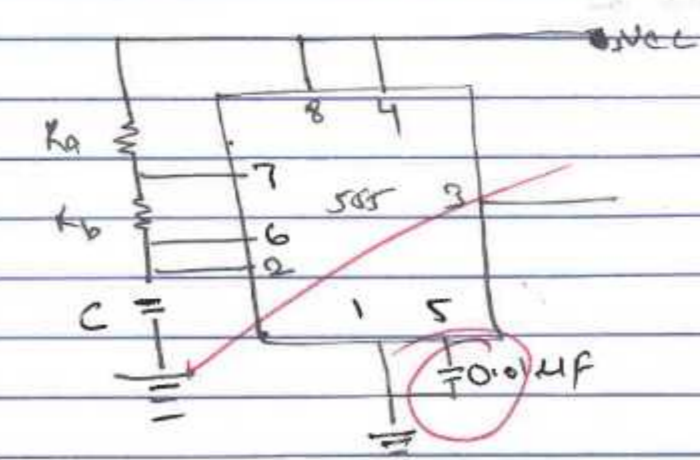
17

a	b	c
0	0	0
0	1	1
1	0	2
1	1	3



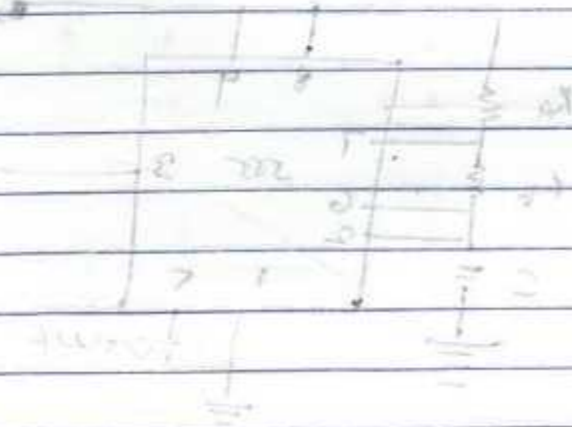
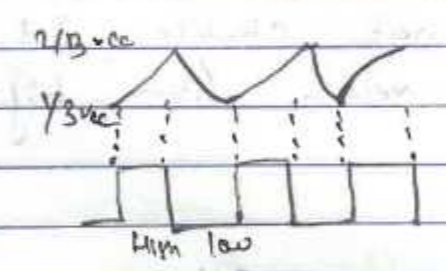
2

1a A multivibrator is an electronic circuit which is used in two way simulator such as Flip Flop, Oscillator. A stable multivibrator is not stable. It continuously always changes its value from high to low and low to high.



off  
 As  $V_c = 0$ . This voltage goes to all capacitor and it is less than  $1/3 V_{cc}$  so  $R_a$  and  $R_b$  goes to charging. ~~And~~ And due to this  $T$  terminates and it gets off. It reaches to  $2/3 V_{cc}$ . And lower ~~com~~ trigger of lower comparator gets high and threshold of upper comparator gets low.  
 $\Phi = 1$     $\Phi = 0$ .

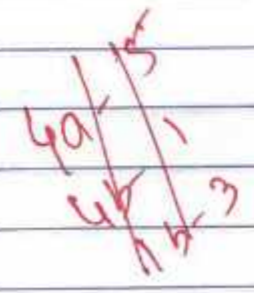
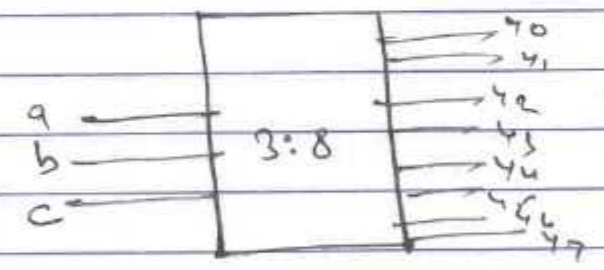
ON  
 As  $V_{cc}$  reached to  $2/3 V_{cc}$  it gets discharged through  $R_b$  and a flip flop formed.  $\Phi = 1$     $\Phi = 0$     $\Phi = 0$     $\Phi = 1$ .  
 Upper comparator gets high and lower comparator gets low.



4b

a	b	c	$Y_0$	$Y_1$	$Y_2$	$Y_3$	$Y_4$	$Y_5$	$Y_6$	$Y_7$
0	0	0	1	0	0	0	0	0	0	0
0	0	1	0	1	0	0	0	0	0	0
0	1	0	0	0	1	0	0	0	0	0
0	1	1	0	0	0	1	0	0	0	0
1	0	0	0	0	0	0	1	0	0	0
1	0	1	0	0	0	0	0	1	0	0
1	1	0	0	0	0	0	0	0	1	0
1	1	1	0	0	0	0	0	0	0	1

5 A decoder is a type of integrated circuit. It gives one output for all 3 minutes.



39-1a  
 25/30  
 1a-8  
 13-5  
 Good improvement  
 You can still do better  
 28/11/19

La Flip Flops contains two states. ONE is 0 and another one is 1. It is one-bit storage.

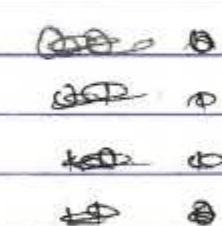
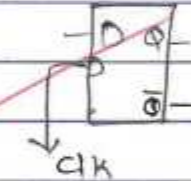
There are four types of flip flops

- ① D-Flip Flop
- ② T-Flip Flop
- ③ J-K Flip Flop
- ④ S-R Flip Flop

D Flip Flop

It is a flip flop with two inputs Data and clock.

It is also called Delay flip flop

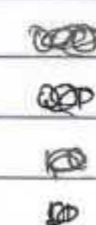
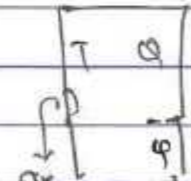


T-Flip Flop

It is a flip flop in which two states high or low.

It is also called

Toggle or trigger flip flop.



Q J-K Flip flop

It is a type of S-R flip flop with three inputs.

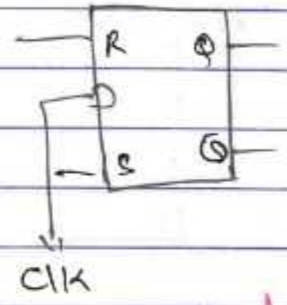
T/T	a	b	c	q	A	B	J	K
	0	0	0	0	0	0	0	x
	0	0	1	1	0	1	1	x
	0	1	0	0	1	0	x	1
	0	1	1	0	1	1	x	0
	1	0	0	1				
	1	0	1	1				
	1	1	0	1				
	1	1	1	0				

Excitation table

Q S-R Flip flop

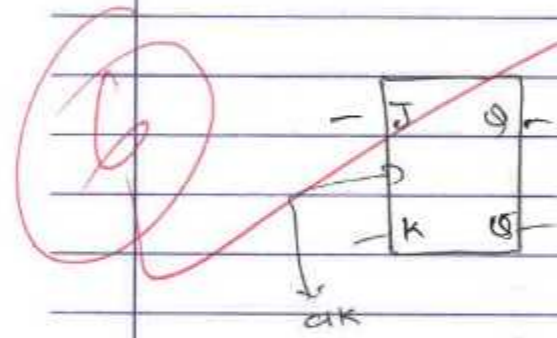
It is a flip flop in which if S=1 then the output sets to 1 and R=1 then the output resets to 0.

Q S-R Flip flop



T/T	Q	Q-bar
0 0	Toggle	
0 1	Set	
1 0	Reset	
1 1	Undefined	

Q J-K Flip flop



T/T	Q	Q-bar
0 0	Toggle	
0 1	Set	
1 0	Reset	
1 1	Not defined	

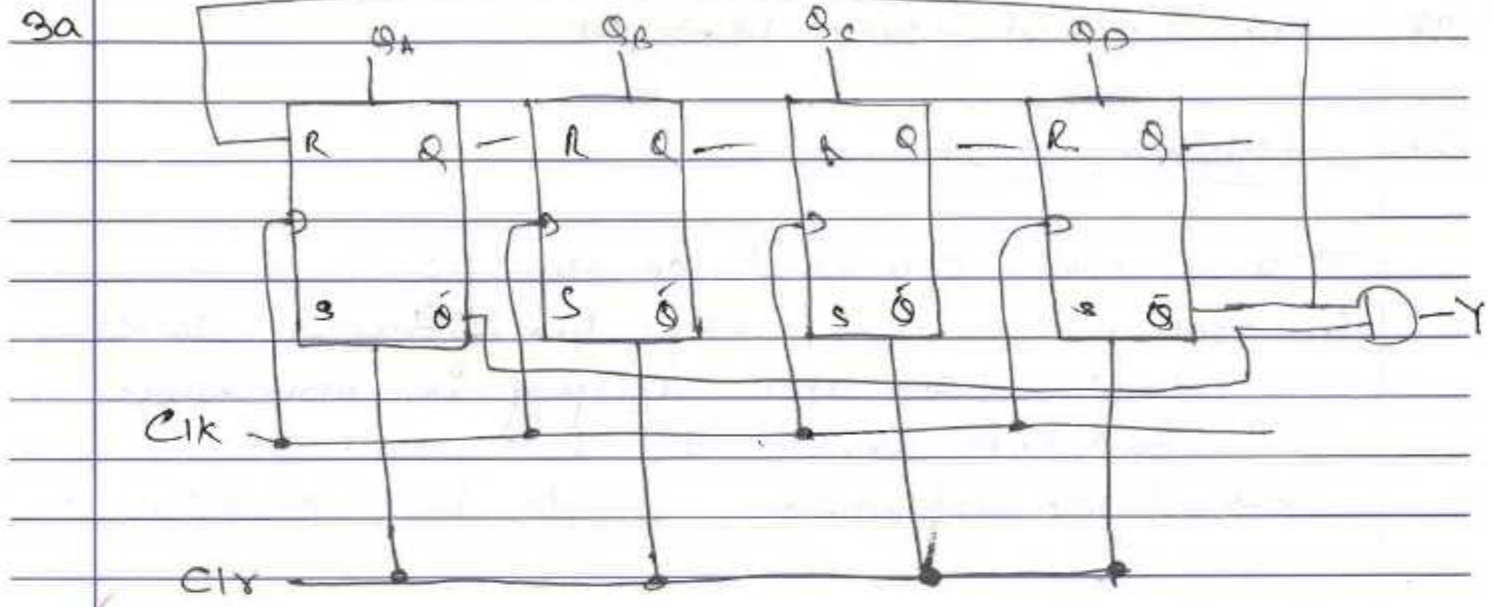


T<sub>1</sub>

00	0
01	1
10	1
11	0

T<sub>2</sub>

00	0
01	1
10	0
11	1



T<sub>3</sub>

Q <sub>D</sub>	Q <sub>C</sub>	Q <sub>B</sub>	Q <sub>A</sub>	Clk
0	0	0	0	0
1	0	0	0	1
0	1	0	0	2
1	1	0	0	3
0	1	1	0	4
1	1	1	0	5
0	0	1	1	6
1	0	0	1	7
0	0	0	0	8

Johnson counter is a type of synchronous counter in which last output is inverted and connected with the first output.





~~Asynchronous counters~~

Asynchronous counters

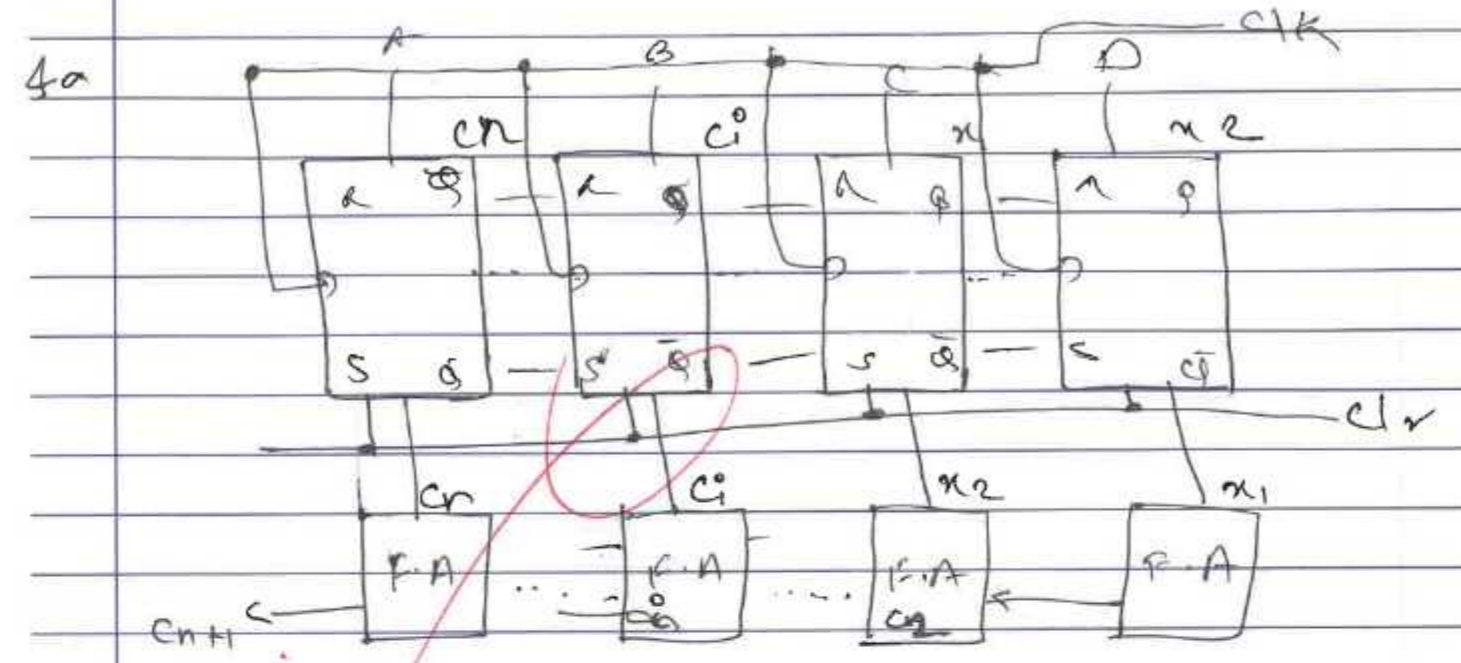
It is a slow operational counter. It is a counter in which every flip flop has different clocks. Its implementation and design is very easy. It does not show decode errors.  
 ex → Ripple up counter, Ripple down counter.

Synchronous counter

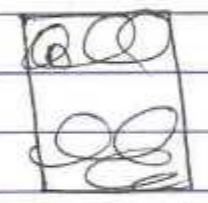
It is a fast operational counter. In this every flip flop has common clock. Its implementation and design is complex. It shows decode errors.  
 ex → Ring counter, Johnson counter.

Sequential circuit  
 It is a serial circuit.  
 We input the data sequentially.  
 It is easy.

combinational circuit  
 It is a parallel circuit.  
 We input the data combinationally.  
 It is hard.



4b



1a = 5  
 1b = 6  
 3a = 5  
 2b = 2

8/30  
 52  
 2/10/14

0	0	0
0	0	1
0	1	0
1	0	0
1	0	1
1	1	0
1	1	1



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### Department of Computer Science and Engineering

Test	Date	Signature of Student	Signature of Invigilator
Test - I	12/09/19	Randhir Pratap Singh	
Test - II	22/10/19	Randhir Pratap Singh	
Test - III	29/10/19	Randhir Pratap Singh	

BLUE BOOK

Name : Randhir Pratap Singh  
USN : 18AM17CS152 Semester : 3rd  
Program: CSF  
Section : A Class Roll No : \_\_\_\_\_  
Course : ADE



## Department of Computer Science and Engineering

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"Be a premier department in the field of Computer Science & Engineering to meet the Technological Challenges of the Society"

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PEO 3	Graduates adapt Value-Based Proficiency in solving real time problems.



## AMC ENGINEERING COLLEGE

18th K.M, Bannerghatta Road, Kalkere, Bengaluru - 560083. Phone: 27828655

### CBCS SCHEME

Student Name: Randhir Pratap Singh USN: 1AM17CS152 Course-Name & Code: ADE -18CS33

Internal Assessment Test	Q1			Q2			Q3			Q4			IA Test Marks ( )		Signature of Faculty Incharge	
	a	b	C	a	b	c	a	b	c	a	b	c	Total Marks	Marks Reduce to		
CO	1	1					2	2								
Max marks	10	5					10	5					21			<i>SL</i>
IA Test 1	7	5					7	2								
CO	1	1					1	3								<i>SL</i>
Max marks	10	5					10	5					18			
IA Test 2	7	3					5	3								
CO				4	4		9	9								<i>SL</i>
Max marks				5	10		5	10					20			
IA Test 3				2	7		5	6								

Assessment Tool*	CO1( )	CO2( )	CO3( )	CO4( )	CO5( )	CO6( )	Total Marks( )	Marks Reduced to	Signature of Faculty Incharge
AT 1	4	4					8		<i>SL</i>
AT 2	4		4				8		<i>SL</i>
AT 3				4	4		8		<i>SL</i>
Final IA Marks	19			Final AT Marks			08		

### Certificate

This is to certify that Mr./Ms. Randhir Pratap Singh.....has satisfactorily completed the course of assignment prescribed by the Visvesvaraya Technological University for Semester..... Branch.....for the academic year 20 - 20

Final Continuous Internal Evaluation (CIE) Marks Awarded ( ) : 27/40

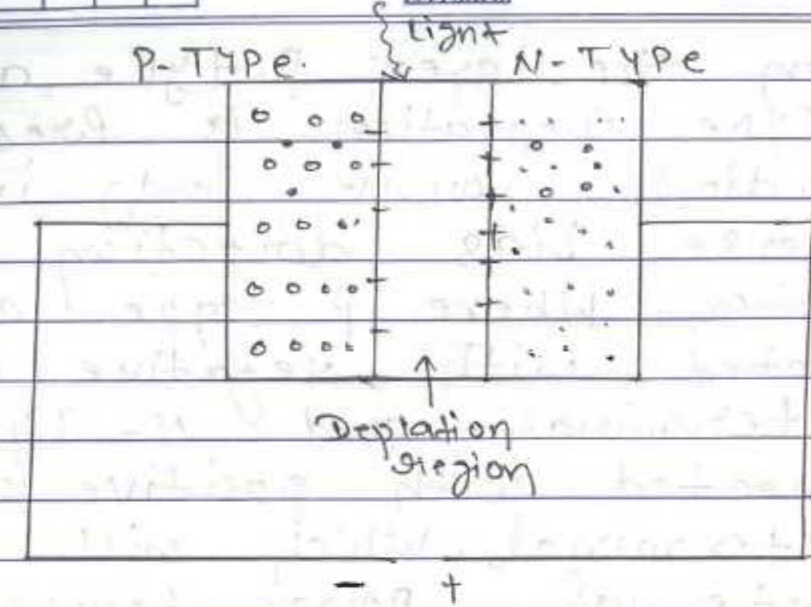
\*Assignment/Quiz/Seminar/Mini-Project

*Randhir Pratap Singh*  
Signature of Student

*SL*  
Signature of Faculty Incharge

*SL*  
Signature of Course Coordinator

9



- In P-Type Photodiode holes is in a majority charge.
- In N Type Photodiode electron is in majority carrier.
- Electron present in P-TYPE. have minority carrier.
- ~~Electron~~ <sup>Holes</sup> present in N-Type conductor is in minority charges.

Construction

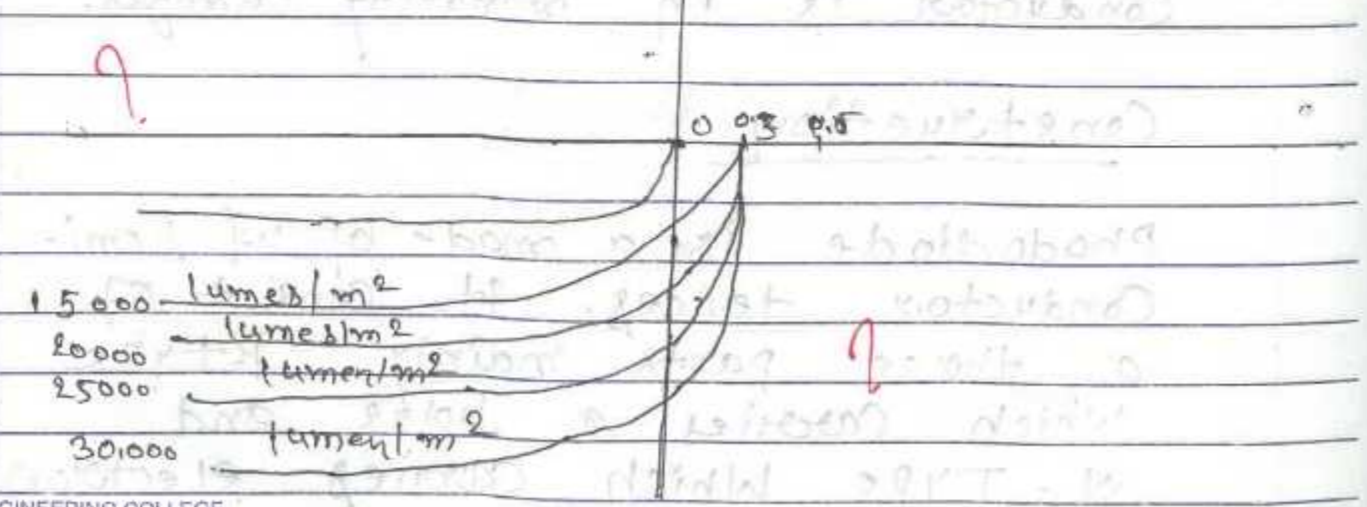
Photodiode is a made up of semi-conductor devices, it consist of a three parts mainly P-type which carries a holes and N-TYPE which carries electron

Between the layer p-type and N-Type depletion is present. Photodiode works only in a reverse bias direction connection. Where p-type are connected with negative charge of terminal and N-type are connected with positive charge of terminal. Which will be a external power source.

In a p-type conductor as a impurity or mined material 3-3 trivalent element are mined and in N-type conductor 5-penta valent element are mined.

Reverse bias

Forward Bias

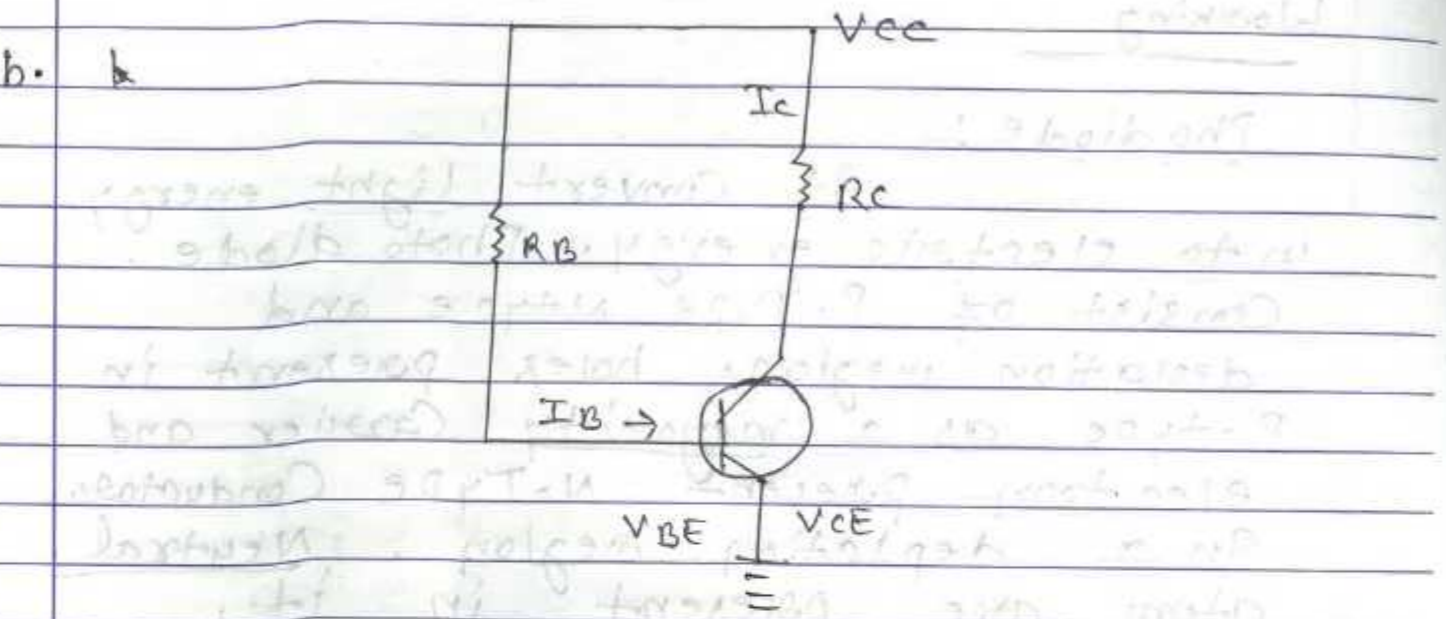


Working

Photodiode:

It convert light energy into electric energy. Photodiode consist of P-type N-type and depletion region. holes present in P-type as a majority carrier and electron present N-type conductor. In a depletion region, neutral atom are present in it. Neutral atom that means free electron are present there and whenever light fall on depletion region, it break the neutral atom and then hole electron are get connected or making bond with holes. Because of reverse biasing N-type wall in positive mode and it get connected to the holes and light fall on the surface of depletion region atom break and charge carrier increases, and after this flow of current will get increases.

PTO



### Base Bias Circuit

Base bias circuit which is also known as fixed bias. This is oldest and simple method to biasing across the circuit. In a base bias circuit mode, connection get very easily. To find base current and voltage across in base circuit we can get the  $I_B$  and  $I_{BE}$  two resistors connected across the circuit collector resistor and base resistor. Current flow through the base is known as base current and current flow through  $R_C$  called collector current.

App

$$V_{CC} - R_B I_B - I_C R_C - V_{BE}$$

$$= V_{CC} - R_B I_B - V_{BE}$$

$$I_B = \frac{V_{CC} - V_{BE}}{R_B}$$

Applying KVL to this circuit

$$= V_{CC} - I_C R_C - V_{CE}$$

$$= V_{CE} = I_C R_C - V_{CE}$$

$$V_{CE} = V_{CC} - I_C R_C$$

and also by KVL voltage of circuit

$$= I_C = \beta I_B$$

3. a.

	a	b	c	d	f	(mex)	(output)
0	0	0	0	0	1		1
1	0	0	0	1	1		
2	0	0	1	0	X		1
3	0	0	1	1	1		
4	0	1	0	0	1		1
5	0	1	0	1	1		
6	0	1	1	0	X		1
7	0	1	1	1	1		
8	1	0	0	0	X		X write mex (d)
9	1	0	0	1	0		
10	1	0	1	0	1		1
11	1	0	1	1	1		
12	1	1	0	0	0		write mex (d)
13	1	1	0	1	1		
14	1	1	1	0	1		write mex (d)
15	1	1	1	1	0		

a	bc	$\bar{b}c$	$b\bar{c}$	$b\bar{c}$
$\bar{a}$	1 <sub>0</sub>	1 <sub>1</sub>	1 <sub>3</sub>	1 <sub>2</sub>
a	X <sub>4</sub>	1 <sub>5</sub>	$\bar{a}$ <sub>7</sub>	d <sub>6</sub>

Rules

first group all 1's with 1's and X  
 second convert 1 to X  
 and then group all together

1

a	bc	$\bar{b}c$	$b\bar{c}$	$b\bar{c}$
$\bar{a}$	X <sub>0</sub>	1 <sub>1</sub>	1 <sub>3</sub>	1 <sub>2</sub>
a	X <sub>4</sub>	1 <sub>5</sub>	$\bar{a}$ <sub>7</sub>	d <sub>6</sub>

$\bar{a}$	$\bar{b}c$	$b\bar{c}$	$b\bar{c}$	$b\bar{c}$
X	X	X	X	X
a	X	X	d	d

2

$\bar{a}b$	$\bar{c}d$	$\bar{c}d$	$\bar{c}d$	$\bar{c}d$
$\bar{a}b$	0 <sub>0</sub>	X <sub>1</sub>	0 <sub>3</sub>	0 <sub>2</sub>
$\bar{a}\bar{b}$	X <sub>4</sub>	1 <sub>5</sub>	1 <sub>7</sub>	1 <sub>6</sub>
ab	0 <sub>12</sub>	1 <sub>13</sub>	0 <sub>15</sub>	0 <sub>14</sub>
a $\bar{b}$	0 <sub>8</sub>	1 <sub>9</sub>	1 <sub>11</sub>	X <sub>10</sub>

$\bar{a}b + a\bar{b}\bar{c}$

2

$\bar{a}b$	$\bar{c}d$	$\bar{c}d$	$\bar{c}d$	$\bar{c}d$
$\bar{a}b$	0 <sub>0</sub>	X <sub>1</sub>	0 <sub>3</sub>	0 <sub>2</sub>
$\bar{a}\bar{b}$	X <sub>4</sub>	1 <sub>5</sub>	1 <sub>7</sub>	1 <sub>6</sub>
ab	0 <sub>12</sub>	1 <sub>13</sub>	0 <sub>15</sub>	0 <sub>14</sub>
a $\bar{b}$	0 <sub>8</sub>	1 <sub>9</sub>	1 <sub>11</sub>	X <sub>10</sub>

=  $\bar{a}b + a\bar{b}\bar{c}$

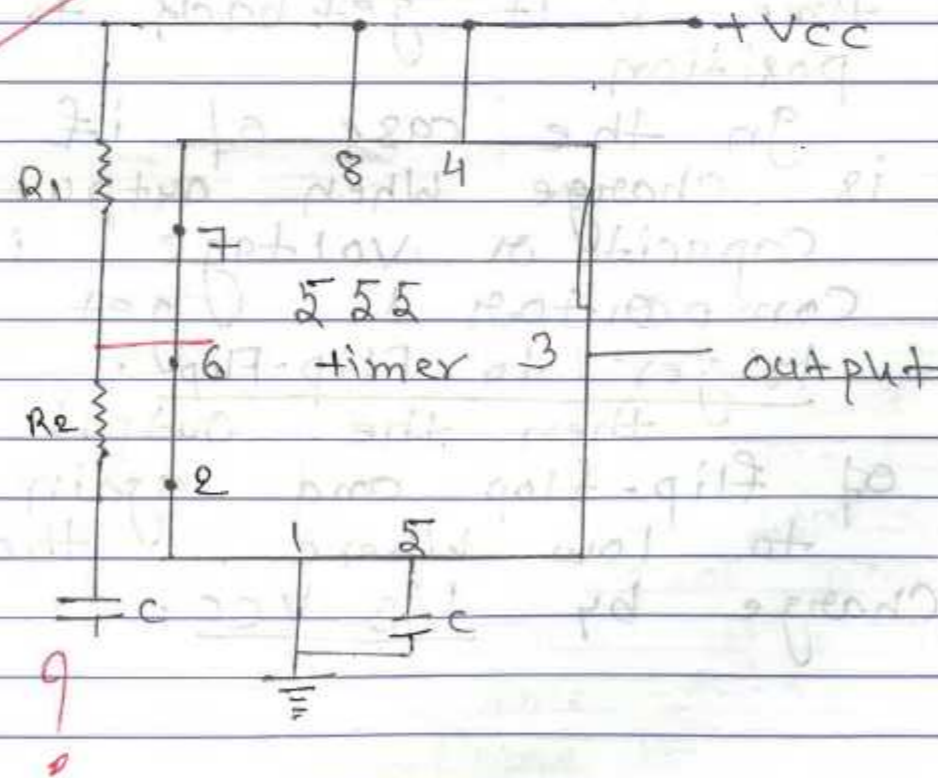
21/30

10 ✓  
11 ✓  
12 ✓  
13 ✓  
14 ✓  
15 ✓  
16 ✓  
17 ✓  
18 ✓  
19 ✓  
20 ✓  
21 ✓  
22 ✓  
23 ✓  
24 ✓  
25 ✓  
26 ✓  
27 ✓  
28 ✓  
29 ✓  
30 ✓

1-  
119.

A multivibrator is a Combinational Circuit, use as a Integrated Circuit in the electronics and digital system. multivibrator has a many input of data and many control to control the system digitally in electronics. But it has only one output. Multivibrator is used as flip-flop, timer, trigger etc.

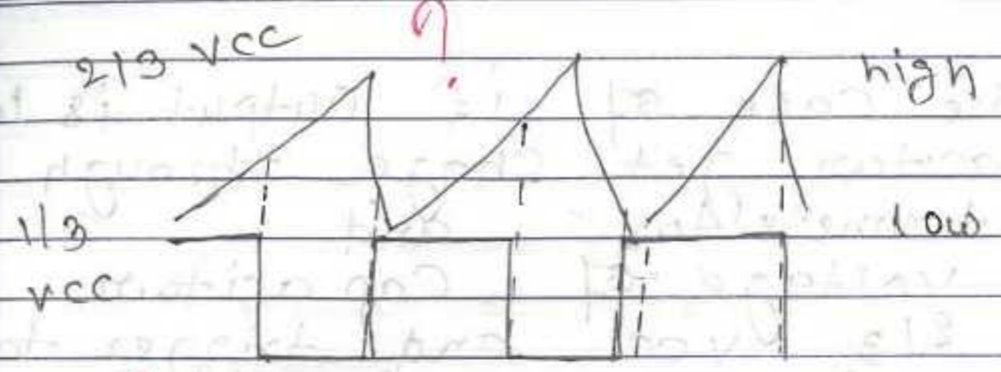
Astable Multivibrator :-



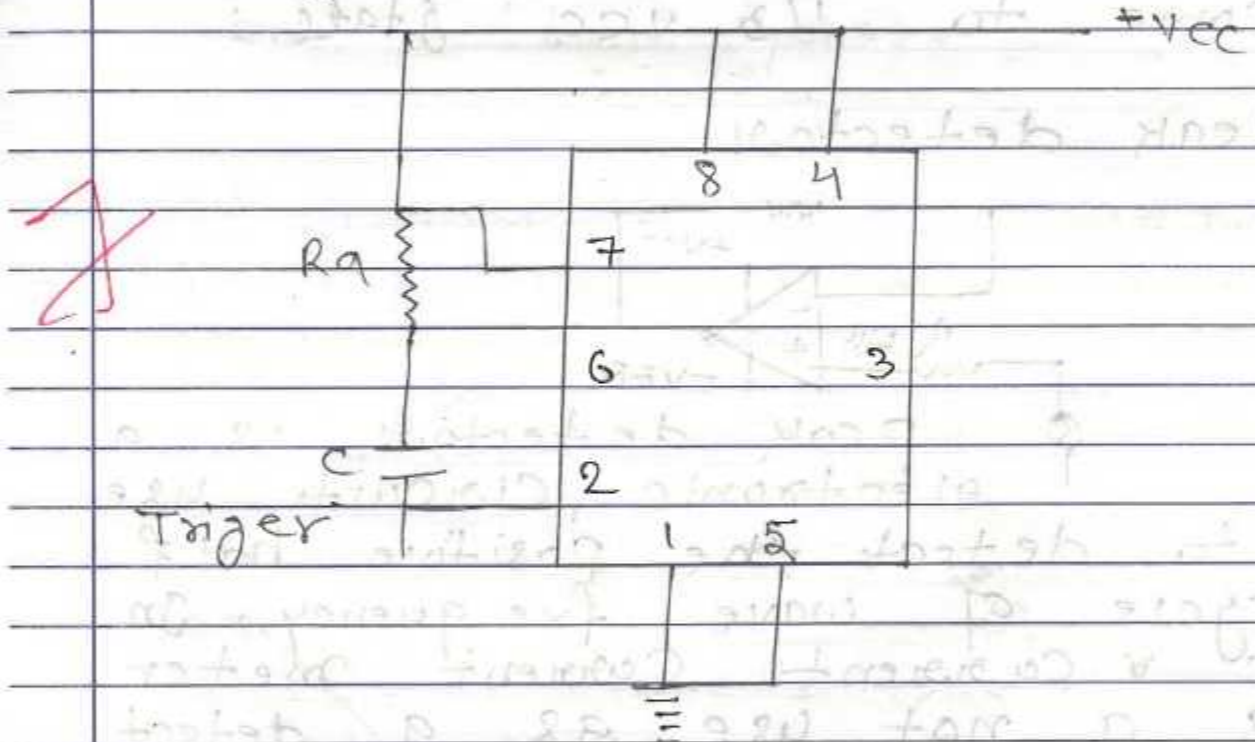


Astable multivibrator is connected to 555 timer, work as a integrated circuit, it is not a stable state multivibrator means that astable multivibrator is a unstable multivibrator because it momentarily vary low to high and high to low. Astable multivibrator does not require any external trigger to change the output because it automatically change to high or after the time it get back to his low position.

In the case of if capacitor is charge when output is 1 capacitor voltage is  $\frac{2}{3} V_{CC}$  comparator get high and trigger to Flip-Flop. then the output became high of flip-flop and again it come to low where the capacitor charge by  $\frac{1}{3} V_{CC}$ .



Mono stable Multivibrator.

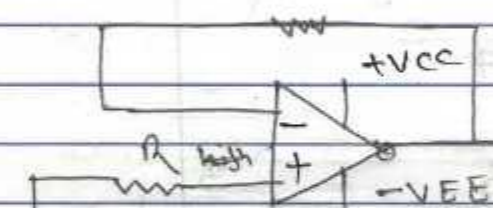


Mono stable multivibrator is a stable multivibrator its require to trigger, it is a stable till unwanted signal not trigger to it. In that time it vary on unstable state after some time it come back to his stable condition or stable

State -

In the case of if output is low capacitor get charge through the transistor and the voltage of capacitor get  $\frac{2}{3} V_{CC}$  and trigger to flip-flop and flip-flop out comes to low and it come to  $\frac{1}{3} V_{CC}$  state.

Peak detector



combin?

Peak detector is an electronic circuit used to detect the positive half cycle of wave frequency. In an AC circuit, a current meter is not used as a detector to positive half cycle frequency. A peak detector is used to detect the half cycle of wave form which will be (+ve) positive. Peak detector detects with the help of operational amplifier, which is connected in it, negative

terminal of operation amplifier is connected to positive  $+V_{CC}$  and a positive terminal is connected to negative  $-V_{EE}$ .

peak detector, detect the wave form when it comes in positive terminal (half cycle).

3.

Multiplexer is a combinational logic circuit which has many inputs to operate the system but one output. It is mainly used widely in digital electronics to reduce the terms of output. Multiplexer takes many data as an input but after that it gives a one output, to reduce the terms of circuit or a combinational circuit which has many inputs at that time multiplexer is used as a combinational logic circuit.



	A	B	C	D	(mex)	f	
0	0	0	0	0	0	0	} d 1
1	0	0	0	1	1	1	
2	0	0	1	0	1	1	} d 2
3	0	0	1	1	0	0	
4	0	1	0	0	1	1	} 1 3
5	0	1	0	1	1	1	
6	0	1	1	0	0	0	} d 4
7	0	1	1	1	1	1	
8	1	0	0	0	0	0	} d 5
9	1	0	0	1	1	1	} write mex
10	1	0	1	0	0	0	
11	1	0	1	1	0	0	} 6
12	1	1	0	0	1	1	
13	1	1	0	1	1	1	
14	1	1	1	0	0	0	} d 7
15	1	1	1	1	1	1	} write mex

5



A	B	C	D	D0	A	B	C	D	D0
				D0					D0
				D1					D1
				D2					D2
				D3					D3
				D4					D4
				D5					D5
				D6					D6
				D7					D7
				D8					D8
				D9					D9
				D10					D10
				D11					D11
				D12					D12
				D13					D13
				D14					D14
				D15					D15
				D1					D1

10

10-1  
16-3  
20-5  
30-3

18/30

31/11/12

2. 9 Difference between Sequential Circuit and Combinational Circuit

Combinational	Sequential
i) Combinational Circuit depend only the present input	i) Sequential Circuit depend the present input and also depend on the previous output.
ii) In Combinational Circuit all flip-flop use as a toggle flip-flop	ii) In Sequential Circuit any flip-flop use as a toggle flip-flop
iii) Combinational Circuit depend upon the speed of flip-flop	iii) Sequential Circuit does not depend on the speed of flip-flop.
iv) Easy to Construct the design of Combinational Circuit	iv) As a Compare of Combinational Circuit it is not easy to Construct.
v) Memory unit is required in Combinational Circuit	v) Memory unit is not required.

Counter is use as to Count the exact clock pulse in circuit. It gives the exact timing consume by per clock pulse.

In a digital circuit Counter are use as the state Count of circuit. and also it show the delay between the two point means timing state.

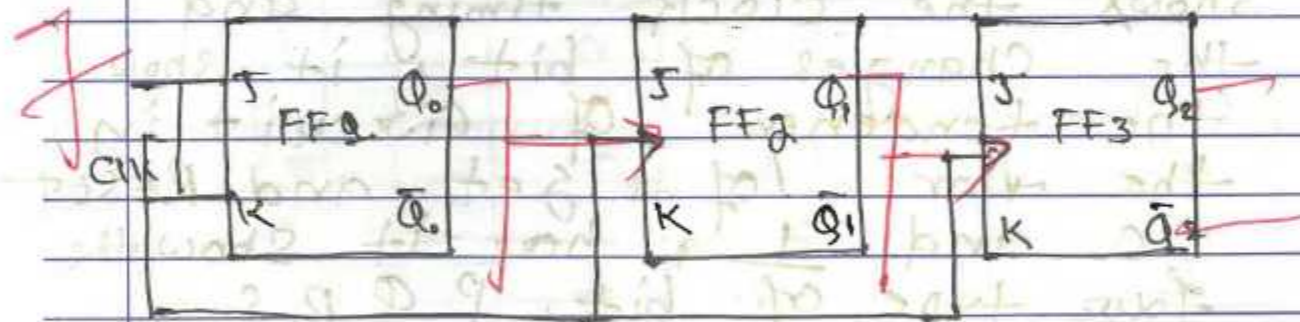
There are two types of Counter

- i) Asynchronous Counter
- ii) Synchronous Counter

Asynchronous Counter are the slower than the synchronous counter. Because of the delay in the transmission of signal between two state. It is also low cost counter. Asynchronous counter depend on the present input, that means the input output of one flip-flop is the input of another flip-flop.

Synchronous Counter :- Synchronous Counter are faster than the Asynchronous Counter. It is also a type of counter. In a Synchronous Counter any flip-flop are use as flip-flop. here also the delay between the transmission between the point. one flip-flop is depend on the output of previous flip flop.

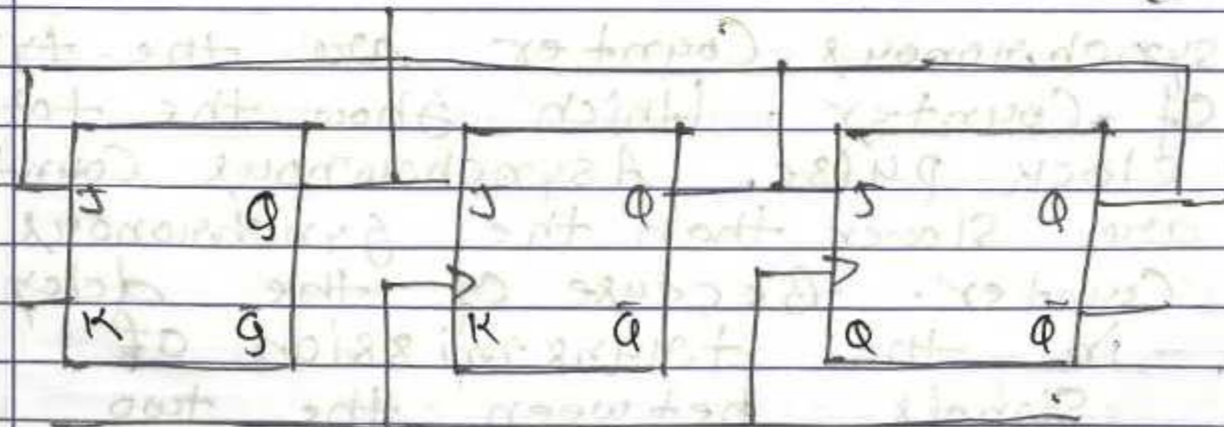
Asynchronous Counter -



Asynchronous Counter are the types of counter, which show the total clock pulse. Asynchronous Counter are slower than the synchronous counter. Because of the delay in the transmission of signals between the two points, It also count the

Clock pulse of signal between the two states. A synchronous counter also the duration or delay between point, means exact time; gets depend on the speed of  $f$ .

Johnson Counter is also a type of counter. It is a special type of counter to count the clock pulse of signal between the point, Johnson counter shows the clock timing and the changes of bit. It show the tendency of circuit in the for of set and RESET 0 and 1, here it show the four type of bit. P Q R S



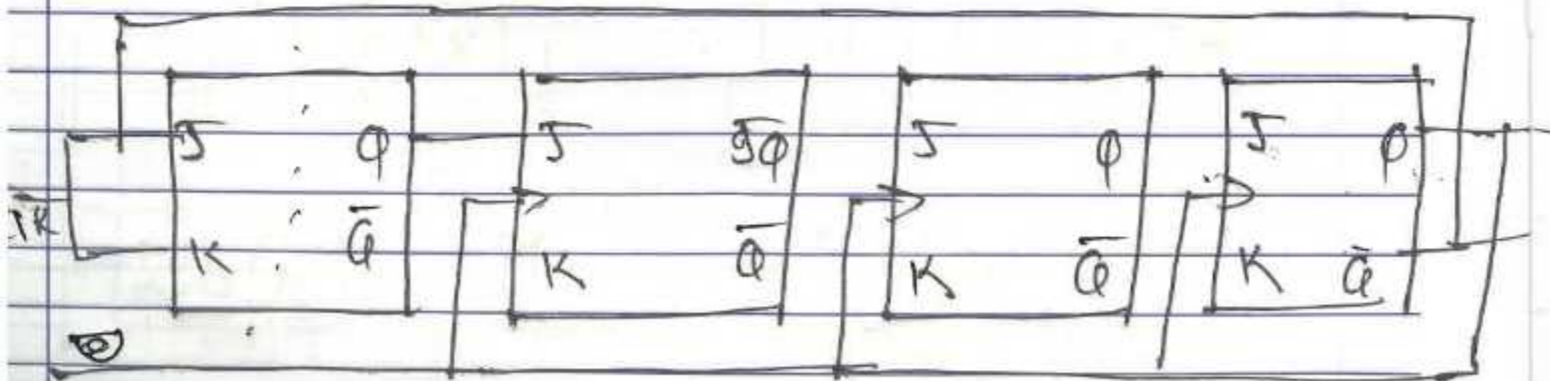
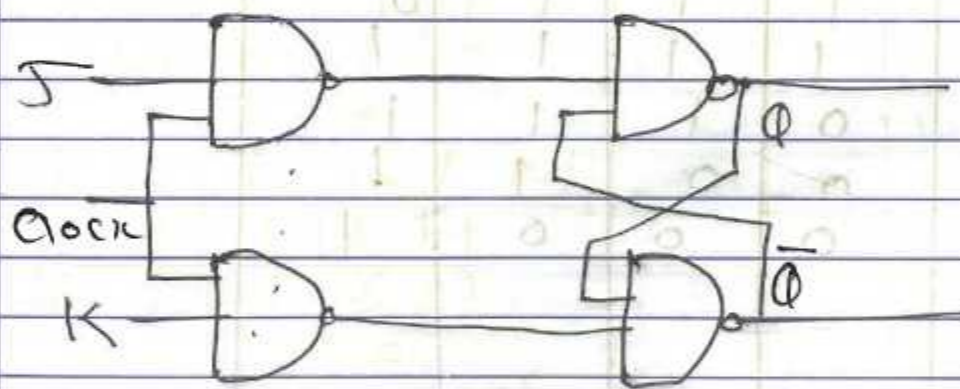
	Serial	P	Q	R	S
0	0	0	0	0	0
1	0	1	0	0	0
2	0	1	1	0	0
3	0	1	1	1	0
4	0	1	1	1	1
5	0	0	1	1	1
6	0	0	0	1	1
7	0	0	0	0	1
8	1	0	0	0	0
9	1	1	0	0	0
10	1	1	1	0	0
11	1	1	1	1	0
12	1	1	1	1	1
13	1	0	1	1	1
14	1	0	0	1	1
15	1	0	0	0	1

Mod 6 Synchronous

J K flip flop

J	$Q_n$	$Q_{n+1}$	J	K
0	0	0	0	X
0	1	1	1	X
1	0	0	X	0
1	1	1	X	0

J.K



P.S N.S

	$a_n$	$b_n$	$a_{n+1}$	$b_{n+1}$	$a_{n+1}$	$b_{n+1}$	Jc	Kc	Jb	Kb	Ja	Ka
0	0	0	0	0	0	0	0	X	0	X	1	X
1	0	0	1	0	1	0	0	X	1	X	X	1
2	0	0	1	1	0	1	0	X	X	0	1	X
3	0	0	1	1	1	0	1	X	X	1	X	1
4	1	1	0	0	1	0	1	X	0	0	X	1
5	1	1	0	1	1	0	X	0	1	X	X	1
6	1	1	1	0	1	1	X	0	X	0	1	X
7	1	1	1	1	1	0	X	0	X	1	X	1

Ja

	00	01	11	10
1	1	X	X	1
0	1	X	X	1

Ka

	00	01	11	10
1	X	1	1	X
0	X	1	1	X

Jc

	00	01	11	10
0	0	0	1	0
0	X	X	X	X

Kc

	00	01	11	10
1	X	X	X	X
0	0	1	X	X

Jb

	00	01	11	10
1	0	1	X	X
0	0	0	X	X

Kb

	00	01	11	10
1	X	X	1	0
0	X	X	1	0



2.11 | 2.9

X	1	0	0	0	0	0	0	0	0
1	X	1	X	0	0	1	0	0	1
1	X	1	X	1	0	0	1	1	0
1	X	1	X	1	0	0	1	1	0
1	X	1	X	1	0	0	1	1	0
1	X	1	X	1	0	0	1	1	0
1	X	1	X	1	0	0	1	1	0
1	X	1	X	1	0	0	1	1	0
1	X	1	X	1	0	0	1	1	0
1	X	1	X	1	0	0	1	1	0

01 11 10 00 / 07

1	1	1	1	1
1	1	1	1	0

01 11 10 00 / 07

1	1	1	1	1
1	1	1	1	0

1	1	1	1	1	1	1	1	1	1
1	1	1	1	1	1	1	1	1	1

01 11 10 00 / 07

1	1	1	1	1	1	1	1	1	1
1	1	1	1	1	1	1	1	1	1



2a- 2 ✓  
 2b- 7  
 3a- 5  
 3b- 6  
 20/30  
 S2  
 2/12/19





# AMC

## ENGINEERING COLLEGE

Affiliated to Visvesvaraya Technological University, Belagavi,  
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Accredited by NAAC & NBA (2009-2012), Ministry of HRD, New Delhi.



### Vision of the Institution

*To be a Leader in Imparting Value Based Technical Education and Research for the Benefit of Society"*

### Mission of the Institution

M1	To Provide State of the art Infrastructure facilities.
M2	To Implement modern Pedagogical methods in delivering the Academic programs with Experienced and Committed faculty.
M3	To Create a vibrant ambience that promotes Learning, Research, Invention and Innovation.
M4	To Undertake Skill Development Programs for Academic Institutions and Industries.
M5	To Enhance Institute Industry Interaction through Collaborative Research and Consultancy.
M6	To Relentlessly pursue Professional Excellence with Ethical and Moral Values.

18<sup>th</sup> K.M. Bannerghatta Road, Kalkere, Bengaluru - 560 083

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Website: [www.amcgroup.edu.in](http://www.amcgroup.edu.in)

Accredited by NAAC & NBA (2009-2012), Ministry of HRD, New Delhi.



### Department of Computer Science and Engineering

Test	Date	Signature of Student	Signature of Invigilator
Test - I			
Test - II	25/10/19	Kiran Kumar	
Test - III	28/11/19	Kiran Kumar	Ramy 28/11/19

BLUE BOOK

Name : Kiran Kumar. H  
USN : 1AM16CS076 Semester : 2<sup>th</sup>  
Program: Computer Science & Engineering  
Section : B Class Roll No : \_\_\_\_\_  
Course : Machine Learning



## Department of Computer Science and Engineering

### Vision of the Department

"Be a premier department in the field of Computer Science & Engineering to meet the Technological Challenges of the Society"

### Mission of the Department

M1	To provide state of the art infrastructure facilities
M2	To provide exposure to the latest tools in the area of computer hardware and software.
M3	To strive for academic excellence through research in Computer Science and Engineering with creative teaching-learning pedagogy
M4	To establish Industry Institute Interaction and make students ready for the Industrial environment.
M5	To transform students into entrepreneurial, technically competent, socially responsible and ethical computer science professional.

### Program Educational Objectives (PEOs)

PEO 1	Graduates possess advanced knowledge of Computer Science & Engineering and excel in leadership roles to serve the society.
PEO 2	Graduates of the program will apply Computer Engineering tools in core technologies for improving knowledge in the Interdisciplinary Research and/or Entrepreneurs.
PEO 3	Graduates adapt Value-Based Proficiency in solving real time problems.



## AMC ENGINEERING COLLEGE

18th K.M, Bannerghatta Road, Kalkere, Bengaluru - 560083. Phone: 27828655

### CBCS SCHEME

Student Name: Kiran Kumar. H USN: 1AM1611076 Course-Name & Code: 15CS73

Internal Assessment Test	Q1			Q2			Q3			Q4			IA Test Marks ( )		Signature of Faculty Incharge
	a	b	C	a	b	c	a	b	c	a	b	c	Total Marks	Marks Reduce to	
CO															
Max marks													18		
IA Test 1															
CO	3	3	-	3	3	-	3	3	-	3	3	-	19		
Max marks	6	9		6	9		5	5		5	5		25	12	
IA Test 2	6	5								5	3				
CO	2	3	-	2	3	-	2	2	-	2	3	-	21		
Max marks	6	9		6	9		5	5		5	5		25		
IA Test 3	6	5					5	5							

Assessment Tool*	CO1( )	CO2( )	CO3( )	CO4( )	CO5( )	CO6( )	Total Marks( )	Marks Reduced to	Signature of Faculty Incharge
AT 1	20	20	20				60		
AT 1	18						18		
AT 2		15					15	4	
AT 3			20				20		

Final IA Marks	(12/15)	Final AT Marks	(9/5)
----------------	---------	----------------	-------

### Certificate

This is to certify that Mr./Ms. Kiran Kumar. H .....has satisfactorily completed the course of assignment prescribed by the Visvesvaraya Technological University for Semester.....<sup>2<sup>nd</sup></sup> Branch...CSE.....for the academic year 20 - 20

Final Continuous Internal Evaluation (CIE) Marks Awarded ( ) :

\*Assignment/Quiz/Seminar/Mini-Project

Kiran Kumar. H  
Signature of Student

[Signature]  
Signature of Faculty Incharge

[Signature]  
Signature of Course Coordinator

(16/20)

II internal Assessment

3(b)	color	Type	Origin	Stolen
	Red	Sports	Domestic	Yes
	Red	Sports	Domestic	NO
	Red	Sports	Domestic	Yes
	Yellow	Sports	Domestic	NO
	Yellow	Sports	Imported	Yes
	Yellow	SUV	Imported	NO
	Yellow	SUV	Imported	Yes
	Yellow	SUV	Domestic	NO
	Red	SUV	Imported	NO
	Red	Sports	Imported	Yes

Probability

~~P(Red = Yes) =~~

$P(\text{Yes}) = 5/10 = 0.5$

$P(\text{NO}) = 5/10 = 0.5$

$P(\text{Domestic} = \text{Yes}) = 2/5 = 0.4$

$P(\text{Domestic} = \text{NO}) = 3/5 = 0.6$

$P(\text{Red} = \text{Yes}) = 3/5 = 0.6$

$P(\text{Red} = \text{NO}) = 2/5 = 0.4$

$P(\text{Imported} = \text{Yes}) = 3/5 = 0.6$

$P(\text{Imported} = \text{NO}) = 2/5 = 0.4$

~~$P(\text{Sports} = \text{Yes}) = 4/6 = 0.66$~~

~~$P(\text{Sports} = \text{NO}) = 2/6 = 0.3$~~

$P(\text{Red, SUV, Domestic})$

$P(\text{SUV} = \text{Yes}) = 1/4 = 0.25$

$P(\text{SUV} = \text{NO}) = 3/4 = 0.75$

$= P(\text{Red}) \times P(\text{SUV}) \times P(\text{Domestic})$

$= 0.6 \times 0.25 \times 0.4$

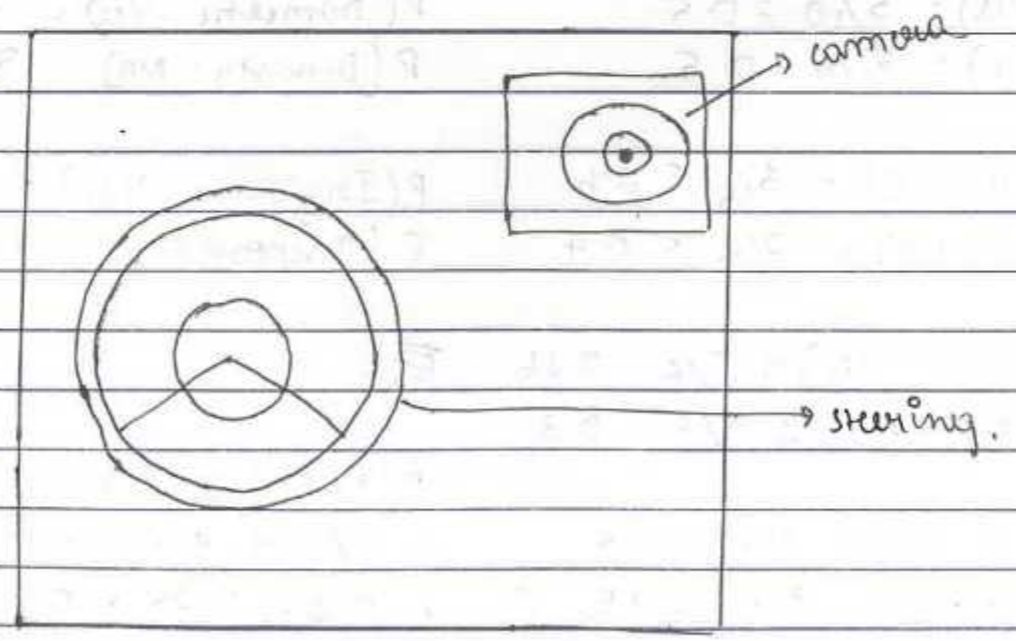
$= 0.06$

$P(\text{NO}) = ?$

X2

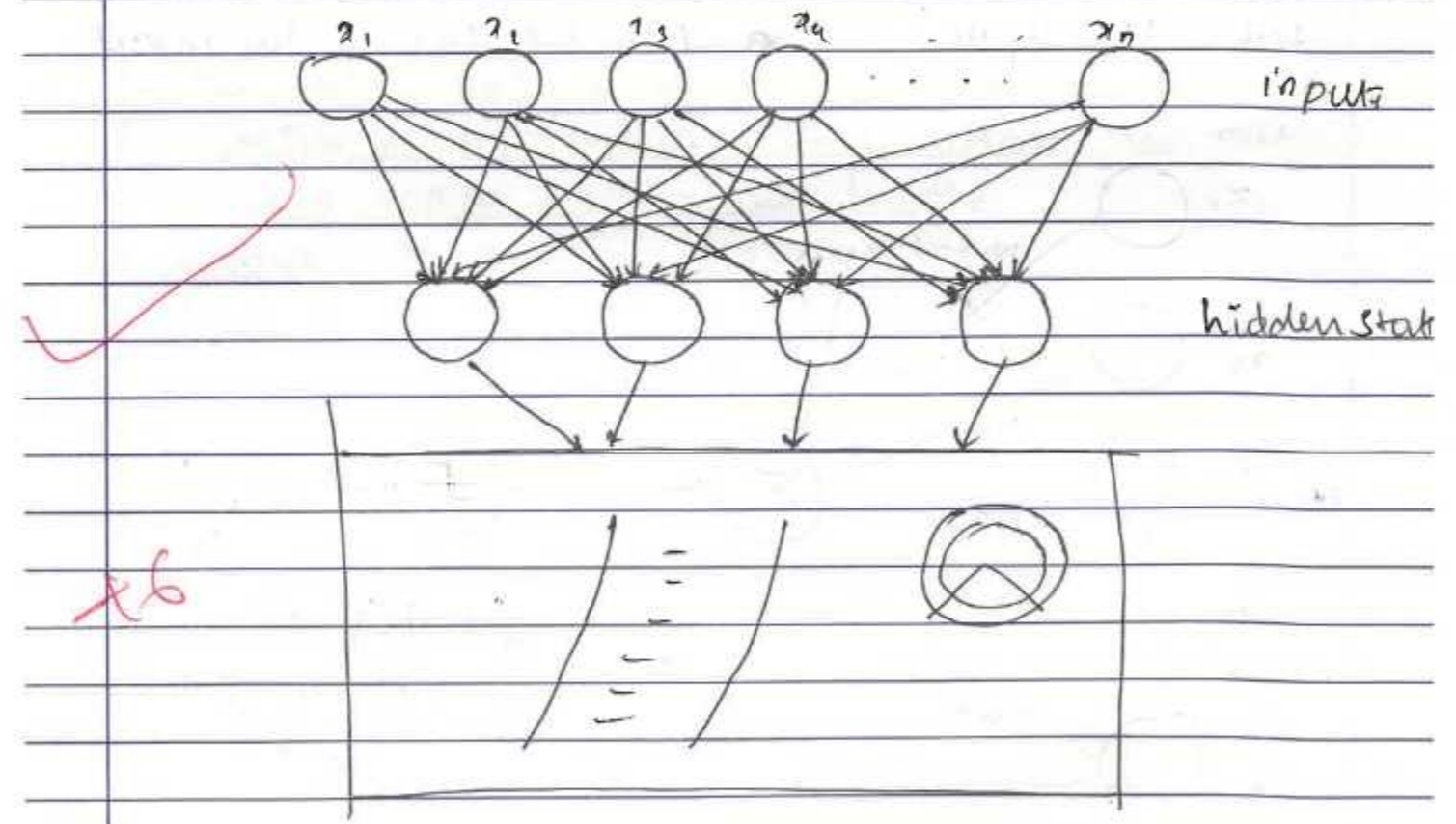
- A) The Application of Neural Network used for learning to steer an autonomous vehicle are
- 1) The ALVINN, which uses the Artificial Neural Network for the steering the autonomous vehicle, by using driving of human
  - 2) The input given to the neural network is 30x32 pixels forward pointed camera in the front of the vehicle.
  - 3) The output is the direction at which the vehicle to be steered at the direction.

The ALVINN uses the ANN to learn the human driving skills & driving range. The machine learns to control the vehicle steering for about 5 minutes at the distance 70 miles. The ANN makes it convenient to drive the autonomous steer upto 100 miles.



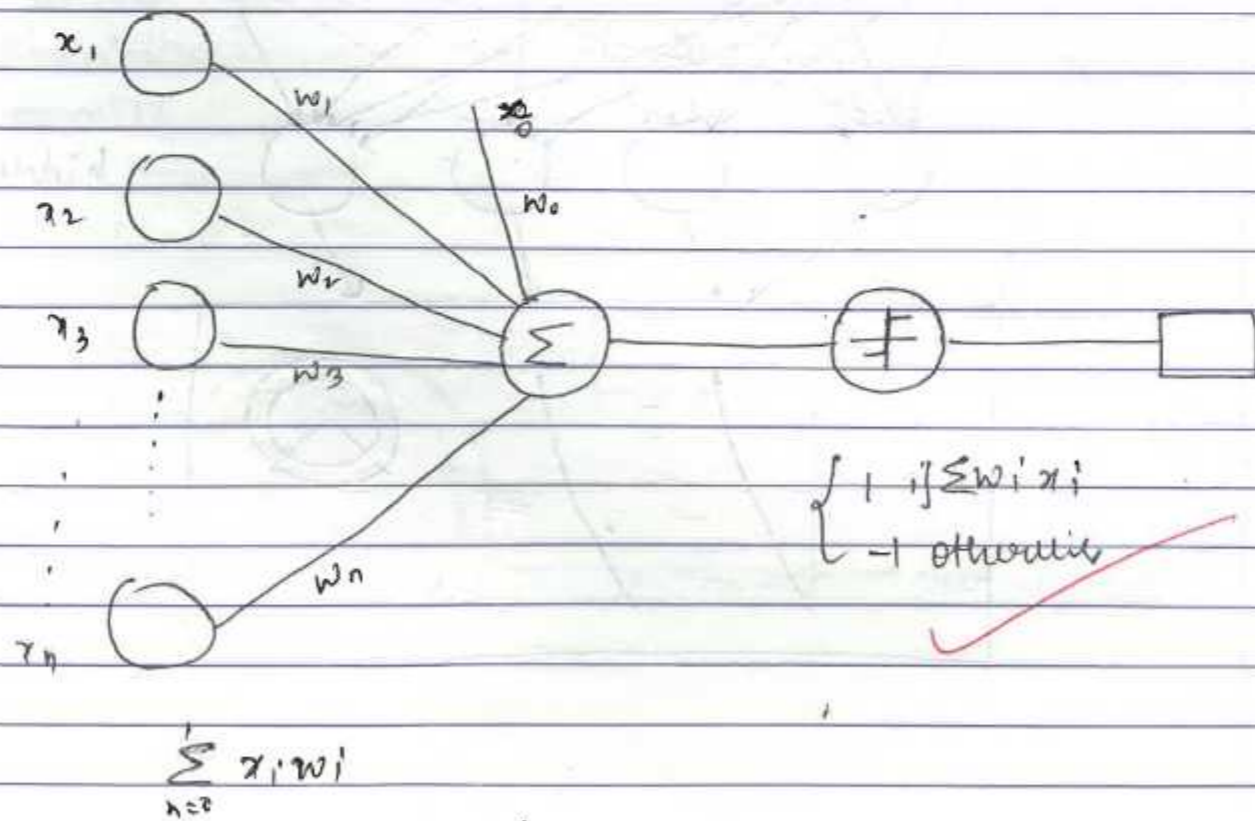
As shown in the diagram the camera is used for the observation of the road and calculates the movement of the steering. By observing it controls the steering.

- This technology is the present upgraded vehicle inbuilt function of Artificial Neural Network
- How the input is taken from the camera & implements the steering left, right straight is shown in the diagram



- As shown in diagram. The input is taken from the camera of about  $30 \times 32$  pixels
- The input is distributed to all the hidden state of 4 state. and
- The training is done through the hidden state hidden state takes each of the images & its features & calculates the steering moment.

1(b) The Perceptron Network is the network which takes the input & network learns the input.



The perceptron Network is the network, where the values of  $(x_1, x_2, x_3, \dots, x_n)$  and the  $(w_1, w_2, w_3, \dots, w_n)$  weighted of the values.

$$\begin{cases} \sum_{i=0}^n w_i x_i \\ -1 \text{ otherwise} \end{cases}$$

The equation of gradient descent rule to minimize the error.

→ The values that are taken is the steepest descent as the  $y$ .

→ The values given to the input is the  $v(x_i)$  which is the values. to calculate the output.

The two inputs are given to the gradient descent rule as the training data & the target course

*Equation of gradient descent?*

*not rule*

3(a) Bayesian belief network & conditional independency

- 1) Bayesian belief Network describes the probability distribution which governs the set of variables defined in the network.
- 2) The Bayesian belief network describes the probability distribution by setting the variables of value  $x$  to  $y$  and the values that are assigned is  $v(y)$ .
- 3) The ~~Bayesian~~ Bayesian network uses the conditional independency along with the other network.

Conditional independency

Conditional independency configuration is that the variables that are defined in the network are independent to each other. The values of one variable do not affect the other.

For example  $P(x_i, y_j, z_k)$

In the values of  $x, y$  &  $z$  the  $x$  is independent of  $y$  and  $z$  is the probability distribution.

$P(x_i, y_j, z_k)$  where the  $x_i$  is independent of  $y_j$  &  $z_k$  is the probability distribution.

$$P(x_i = x | y_j = y, z_k = z) = P(x = x | z_k = z)$$

The values  $(x_1, \dots, x_n)$  &  $(y_1, \dots, y_m)$  and the  $(z_1, \dots, z_n)$ . The values of  $(x_1, \dots, x_n)$  is independent of  $(y_1, \dots, y_m)$  & the  $z$  is the distribution.

The standard form of conditional independency is

$$P(x/y, z) = P(x/z)$$

3(A) Brute force MAP Learning algorithm

- The Brute force map algorithm takes the input  $H_{map}$  hypothesis of the  $P(d/H)$   $P(h/D)$ . The hypothesis mapping takes over the algorithm which is used for learning the  $h$  for mapping.
- The algorithm is used in the Machine learning to learn the mapping of the input from the user.



Age	Income	Student	Credit	Buy - Computer
< 30	high	NO	Excellen	NO
< 30	high	NO	Fair	NO
31-40	high	NO	Fair	Yes
> 40	Medium	Yes	Fair	Yes
> 40	low	Yes	Excellen	Yes
> 40	low	Yes	Excellen	NO
31-40	low	NO	Fair	Yes
< 30	medium	Yes	Fair	NO
< 30	low	Yes	Fair	Yes
> 40	medium	Yes	Excellen	Yes
< 30	medium	NO	Exclt	Yes
31-40	medium	Yes	Fair	Yes
31-40	high	NO	Exclt	Yes
> 40	medium	NO	Exclt	NO

$P(\text{Yes}) = 9/14$

$P(\text{NO}) = 5/14$

	P(Yes)	P(NO)		P(Yes)	P(NO)
< 30	2/5	3/5	> 40	3/5	2/5
31-40	4/4	0/4			



	P(Yes)	P(NO)
P(high)	2/4	2/4
P(Medium)	4/6	2/6
P(Low)	3/4	1/4

	P(Yes)	P(NO)	Student	P(Yes)	P(NO)
Fair	6/8	2/8	P(No)	3/7	4/7
Excellent	3/6	3/6	P(Yes)	6/7	1/7

$P(\text{Fair}) = 6/8 = 0.75$

$P(\text{Student} = \text{Yes}) = 6/7 = 0.85$

$P(\text{medium} = \text{Yes}) = 4/6 = 0.61$

$P(\text{Fair}) \times P(\text{Student}) \times P(\text{medium})$

$= 0.75 \times 0.85 \times 0.6$

=

+3

$\frac{19}{25}$

1(a) 6

(b) 5

4(a) 5

(b) 3

$\frac{19}{25}$

### III Internal Assessment.

#### 1) K-nearest neighbor algorithm

##### 1) Training Algorithm

for each training examples  $(x, f(x))$  add the examples to the list of training examples

##### 2) Classification algorithm

Given the instance of  $x_q$  from Training examples are classified

Let  $x_1, \dots, x_k$  denotes  $K$  instance of <sup>training example</sup>  $x_q$  which is nearest to  $x_q$ .

$$\hat{f}(x_q) \leftarrow \underset{v \in V}{\operatorname{argmax}} \sum_{i=1}^k d(a, b) (x, f(x))$$

where  $d(a, b) = 1$

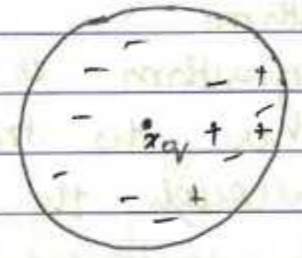
if  $d(a) = a = b$  then otherwise  $d(a, b) = 1$

#### Explanation:-

→ In K-nearest neighbor algorithm the  $\hat{f}(x_q)$  that estimates its values that are nearest to the  $x_q$

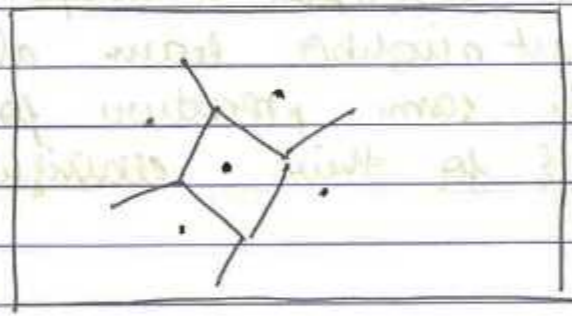
→  $\hat{f}(x_i)$  where the  $x_i$  is the instance of training examples that are nearest to  $x_q$ .

→ If  $K=1$  then 1-Nearest neighbor algorithm that is the instance of training example is nearest to  $x_q$ .



The diagram above shows the number of positive & negative training examples that are nearest to  $x_q$ .

$x_q$  is the centre point at which the K-nearest neighbor where K is the number of training examples.



→ This diagram shows the polyhedron of the K-nearest neighbor, where the training examples are examined to get nearest to the  $x_q$ .



- The  $k$ -nearest neighbor algorithm is called to be an instance based learning because
- An instance based learning is one of the fastest learning algorithms.
- $k$ -nearest neighbor algorithm is also a fastest learning algorithm when the training examples are learning the  $\sigma$  through the algorithm quickly
- It simply stores the training examples and in contrast demonstrate to construct the target function by using the training examples.
- Each time the algorithm goes through training example the first it gets the relationship between the previously examined & present training examples for their relationship and then it constructs a target function.
- The  $k$ -nearest neighbor learn algorithm also follows the same procedure for training examples & for their classification

- 14) The following terms with respect to  $k$ -nearest neighbor learning algorithm
- i) Regression → Regression is one of learning method used in the locally weighted linear regression.
  - ii) Residual → Residual function that differs from Regression of  $\sigma$  learning.
  - (iii) Kernel function → The  $k$  is the kernel function used in the algorithm that defines as the values of kernel function decrease the distance increases.

3(B) The reinforcement learning is the method of learning in such a way that the machine learns in a trial & error method.

- In the reinforcement learning. The machine is given input as an object to identify. If the machine fails to identify then the user or the training examples are given to the machine.
- The answers given by the machine are corrected by the user.
- This way of learning method of allowing to identify the input & then correcting is said to be the reinforcement learning.

Disadvantages of reinforcement learning

- The system network takes long process to identify the input & process it in the reinforcement algorithm & then giving output.
- The training examples of input should be corrected by the user. When the machine system fails to identify.
- The user has to correct everytime the system fails to identify.

The reinforcement learning differs from the other function approximation tasks.

→ On approach to the function approximation task that is similar to the locally weighted linear regression & neural networks that learns the Radial Basis function.

- reinforcement learning differs from other approximation tasks which is different from  $k$ -nearest neighbor algorithm &  $k$ -nearest neighbor learning, & the locally weighted linear regression algorithms.
- Radial basis function is a approx function approximation tasks that differs from the other function.
- Reinforcement learning problems are not similar to the other learning algorithms.

3(A) Locally weighted Linear Regression.

→ In locally weighted linear regression the approach to the function approximation tasks that is similar to the neural networks & the Radial Basis function that learns the network

$$f(x) = w_0 + \sum_{u=1}^k w_u K(d(x_u, x)) \quad \text{Equ 1}$$

→ where the  $x_u$  is the function a example of  $x$  & the  $K(d(x_u, x))$  is the kernel function that is defined as  $k$  in the Equ 1.



→ As the  $k_u(d(x_u, x))$  decreases when the  $d(x_u, x)$  which the distance is increased.

→ The function used in the weighted regression is as follows shown formula,

~~→ The function used in the weighted regression is as follows shown formula,~~

~~→ The function used in the weighted regression is as follows shown formula,~~

~~→ The function used in the weighted regression is as follows shown formula,~~

~~→ The function used in the weighted regression is as follows shown formula,~~



$f(a) = 6$   
 $(b) = 5$

$g(a) = 5$   
 $(b) = 5$

~~21~~  
~~25~~



# AMC

## ENGINEERING COLLEGE

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Approved by Government of Karnataka, Recognized by AICTE, New Delhi.



Accredited by NAAC & NBA (2009-2012), Ministry of HRD, New Delhi.

### Vision of the Institution

*To be a Leader in Imparting Value Based Technical Education and Research for the Benefit of Society"*

### Mission of the Institution

M1	To Provide State of the art Infrastructure facilities.
M2	To Implement modern Pedagogical methods in delivering the Academic programs with Experienced and Committed faculty.
M3	To Create a vibrant ambience that promotes Learning, Research, Invention and Innovation.
M4	To Undertake Skill Development Programs for Academic Institutions and Industries.
M5	To Enhance Institute Industry Interaction through Collaborative Research and Consultancy.
M6	To Relentlessly pursue Professional Excellence with Ethical and Moral Values.

18<sup>th</sup> K.M. Bannerghatta Road, Kalkere, Bengaluru - 560 083  
E-mail: principal@amcec.edu.in : hodcse@amceducation.in  
Website: www.amcgroup.edu.in



# AMC

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### Department of Computer Science and Engineering

Test	Date	Signature of Student	Signature of Invigilator
Test - I	12/9/19	Akshitha B.	Kanya
Test - II	22/10/19	Akshitha B.	[Signature]
Test - III	28/11/19	Akshitha B.	[Signature]

BLUE BOOK

Name : AKSHITHA B  
USN : IAMBCS015 Semester : III  
Program: CSE - Analog and Digital electronics  
Section : "A" Class Roll No : 15  
Course : CSE



## Department of Computer Science and Engineering

### Vision of the Department

"Be a premier department in the field of Computer Science & Engineering to meet the Technological Challenges of the Society"

### Mission of the Department

M1	To provide state of the art infrastructure facilities
M2	To provide exposure to the latest tools in the area of computer hardware and software.
M3	To strive for academic excellence through research in Computer Science and Engineering with creative teaching-learning pedagogy
M4	To establish Industry Institute Interaction and make students ready for the Industrial environment.
M5	To transform students into entrepreneurial, technically competent, socially responsible and ethical computer science professional.

### Program Educational Objectives (PEOs)

PEO 1	Graduates possess advanced knowledge of Computer Science & Engineering and excel in leadership roles to serve the society.
PEO 2	Graduates of the program will apply Computer Engineering tools in core technologies for improving knowledge in the Interdisciplinary Research and/or Entrepreneurs.
PEO 3	Graduates adapt Value-Based Proficiency in solving real time problems.



## AMC ENGINEERING COLLEGE

18th K.M, Bannerghatta Road, Kalkere, Bengaluru - 560083. Phone: 27828655

### CBCS SCHEME

Student Name:	AKSHITHA R			USN:	IAM18CSDIS			Course-Name & Code:	A 18CS35							
Internal Assessment Test	Q1			Q2			Q3			Q4			IA Test Marks ( )		Signature of Faculty Incharge	
	a	b	C	a	b	c	a	b	c	a	b	c	Total Marks	Marks Reduce to		
CO	1	1					2	2								SLE
Max marks	10	5					10	5					30			
IA Test 1	10	5					10	5								
CO	1	1								4	4					SLE
Max marks	10	5								10	5		30			
IA Test 2	10	5								10	5					
CO				4	4		4	4								SLE
Max marks				5	10		5	10					30			
IA Test 3				5	10		5	10								
Assessment Tool*	CO1( )	CO2( )	CO3( )	CO4( )	CO5( )	CO6( )	Total Marks( )	Marks Reduced to	Signature of Faculty Incharge							
AT 1	5	5					10		S							
AT 2	5		5				10		S							
AT 3				5	5		10		S							
Final IA Marks	30			Final AT Marks			10									

### Certificate

This is to certify that ~~Mr~~/Ms. ...AKSHITHA R.....has satisfactorily completed the course of assignment prescribed by the Visvesvaraya Technological University for Semester ...III... Branch...C.S.E...for the academic year 2019-2020

Final Continuous Internal Evaluation (CIE) Marks Awarded ( ) : 40/40

\*Assignment/Quiz/Seminar/Mini-Project

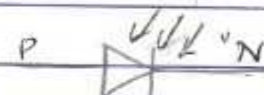
AKSHITHA R  
Signature of Student

SLE  
Signature of Faculty Incharge

Signature of Course Coordinator

### 1. a Photodiode

Photodiode is a light detector semiconductor device which converts light energy into electrical energy or the voltage which depends upon the mode of operation.



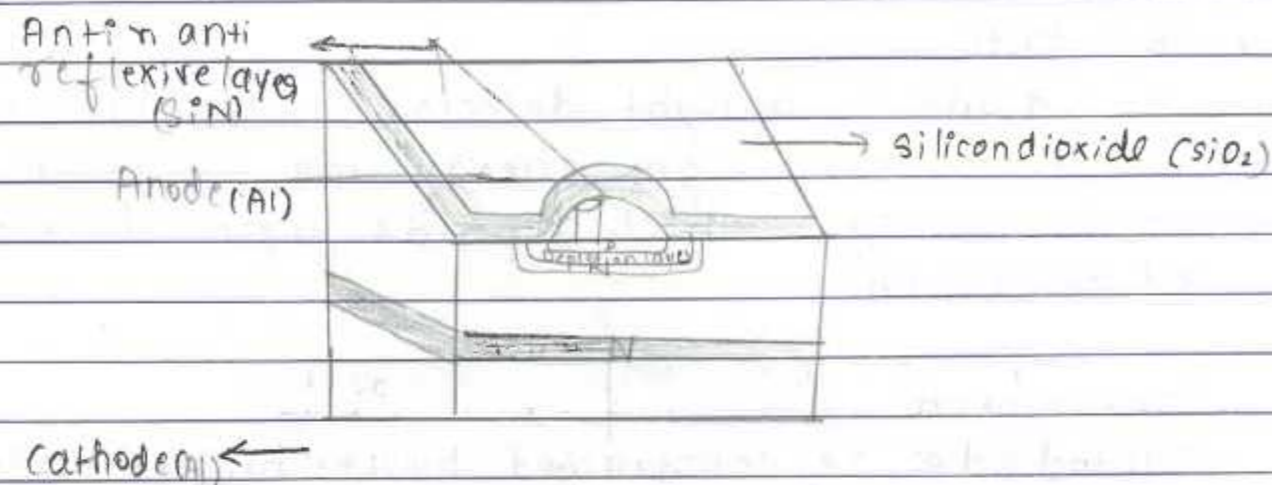
#### Construction:

Photodiode is constructed by a technique called ion implantation where the surface of layer of n-type is bombarded with p-type silicon ions, to produce p-type layer of one micro metre thick. During the formation of diode excess of electrons move from n-type to p-type and excess of holes move from p-type to n-type.

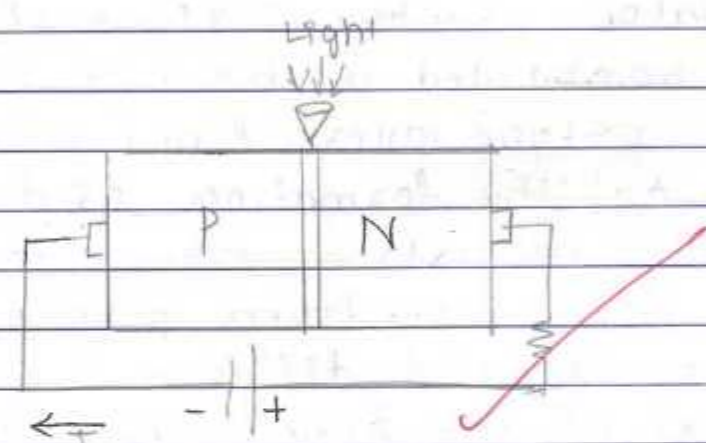
This process is called diffusion.

The removal of the free charge carriers close to pn junction so creating the depletion region.

The top of the layer is protected by silicon dioxide and there is a window in which light to shine on the semiconductor. The window is coated with the thin anti-reflexive layer of silicon nitride (SiN) for the absorption of the light. The anode of aluminium is connected to p-type. Beneath, the n<sup>+</sup> layers is more heavily doped by producing low resistance of connection to the cathode.



Working:-

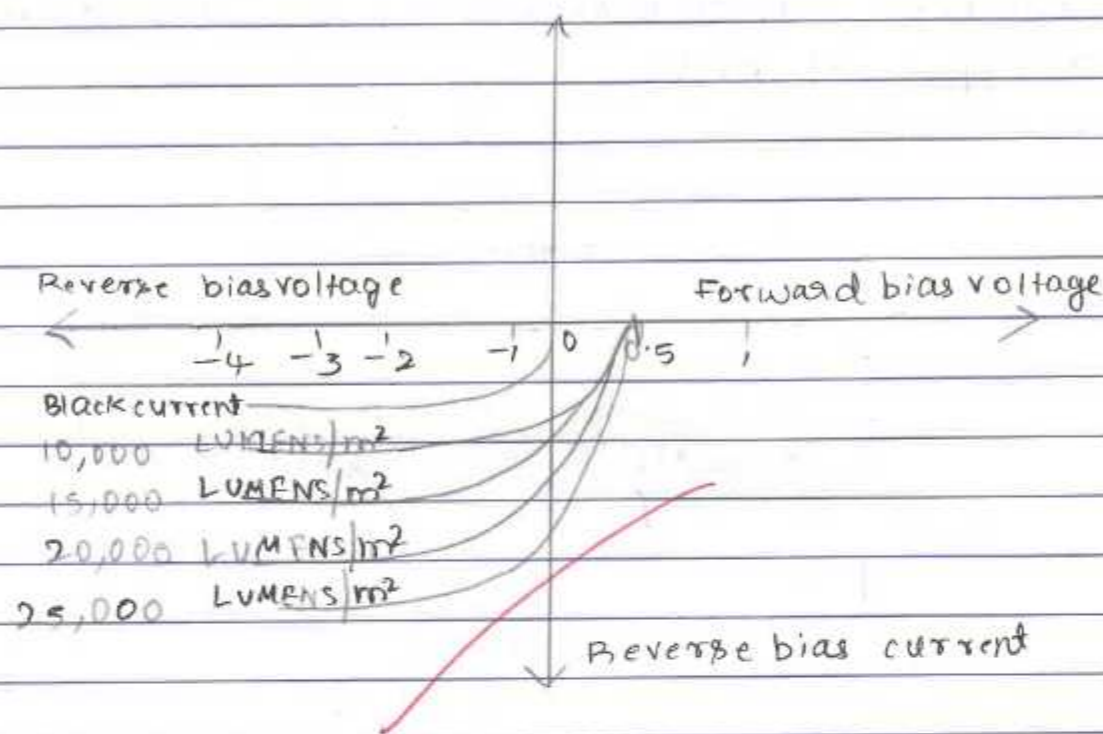


Photodiode in reverse biased

When the conventional diode is reverse biased it expands the depletion layer. Then the current starts flowing due to minority charge carriers. When the reverse current increases, the reverse voltage also increases.

The photodiode is illuminated by the light source. Then the photons strike the junction. It emits the energy in the form of photons. The holes from p-type cross the region to move towards electrons of n-type due to the diffusion process.

V-I characteristics:



$$I = I_0 + I_{sc} (1 - e^{-V/\Delta V})$$

$I_{sc}$  - Short circuit current

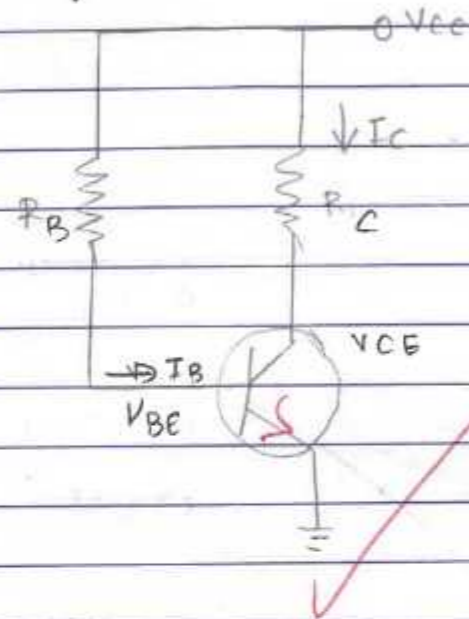
$\Delta$  - 2 for germanic, 1 for silicon

$\Delta V$  - Volt value of temperature

The characteristics of V-I curve is understood by plotting the graph of voltage [reverse bias voltage] versus current [reverse bias current]. The As the intensity of light falls down on depletion region increase, the reverse bias current also increase. As mentioned in the above example we have taken 0.5V of  $V_B$ .

b) Base Bias / Fixed bias:

The base bias has the stability less compared to other types of bias.



By applying KVL to the base circuit,

$$V_{cc} - I_B R_B - V_{BE} = 0$$

$$V_{cc} - V_{BE} = I_B R_B$$

[∵  $V_{cc}$ ,  $V_{BE}$ ,  $R_B$  are the junction of transistor and gnd]

$$\therefore I_B = \frac{V_{cc} - V_{BE}}{R_B}$$

$$\therefore I_C = \beta I_B$$

By applying KVL to the collector circuit,

$$V_{cc} - I_C R_C - V_{CE} = 0$$

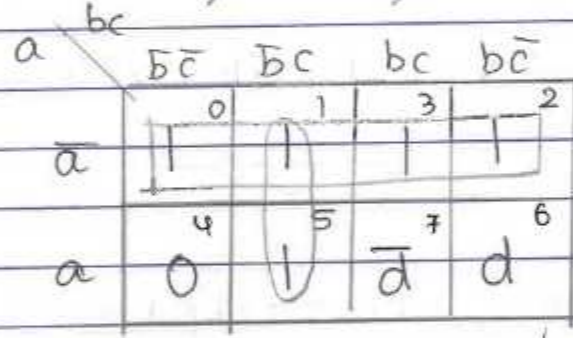
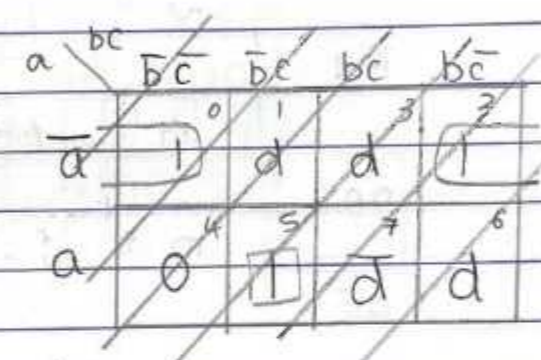
$$V_{cc} = V_{CE} + I_C R_C$$

[∵  $V_{cc}$ ,  $V_{CE}$ ,  $R_C$  are used in transistor]

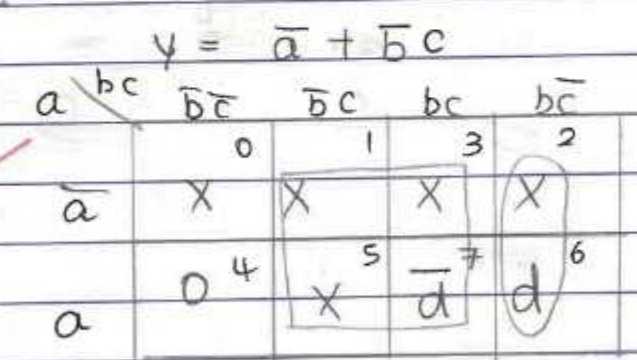
$$\therefore V_{CE} = V_{cc} - I_C R_C$$

3.a  $f(a,b,c,d) = \sum_m (0,1,3,4,5,7,10,11,13,14) + d c (2,6,8)$

a	b	c	d	y	value to be entered
0	0	0	0	1	1
0	0	0	1	1	
0	0	1	0	0	0
0	0	1	1	1	1
0	1	0	0	1	1
0	1	0	1	1	
0	1	1	0	0	0
0	1	1	1	1	1
1	0	0	0	0	0
1	0	0	1	0	
1	0	1	0	1	1
1	0	1	1	1	
1	1	0	0	0	0
1	1	0	1	1	
1	1	1	0	1	1
1	1	1	1	0	



8+2  
=10  
10



$$y = \bar{c}d + b\bar{c}d$$

$$\therefore y = \bar{a} + \bar{b}c + \bar{c}d + b\bar{c}d$$



a.  $f(a,b,c,d) = \sum_m(5,6,7,9,11,13) + d.c.c(1,4,10)$

AB \ CD	$\bar{c}\bar{d}$	$\bar{c}d$	$cd$	$c\bar{d}$
$\bar{A}\bar{B}$	0 <sup>0</sup>	X <sup>1</sup>	0 <sup>3</sup>	0 <sup>2</sup>
$\bar{A}B$	X <sup>4</sup>	1 <sup>5</sup>	1 <sup>7</sup>	1 <sup>6</sup>
$A\bar{B}$	0 <sup>12</sup>	1 <sup>13</sup>	0 <sup>15</sup>	0 <sup>14</sup>
$AB$	0 <sup>8</sup>	1 <sup>9</sup>	1 <sup>11</sup>	X <sup>10</sup>
$A\bar{B}$				

$\therefore y = \bar{c}d + \bar{a}b + a\bar{b}c$

b.  $F(A,B,C,D) = \prod M(1,2,3,4,7,10,11)$

AB \ CD	$c\bar{d}$	$c\bar{d}$	$\bar{c}d$	$\bar{c}d$
$A+B$	1 <sup>0</sup>	0 <sup>1</sup>	0 <sup>3</sup>	0 <sup>2</sup>
$A+\bar{B}$	0 <sup>4</sup>	1 <sup>5</sup>	0 <sup>7</sup>	1 <sup>6</sup>
$\bar{A}+B$	1 <sup>12</sup>	1 <sup>13</sup>	1 <sup>15</sup>	1 <sup>14</sup>
$\bar{A}+\bar{B}$	1 <sup>8</sup>	1 <sup>9</sup>	0 <sup>11</sup>	0 <sup>10</sup>

$\therefore y = (B+\bar{C})(A+B+\bar{D})(A+\bar{C}+\bar{D})(A+\bar{B}+C+D)$

4.a.  $f(A,B,C,D) = \sum_m(0,2,3,6,7,8,10,12,13)$

Minterm	Binary expression	Minterm	Binary expression	Minterm	Binary expression	Minterm	Binary expression
$m_0$	0000	$m_0$	0000	$m_0, m_2$	00-0	$m_0, m_2, m_8, m_{10}$	0-0-0
$m_2$	0010	$m_2$	0010	$m_0, m_8$	-000	$m_2, m_3, m_6, m_7$	0-1-
$m_3$	0011	$m_8$	1000	$m_2, m_3$	001-		
$m_6$	0110	$m_3$	0011	$m_2, m_6$	0-10		
$m_7$	0111	$m_6$	0110	$m_2, m_7$	-010		
$m_8$	1000	$m_{10}$	1010	$m_8, m_{10}$	10-0		
$m_{10}$	1010	$m_{12}$	1100	$m_3, m_7$	0-11		
$m_{12}$	1100	$m_7$	0111	$m_6, m_7$	011-		
$m_{13}$	1101	$m_{13}$	1101	$m_2, m_{13}$	110-		

Prime implicants

$m_8, m_{10} - a\bar{b}d$

$m_{12}, m_{13} - abc$

$m_0, m_2, m_8, m_{10} - bd$

$m_2, m_3, m_6, m_7 - \bar{a}c$

$\therefore y = a\bar{b}d + abc + bd + \bar{a}c$

Petricks method / Prime implicant chart

Minterm	$m_0$	$m_2$	$m_3$	$m_6$	$m_7$	$m_8$	$m_{10}$	$m_{12}$	$m_{13}$
$m_8, m_{10}$	X								
$m_{12}, m_{13}$								⊙	⊙
$m_0, m_2$	⊙								
$m_2, m_3$			⊙	⊙	⊙				
$m_6, m_7$				⊙	⊙				

Essential prime implicants,

$\therefore y = abc + bd + \bar{a}c$

$m_{12}, m_{13} - abc$

$m_0, m_2, m_8, m_{10} - bd$

$m_2, m_3, m_6, m_7 - \bar{a}c$

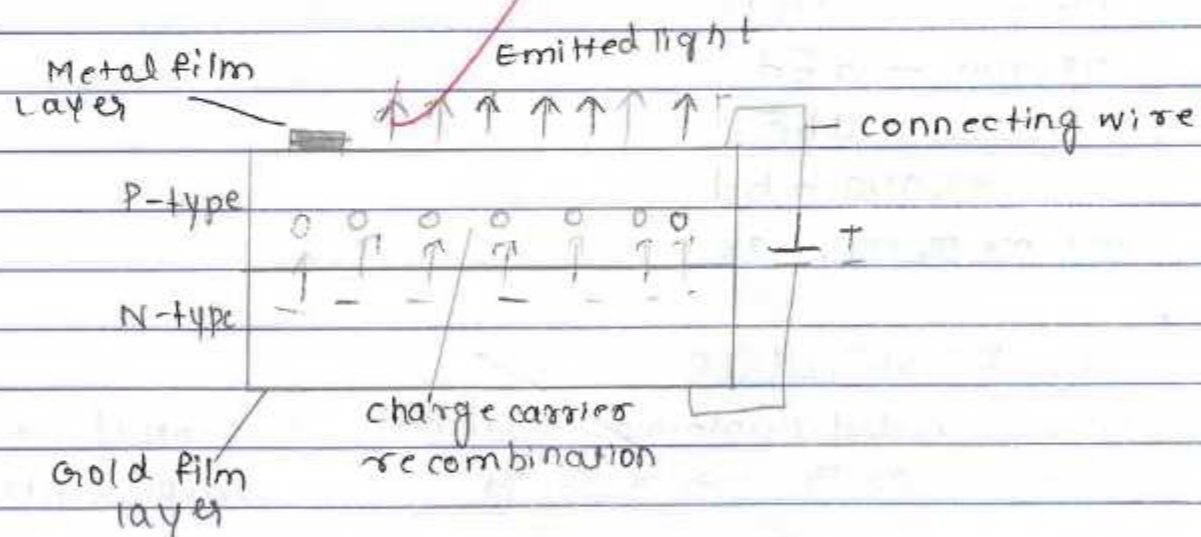
a. LED:

Light emitting diode is a photodiode which emits light when the electric current is passed in forward direction. This phenomenon is called electroluminescence.

Electroluminescence is the property of material to convert electrical energy into light energy.

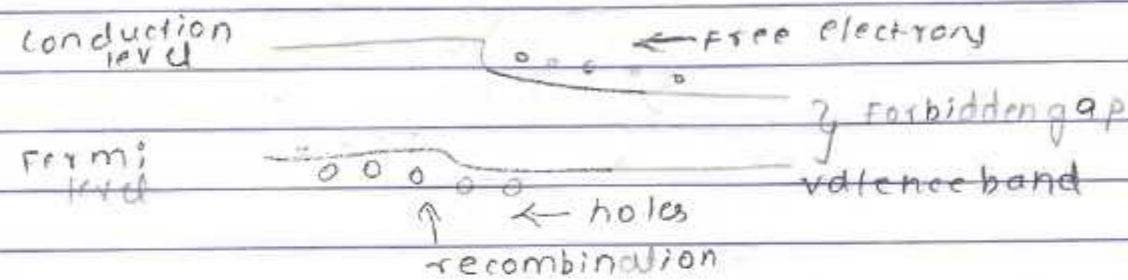
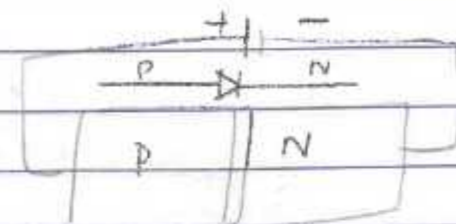
Construction:

LED is constructed using Gallium Arsenide ( $GaAs$ ), Gallium phosphide ( $GaP$ ), Gallium Arsenide phosphide. Any of the above mentioned compounds can be used in construction of LED.



The p-type layer is placed above the n-type layer because there is a formation of charge carrier recombination which occurs in p-type. The anode is protected from the metal film layer and cathode is protected from gold film layer.

Working:



The charge carriers recombine in the PN junction, the n-type electrons cross the n-region and move toward the p-type electrons to recombine. The free electrons are at the conduction level whereas the holes are at the valence band. LED is formed using quantum theory. It states that the energy of electrons moving from a higher level to a lower level by emitting light in the form of photons. The energy of holes is greater than the energy of electrons.

*Photocoupler?*

Handwritten notes in red ink:

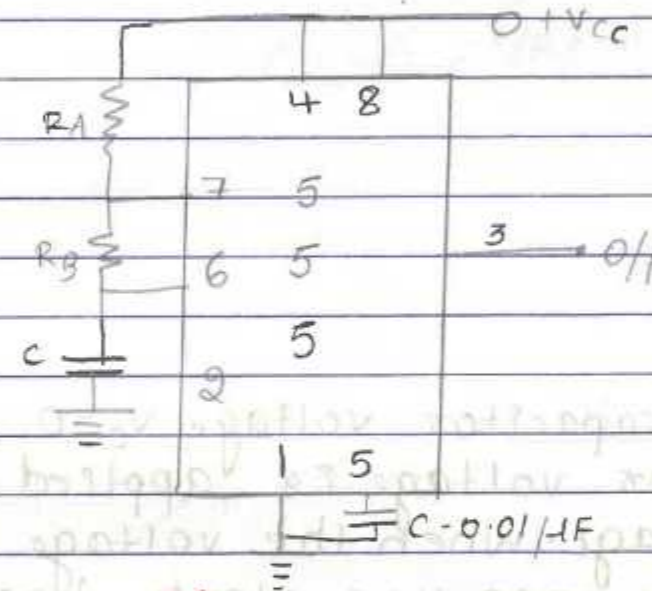
- 10 - 10
- 15 - 5
- 33 - 5
- 43 - 5
- 25 - 5
- 30 - 10
- 28/30
- SLV
- 18/13
- 30/30
- good

IT-Internals

1.a: Multivibrator

Multivibrator is a logical circuit which is widely used to implement two-state devices like relaxation oscillators, timers, flip-flops etc.

Astable multivibrator:



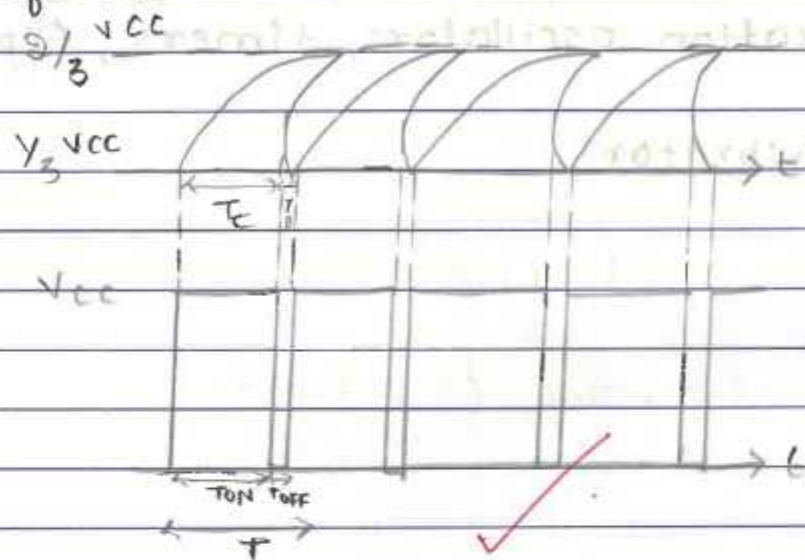
In Astable multivibrator it doesn't have any stable state. It keeps on changing from low to high and high to low. So this is called as free runtime multivibrator or square wave generator.

Astable multivibrator doesn't require any external trigger to change the state of the output.

Applications:

- \* Square wave generator
- \* Free ramp oscillator

Waveforms:



At  $t=0$  the capacitor voltage  $V_c=0$ , where the same capacitor voltage is applied at the input voltage. When the voltage is supplied the capacitor starts charging up to  $\frac{2}{3}V_{cc}$ , when it reaches threshold voltage it starts discharging till  $\frac{1}{3}V_{cc}$  which leads to  $T_{off}$ . When the voltage  $V_c=0$  which is less than  $\frac{1}{3}V_{cc}$  [ $\because V_c=0 < \frac{1}{3}V_{cc}$ ] it starts discharging. When the voltage is supplied it reaches to  $\frac{2}{3}V_{cc}$  which makes  $T_{on}$ .

$$T_{ON} = T_c = 0.693(R_A + R_B)C$$

$$f = \frac{1}{T} = \frac{1}{(T_c + T_d)}$$

$$V_c = V_{cc} (1 - e^{-t/RC})$$

$$V_f = V_{cc} + (V_f - V_i) e^{-t/RC}$$

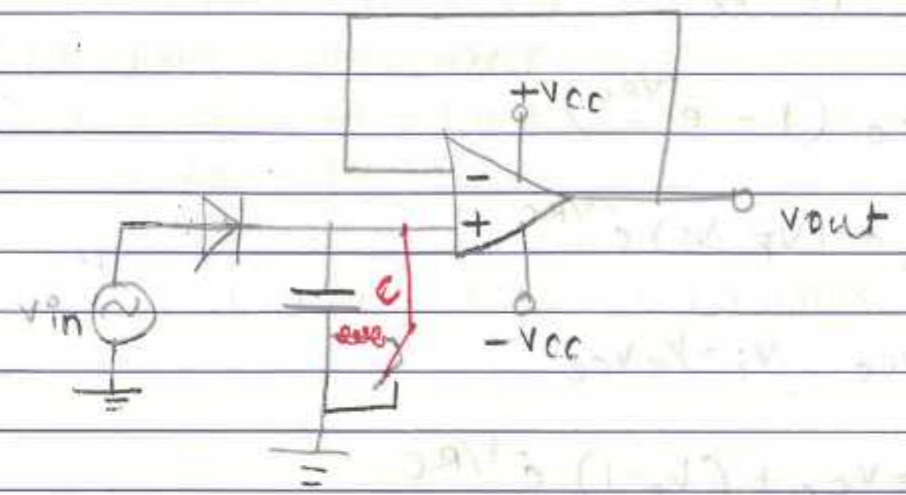
$$V_f = \frac{2}{3}V_{cc} \quad V_i = \frac{1}{3}V_{cc}$$

$$\frac{2}{3}V_{cc} = V_{cc} + (\frac{1}{3}V_{cc} - V_{cc}) e^{-t/RC}$$

$$\therefore T_{ON} = T_c = 0.693(R_A + R_B)C$$

In Astable multivibrator there are two trigger points provided.

1. b Peak detector: [voltage follower circuit]



Peak detector detects the peak value of non-sinusoidal value. Peak detector holds the positive value of voltage in the circuit.

Working:  
 when the peak detects the voltage at the circuit there is a MOSFET switch. It is also known as voltage follower circuit. The voltage is supplied from the input where the capacitor gets charges through it and passes to the op-amp. the non-inverting terminal is connected to input and the inverting terminal is given at output. The peak detected at the  $v_{cc}$  is sent to the output. The capacitor charges when it has high voltage and gets discharged when it is provided with low voltage.

4. a. Given:-

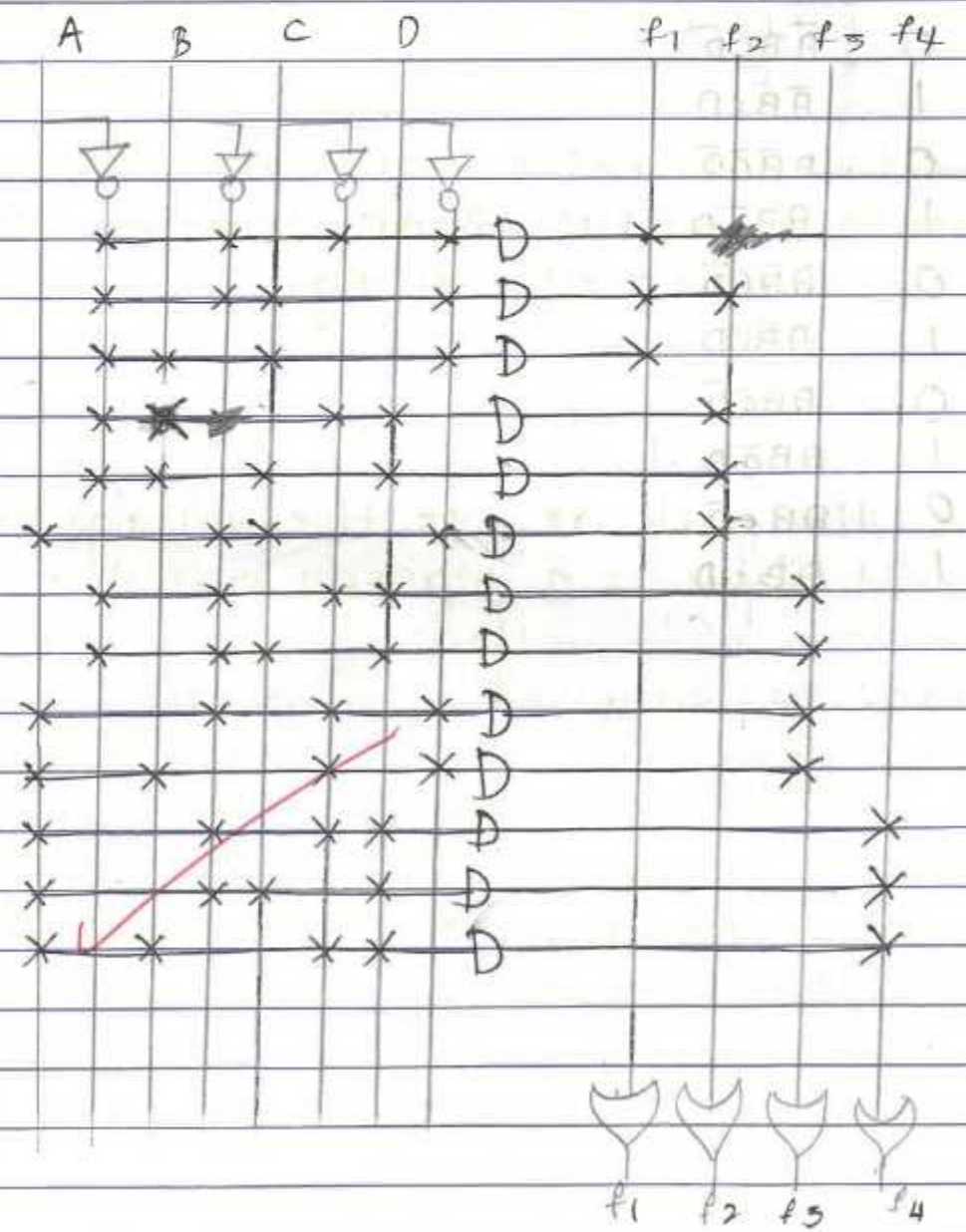
$$f_1 = \sum m(0, 2, 6) = \sum m(\bar{A}\bar{B}\bar{C}\bar{D} + \bar{A}\bar{B}C\bar{D} + \bar{A}B\bar{C}\bar{D})$$

$$f_2 = \sum m(2, 5, 7, 10) = \sum m(\bar{A}\bar{B}C\bar{D} + \bar{A}B\bar{C}D + \bar{A}B\bar{C}\bar{D} + \bar{A}B\bar{C}D)$$

$$f_3 = \sum m(1, 3, 8, 12) = \sum m(\bar{A}B\bar{C}\bar{D} + \bar{A}B\bar{C}D + \bar{A}B\bar{C}\bar{D} + \bar{A}B\bar{C}D)$$

$$f_4 = \sum m(9, 11, 13) = \sum m(\bar{A}B\bar{C}\bar{D} + \bar{A}B\bar{C}D + \bar{A}B\bar{C}D)$$

PLA:- [Programmable logical Array]



4b 3:8 line Decoder:-

A decoder is an integrated circuit which doesn't have inputs but have control pins.

A 3:8 line decoder is a decoder which has 3 control pins and 8 outputs

In general  $n$  to  $2^n$  the decoder is represented.

Truth table:

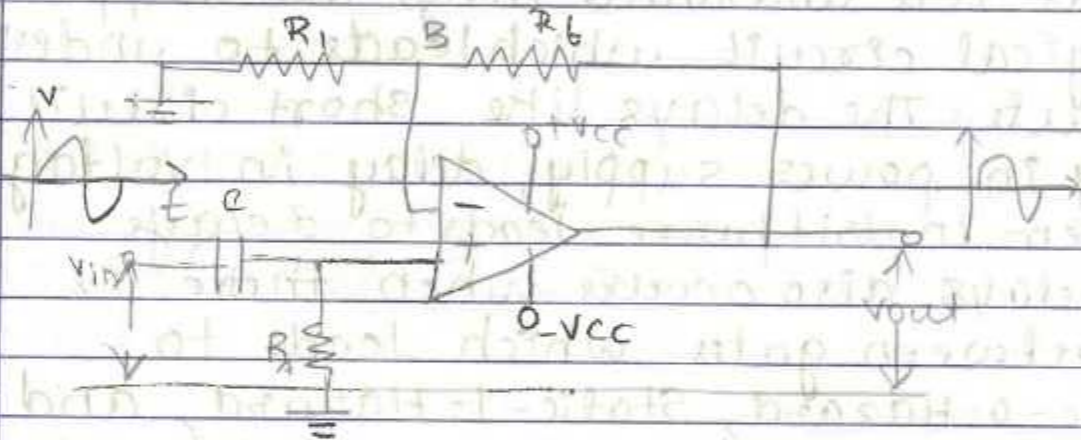
DATA inputs			$Y_0$	$Y_1$	$Y_2$	$Y_3$	$Y_4$	$Y_5$	$Y_6$	$Y_7$				
A	3-8 line Decoder	$Y_0$	A	B	C	$Y_0$	$Y_1$	$Y_2$	$Y_3$	$Y_4$	$Y_5$	$Y_6$	$Y_7$	
B		0	0	0	1	0	0	0	0	0	0	0	0	
C		0	0	1	0	1	0	0	0	0	0	0	0	0
		0	1	0	0	0	1	0	0	0	0	0	0	0
		0	1	1	0	0	0	1	0	0	0	0	0	0
		1	0	0	0	0	0	0	1	0	0	0	0	0
		1	0	1	0	0	0	0	0	1	0	0	0	0
		1	1	0	0	0	0	0	0	0	1	0	0	0
	1	1	1	0	0	0	0	0	0	0	0	1	0	
			1	1	1	0	0	0	0	0	0	0	1	

In 3:8 line decoder we are providing A, B, C 3 data inputs which are control pins and there are 8 outputs which are  $Y_0, Y_1, Y_2, Y_3, Y_4, Y_5, Y_6, Y_7$ .

2.a Filter:

A filter is a frequency selective circuit which is commonly used in signal processing. The frequency signal is given in the specified range and external frequencies are stopped outside the band.

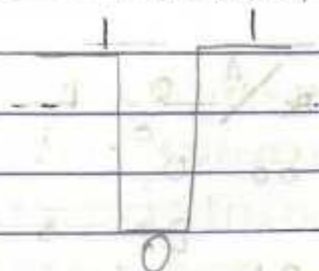
First order High pass filter:



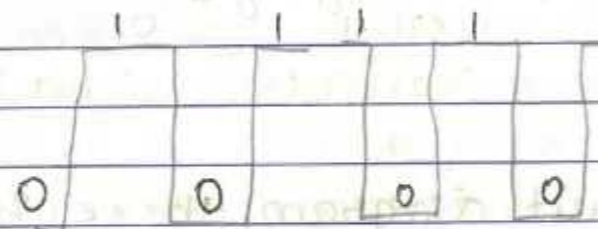
In the first order high pass filter there is a combination of resistors and capacitors. Only high frequencies are provided to the op-amp. The resistance offers resistance to the high voltages and capacitor charges to high voltages when the high voltage is supplied it passed through capacitor of the input voltage so that op-amp does not get damaged.



(ii) Static-1-Hazard



(iii) Dynamic Hazard



Not asked

10-10  
10-5  
10-5  
10-5  
30/30  
Good  
25/10/17



INTERNAL ASSESSMENT-3

2.a. Combinational circuits

- \* combinational circuits are dependent only on inputs
- \* combinational circuits are easier to design.
- \* combinational circuits are faster in speed.
- \* Parallel adder is a combinational circuit
- \* Ex: Encoders, Decoders, Multiplexers
- \* combinational circuits are time independent circuits

sequential circuits

- \* sequential circuits are dependent on present inputs and past outputs
- \* sequential circuits are comparatively harder to design
- \* sequential circuits are slower.
- \* serial adder is a sequential circuit.
- \* Ex: counters, registers, Flipflops etc...
- \* sequential circuits are time dependent circuits

1.b. Asynchronous counter:

Asynchronous counter is also known as serial counter. In asynchronous counter the output of the flipflop is given as clock input to the next flipflop. Asynchronous counter are not triggered simultaneously. Asynchronous counter are very simple to design even if there are more number of states.

Ex: Ripple up counter.

Ripple down counter.

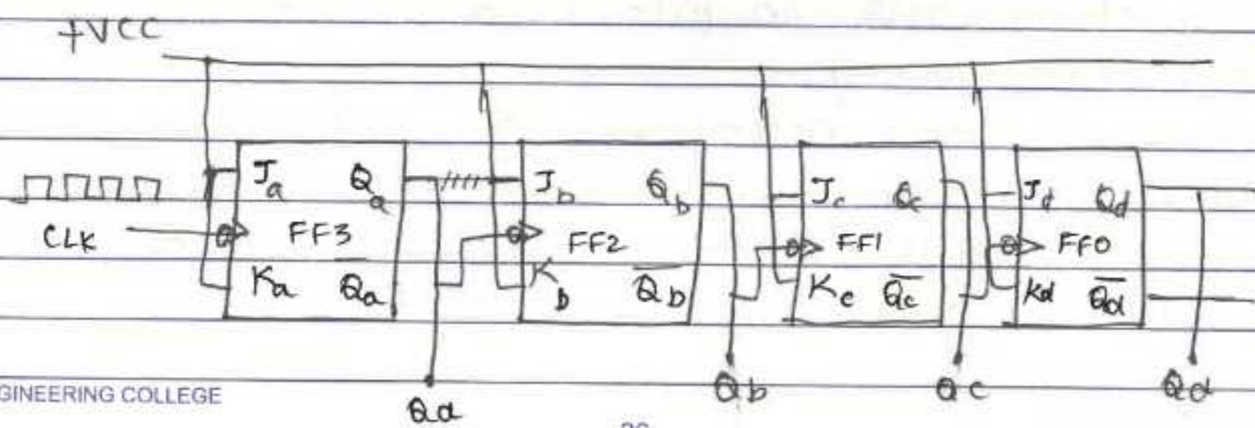
Synchronous counter:

Synchronous counter is also known as parallel counter. In synchronous counter, the clock input for all flip-flops is connected to same external clock. Synchronous counter are faster in speed. Synchronous counter are triggered simultaneously.

Ex: Johnson counter.

Ring counter.

Asynchronous counter/Ripple counter



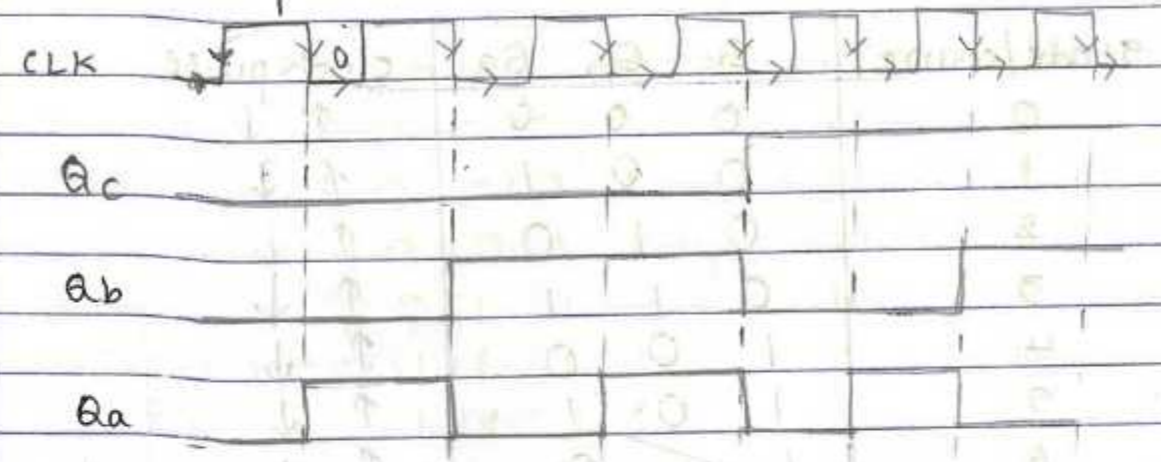
Truth table:

State/count	Qc	Qb	Qa	clock pulse
0	0	0	0	↑ ↓
1	0	0	1	↑ ↓
2	0	1	0	↑ ↓
3	0	1	1	↑ ↓
4	1	0	0	↑ ↓
5	1	0	1	↑ ↓
6	1	1	0	↑ ↓
7	1	1	1	↑ ↓

- \* In asynchronous counter the output of the flipflop-3 is given as clock input of flipflop-2 and output of flipflop-2 is given as clock input of flipflop-1 and output of flipflop-1 is given as clock input of flipflop-0.
- \* Negative edge triggered JK flipflops are used to design asynchronous counter as shown in the diagram.
- \* J and K inputs are connected to +Vcc and an external clock is provided.
- \* Asynchronous counter are not triggered simultaneously.
- \* Asynchronous counter are comparatively slower than synchronous counter.
- \* Asynchronous counter are also known as serial counter.

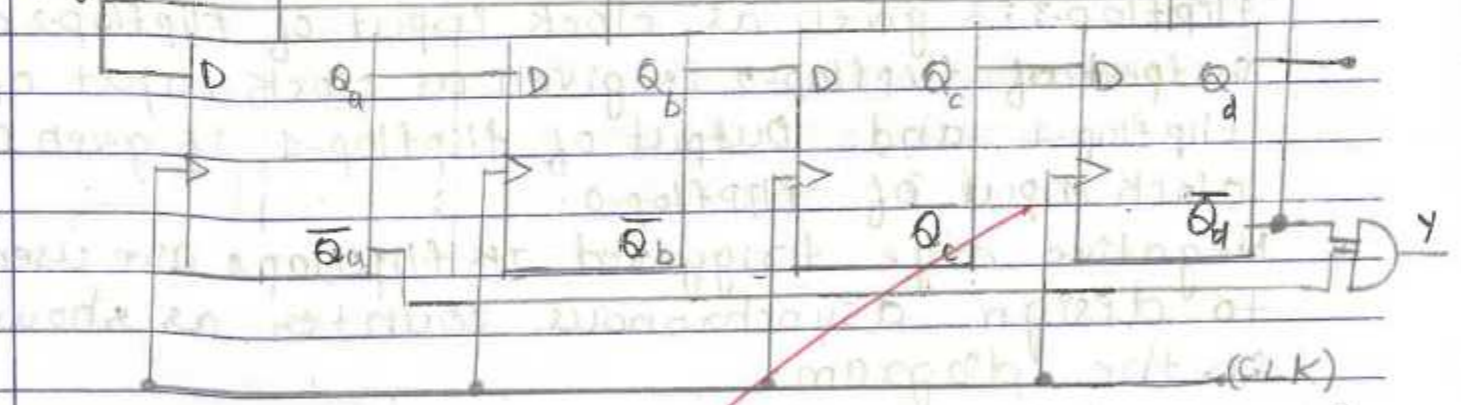


Waveforms: [negative edge triggered]



3a Johnson counter:

Diagram:



In Johnson counter the output of last flipflop  $\bar{Q}_d$  is connected to the first flipflop input  $D$ . And gate is used with the input  $D$  and output  $\bar{Q}_d$  to get output  $y$ . Johnson counter is also known as switched tail counters. As we observe in the truth table the value of  $\bar{Q}_d$  is complimented and sent the bit to the next state.

Truth table:

Count	Serial bits	$Q_a$	$Q_b$	$Q_c$	$Q_d$
0	1	0	0	0	0
1	1	1	0	0	0
2	1	1	1	0	0
3	1	1	1	1	0
4	0	1	1	1	1
5	0	0	1	1	1
6	0	0	0	1	1
7	0	0	0	0	1
8	1	0	0	0	0
9	1	1	0	0	0

complement bit

Waveforms:

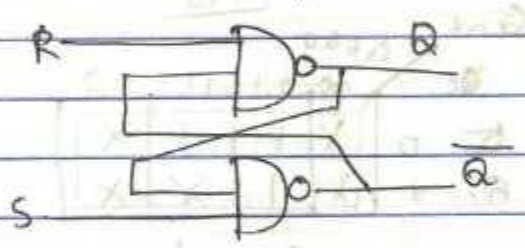


5

In Mod-6 counters,  
 Number of states = twice the number of flipflops.  
 The circuit is designed based on the inputs of the excitation inputs by the values obtained from K-map.

b) (a) RS Flip Flop:

Circuit diagram:



Truth Table:	R	S	Q	Q̄	state
	0	0	?	?	Forbidden state
	0	1	1	0	Set
	1	0	0	1	Reset
	1	1	NC	NC	Previous state no change

characteristic equation:

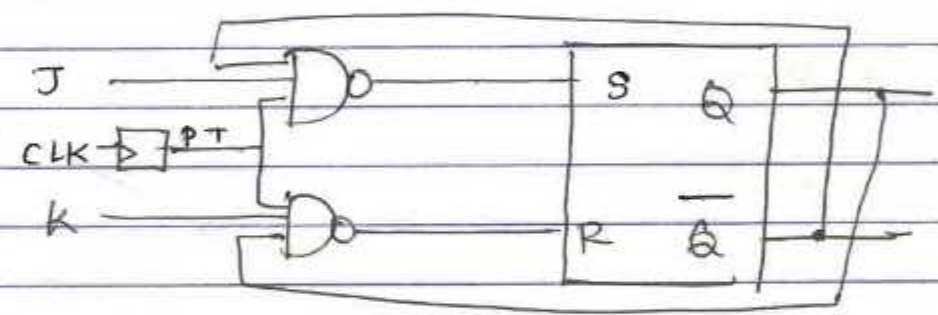
Q̄	R̄S	R̄S̄	RS	RS̄
Q̄	0	0	X	1
Q	1	0	X	0

$Q_{n+1} = R + Q\bar{S}$

- ⊗ case 1: When  $R=0, S=0$ , the flipflop is in forbidden state.
- case 2: When  $R=0, S=1$ , then the flipflop enters Set state i.e,  $Q=1, \bar{Q}=0$
- case 3: When  $R=1, S=0$ , then the flipflop enters reset state i.e;  $Q=0, \bar{Q}=1$
- case 4: When  $R=1, S=1$ , then flipflop remains in previous state.

(b) JK Flip Flop:

(F)



CLK	J	K	Q <sub>n+1</sub>
↑	0	0	Q <sub>n</sub>
↑	0	1	0 - Reset
↑	1	0	1 - Set
↑	1	1	Q <sub>n</sub>

characteristic equation:

Q̄	J̄K̄	J̄K	JK̄	JK
Q̄	0	0	1	1
Q	1	0	0	1

$Q_{n+1} = \bar{Q}J + Q\bar{K}$



~~© D ELLIPLOP~~

D

20-5  
25-10  
30-5  
35-10

30/30

Good

SL

2/12/19





# AMC

## ENGINEERING COLLEGE

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### Vision of the Institution

*To be a Leader in Imparting Value Based Technical Education and Research for the Benefit of Society"*

### Mission of the Institution

M1	To Provide State of the art Infrastructure facilities.
M2	To Implement modern Pedagogical methods in delivering the Academic programs with Experienced and Committed faculty.
M3	To Create a vibrant ambience that promotes Learning, Research, Invention and Innovation.
M4	To Undertake Skill Development Programs for Academic Institutions and Industries.
M5	To Enhance Institute Industry Interaction through Collaborative Research and Consultancy.
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### Department of Computer Science and Engineering

Test	Date	Signature of Student	Signature of Invigilator
Test - I	12/09/19	<i>Chandana S</i>	<i>[Signature]</i>
Test - II	22/10/19	<i>Chandana S</i>	<i>[Signature]</i>
Test - III	08/11/19	<i>Chandana S</i>	<i>Nichita</i>

BLUE BOOK

Name : CHANDANA S  
USN : 1AM18CS045 Semester : 3<sup>rd</sup>  
Program: Computer Science & Engineering  
Section : A Class Roll No : 45  
Course : Analog & Digital Electronics



## Department of Computer Science and Engineering

### Vision of the Department

"Be a premier department in the field of Computer Science & Engineering to meet the Technological Challenges of the Society"

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M1	To provide state of the art infrastructure facilities
M2	To provide exposure to the latest tools in the area of computer hardware and software.
M3	To strive for academic excellence through research in Computer Science and Engineering with creative teaching-learning pedagogy
M4	To establish Industry Institute Interaction and make students ready for the Industrial environment.
M5	To transform students into entrepreneurial, technically competent, socially responsible and ethical computer science professional.

### Program Educational Objectives (PEOs)

PEO 1	Graduates possess advanced knowledge of Computer Science & Engineering and excel in leadership roles to serve the society.
PEO 2	Graduates of the program will apply Computer Engineering tools in core technologies for improving knowledge in the Interdisciplinary Research and/or Entrepreneurs.
PEO 3	Graduates adapt Value-Based Proficiency in solving real time problems.



## AMC ENGINEERING COLLEGE

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Chandana CBCS SCHEME

Student Name: \_\_\_\_\_ USN: 1AM18CS95 Course-Name & Code: APE

Internal Assessment Test	Q1			Q2			Q3			Q4			IA Test Marks ( )		Signature of Faculty Incharge
	a	b	C	a	b	c	a	b	c	a	b	c	Total Marks	Marks Reduce to	
CO	1	1					2	2							
Max marks	10	5					10	5					22		SLW
IA Test 1	10	5					5	2							
CO	1	1					1	2							
Max marks	10	5					10	5					25		SLW
IA Test 2	10	5					5	5							
CO				4	4		4	4							
Max marks				5	10		5	10					30		SLW
IA Test 3				5	10		5	10							

Assessment Tool*	CO1( )	CO2( )	CO3( )	CO4( )	CO5( )	CO6( )	Total Marks( )	Marks Reduced to	Signature of Faculty Incharge
AT 1	5	5					10		SLW
AT 2	5		5				10		SLW
AT 3				5	5		10		SLW

Final IA Marks	26	Final AT Marks	10
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### Certificate

This is to certify that Mr./Ms. Chandana S ..... has satisfactorily completed the course of assignment prescribed by the Visvesvaraya Technological University for Semester.. 3<sup>rd</sup> Branch..... CSE... for the academic year 2019-2020

Final Continuous Internal Evaluation (CIE) Marks Awarded ( ) : 36/40

\*Assignment/Quiz/Seminar/Mini-Project

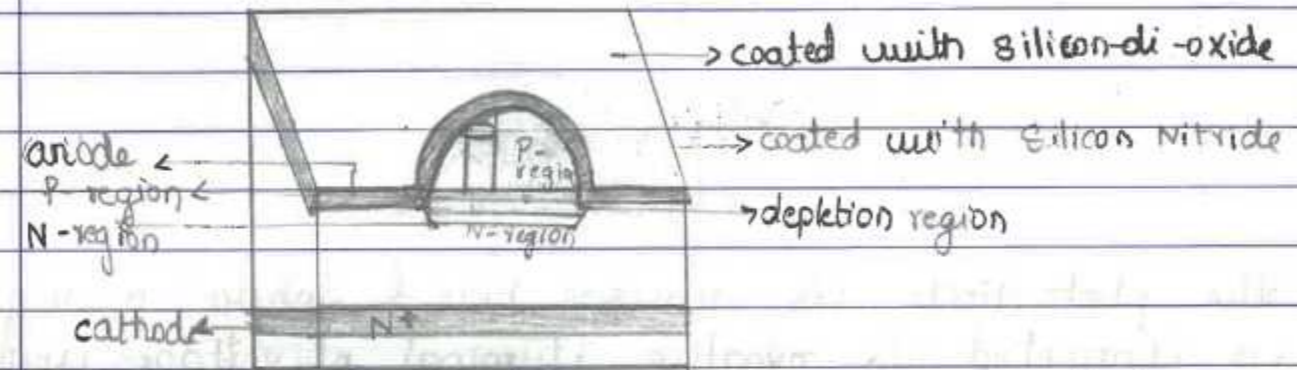
Signature of Student

Signature of Faculty Incharge

Signature of Course Coordinator

### 1a). Photodiode :- Construction -

→ It works on a technique called as implantation.



→ Where the layer of N-region is bombarded to the the layer of P-region to get a layer of p-region of thickness 1 $\mu$ m.

→ The photodiode is coated with silicon-di-oxide, where it has windows which shine on light of a semiconductor, that is coated with silicon nitride for the maximum absorption of light.

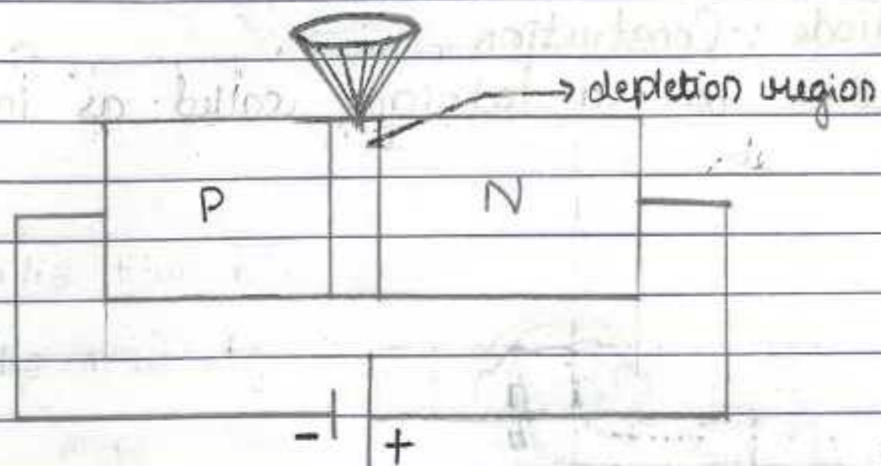
→ Where the anode of aluminium is connected to p-region.

→ The cathode which is rich in  $N^+$ , offers low-resistance it is connected to n-region.

→ The Photodiode is reverse biased, due to this the depletion region is created, between p-n junction.

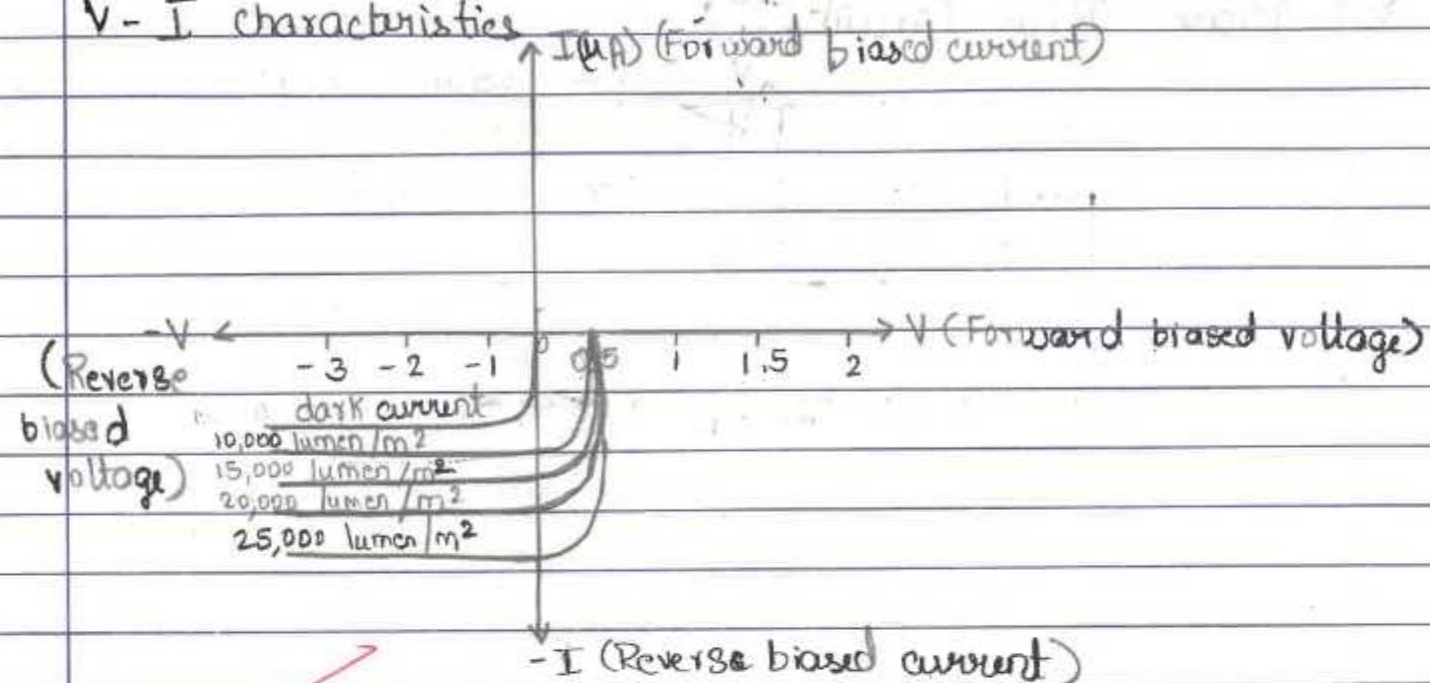
→ The electrons from n-region to p-region & holes move from p-region to n-region. This process is called as diffusion.

Working



- The photodiode is reverse biased, where p-region is connected to negative terminal of voltage source and n-region is connected to positive terminal of voltage source.
- Due to this the width of the p depletion region increases, where of the p-n junction diode.
- The flow of current is due to minority charge carriers.
- That, when the light or photons strikes the depletion region of p-n junction diode, they impart the energy in the form of light.
- Where electrons move from valence band to conduction band, thus there are holes in valence band, then electron and hole pair are generated in the p-n junction.
- Where p-region is connected to the anode and n-region is connected to the cathode.
- Thus photodiode is used to convert light energy to electrical energy.

V-I characteristics



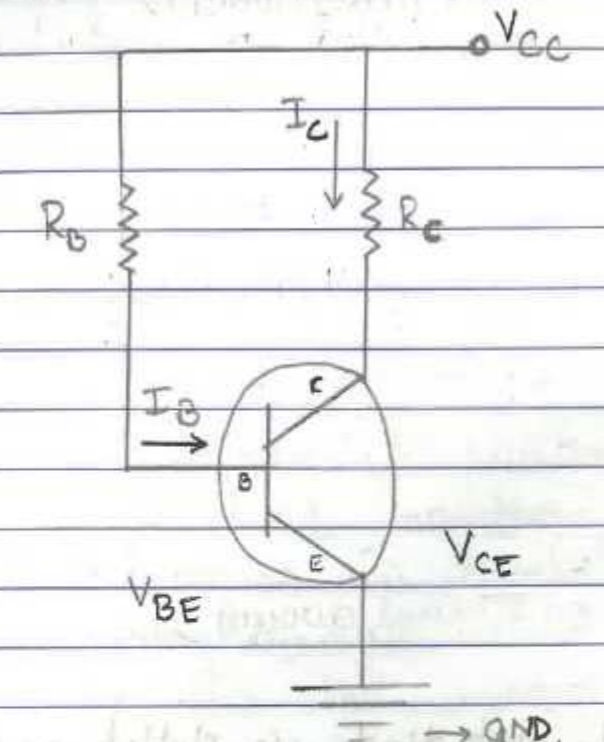
10

- The V-I characteristics of photodiode is plotted against reverse biased voltage v/s reverse biased current.
- Where the reverse biased voltage is 0.5V.
- The total current is calculated by the summation of saturation and short circuit current.

$$I = I_{sc} + (I_0 \cdot e^{V/\Delta V_t})$$

Where  $I_{sc}$  → short circuit current.  
 $V$  → voltage positive for forward bias  
 negative for reverse bias  
 $V_t$  → temperature equivalent.  
 $\Delta$  → For germanium it is 1  
 for silicon it is 2.

b). Base Bias Circuit.



The base bias circuit, where two resistors  $R_b$  &  $R_c$  are used, where the base of  $R_b$  is connected to the base of the transistor. Then  $R_c$  is connected to the collector of the transistor. Where emitter is grounded. Since  $V_{cc}$  &  $R_b$  is constant, the  $I_B$  also remains constant.

Working  
By apply KVL across  $V_{cc}$  of Base bias circuit ( $V_{cc}, R_b, I_B$ )  
By KVL method  
 $V_{cc} - I_B R_b - V_{BE} = 0$   
 $V_{cc} = I_B R_b + V_{BE}$

$$I_B = \frac{V_{CC} - V_{BE}}{R_B} \quad (V_{BE} = 0.5V \text{ for Silicon } 0.3V \text{ for germanium})$$

This is the base current.

For collector current  
w.r.t  $I_C = \beta I_B$

where  $\beta$  (is the efficiency of transistor)

Applying KVL across  $R_c$   
By KVL method

$$V_{CC} = I_C R_c + V_{CE}$$

$$V_{CE} = V_{CC} - I_C R_c$$

This is for collector emitter voltage

Base Bias circuit it is not employed much because, stabilised Q points are not obtained.

3(a)  $f(a, b, cd) = \sum m(0, 1, 3, 4, 5, 7, 10, 11, 13, 14) + dc(2, 6, 8)$

By K-map.

$2^4 = 2 \times 2 \times 2 \times 2 = 16$

		CD				
		$\bar{C}\bar{D}$	$\bar{C}D$	$CD$	$C\bar{D}$	
AB	$\bar{A}\bar{B}$	1 <sup>0</sup>	1 <sup>1</sup>	1 <sup>3</sup>	X <sup>2</sup>	$\pi(1, 3)$
	$\bar{A}B$	1 <sup>4</sup>	1 <sup>5</sup>	1 <sup>7</sup>	X <sup>6</sup>	$\pi(4, 5, 7)$
	$AB$	0 <sup>12</sup>	1 <sup>13</sup>	0 <sup>15</sup>	1 <sup>14</sup>	$\pi(13, 14)$
	$A\bar{B}$	X <sup>8</sup>	0 <sup>9</sup>	1 <sup>11</sup>	1 <sup>10</sup>	$\pi(10, 11)$



$$Y = (\overline{A}\overline{B} + \overline{A}B)(\overline{C} + C) + [\overline{C}\overline{D}(A + \overline{A})] + \overline{A}\overline{B}C$$

$$Y = (\overline{A}) + \overline{C}\overline{D} + \overline{A}\overline{B}C$$

$$Y = \overline{A} + \overline{C}\overline{D} + \overline{A}\overline{B}C + \overline{C}\overline{D}AB$$

$$Y = \overline{A} + \overline{C}\overline{D} + \overline{A}\overline{B}C + \overline{C}\overline{D}AB$$

A	B	C	D	Fundamental product		Y
0	0	0	0	$\overline{A}\overline{B}\overline{C}\overline{D}$	$m_0$	1
0	0	0	1	$\overline{A}\overline{B}\overline{C}D$	$m_1$	1
0	0	1	0	$\overline{A}\overline{B}C\overline{D}$	$m_2$	X
0	0	1	1	$\overline{A}\overline{B}CD$	$m_3$	1
0	1	0	0	$\overline{A}B\overline{C}\overline{D}$	$m_4$	1
0	1	0	1	$\overline{A}B\overline{C}D$	$m_5$	1
0	1	1	0	$\overline{A}BC\overline{D}$	$m_6$	X
0	1	1	1	$\overline{A}BCD$	$m_7$	1
1	0	0	0	$A\overline{B}\overline{C}\overline{D}$	$m_8$	X
1	0	0	1	$A\overline{B}\overline{C}D$	$m_9$	0
1	0	1	0	$A\overline{B}C\overline{D}$	$m_{10}$	1
1	0	1	1	$A\overline{B}CD$	$m_{11}$	1
1	1	0	0	$AB\overline{C}\overline{D}$	$m_{12}$	0
1	1	0	1	$AB\overline{C}D$	$m_{13}$	1
1	1	1	0	$ABC\overline{D}$	$m_{14}$	1
1	1	1	1	$ABCD$	$m_{15}$	0

$$Y = m_0 m_1 m_3 m_4 m_5 m_7 m_{10} m_{11} m_{13} m_{14} m_2 m_6 m_8$$

$$Y = (\overline{A}\overline{B}\overline{C}\overline{D}) + (\overline{A}\overline{B}\overline{C}D) + (\overline{A}\overline{B}C\overline{D}) + (\overline{A}\overline{B}CD) + (\overline{A}B\overline{C}\overline{D}) + (\overline{A}B\overline{C}D) + (\overline{A}BC\overline{D}) + (\overline{A}BCD) + (A\overline{B}\overline{C}\overline{D}) + (A\overline{B}\overline{C}D) + (AB\overline{C}\overline{D}) + (AB\overline{C}D)$$

$$Y = \overline{A} + \overline{C}\overline{D} + \overline{A}\overline{B}C + \overline{A}B\overline{C}D$$

b)

AB \ CD	$\overline{C}\overline{D}$	$\overline{C}D$	$CD$	$C\overline{D}$
$\overline{A}\overline{B}$	0 <sup>0</sup>	X <sup>1</sup>	0 <sup>3</sup>	0 <sup>2</sup>
AB	X <sup>4</sup>	1 <sup>5</sup>	1 <sup>6</sup>	1 <sup>7</sup>
$\overline{A}B$	0 <sup>10</sup>	1 <sup>13</sup>	0 <sup>15</sup>	0 <sup>14</sup>
$A\overline{B}$	0 <sup>8</sup>	1 <sup>9</sup>	1 <sup>11</sup>	X <sup>10</sup>

$$Y = \overline{A}B(\overline{C} + C) + \overline{C}\overline{D}\overline{A} + \overline{C}\overline{D}B + \overline{A}\overline{B}D + \overline{A}\overline{B}C$$

$$Y = \overline{A}B + \overline{A}\overline{C}\overline{D} + B\overline{C}\overline{D} + \overline{A}\overline{B}D + \overline{A}\overline{B}C$$

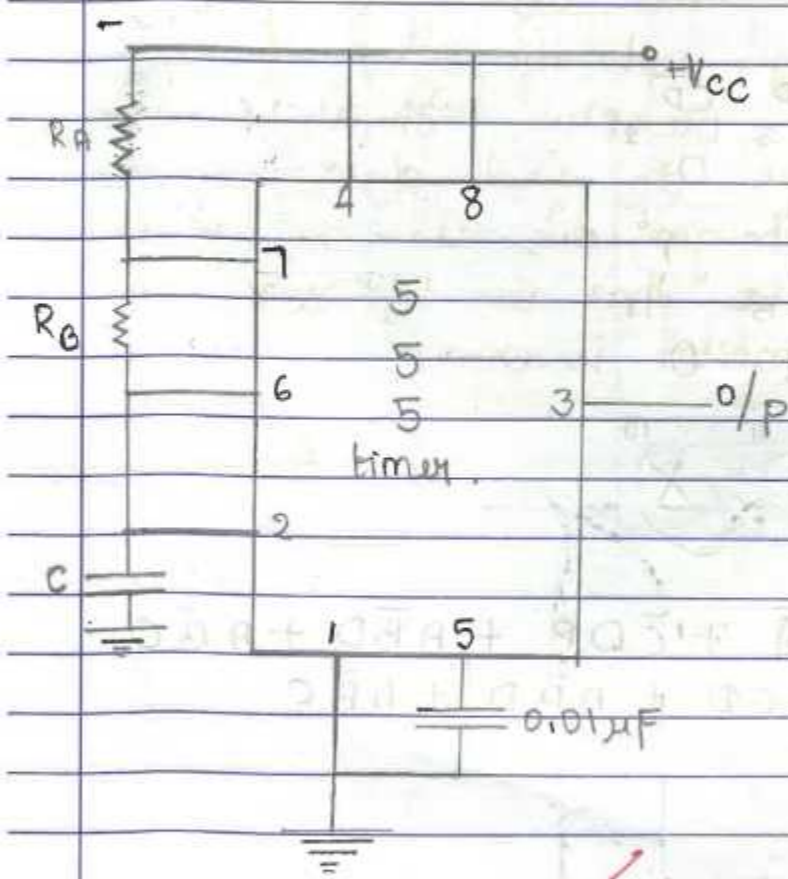
$\begin{matrix} 1a - 10 \\ 1b - 5 \\ 3a - 5 \\ 3b - 2 \end{matrix}$

92/30

SAJ  
16/1/19

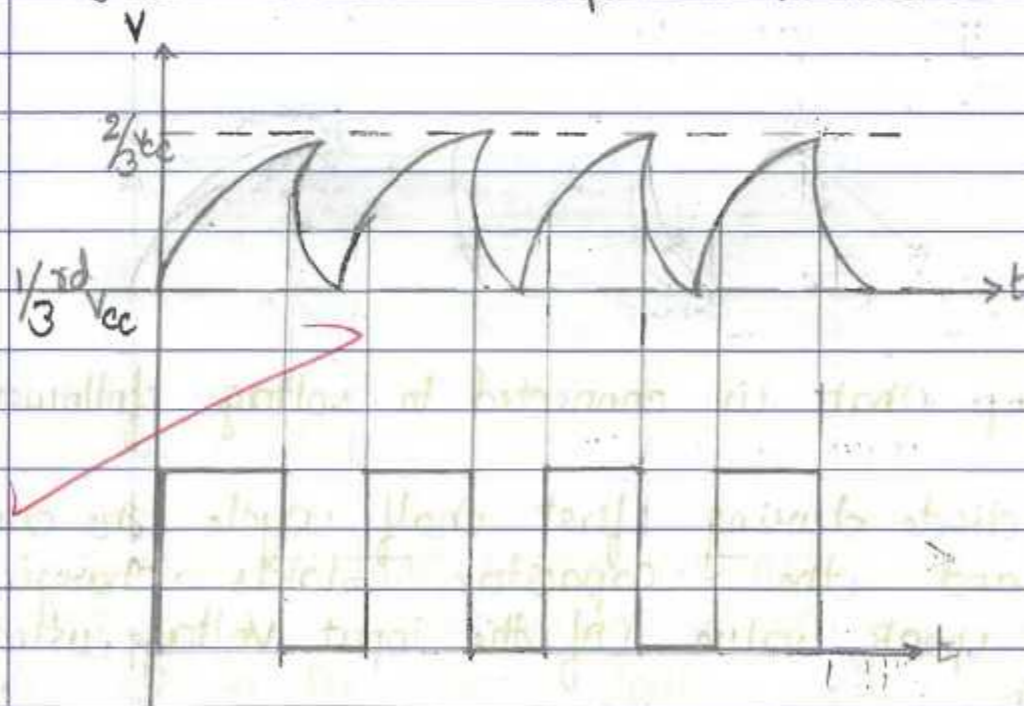
Q. A multivibrator is an electronic circuit which works mainly in a simple two state systems like flipflops, timers, Oscillators. It is characterized by two amplifying devices (vacuotres coupled with capacitors).

Working of Astable multivibrator using 555 timer.



- 555 timer has greater applications in Op-amps
- One such is Astable multivibrator using 555 timer.
- It do not have single stable state. It will be changing its state from low to high or high to low thus giving rise to rectangular waveforms of free running generator.

- In Astable multivibrator there is no input trigger provided at pin no 2.
- There is a threshold for charging and discharging of a capacitor. When the capacitor get charged until  $\frac{1}{3}$ rd of  $V_{cc}$ .
- The where  $V_c = 0$  which is the voltage applied on the capacitor.
- That ( $V_c = 0$ ) voltage is less than  $\frac{1}{3}$ rd of  $V_{cc}$ .
- The capacitor charges upto the  $\frac{2}{3}$ rd of  $V_{cc}$  one when capacitor reaches threshold voltage the capacitor discharges to  $\frac{1}{3}$ rd of  $V_{cc}$ .
- The capacitor gets charged due to the presence of two major components that is  $R_A$  &  $R_B$  resistors.
- Then when capacitor is charge



Applications of

Waveform of astable multivibrator

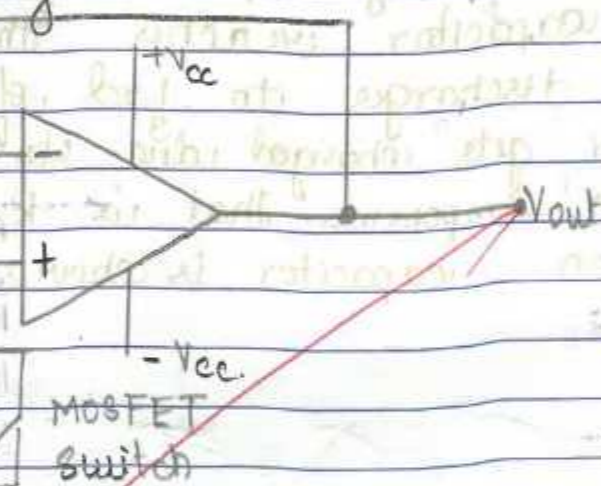
- There are triggers are provided by the resistors.
- When capacitor is charging the T is in off state.

capacitor reaches  $\frac{2}{3}$  rd of  $V_{cc}$ , the terminated.

Time is  $0.693 (R_A + R_B)C$ .

Detector.

Detector circuit that detects the peak of the voltage. It detects the highest positive peak value of voltage.



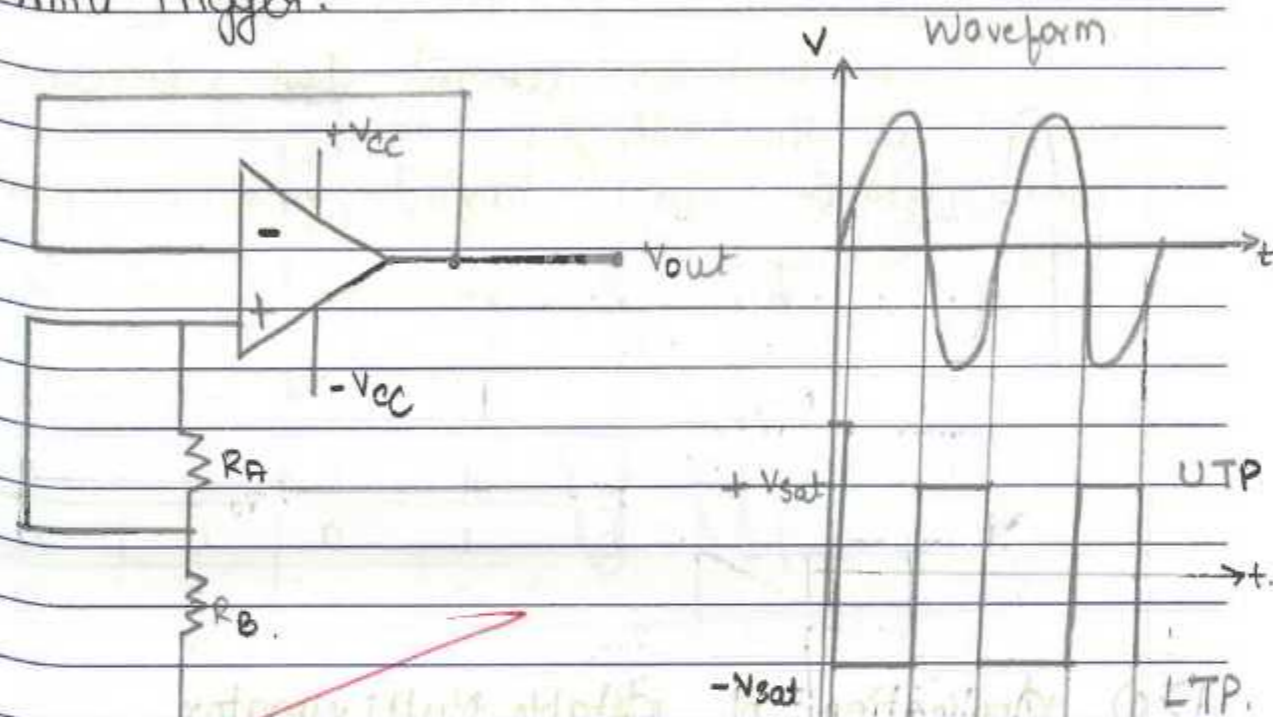
amp that is connected to voltage follower

diode during first half cycle the diode and the capacitor starts charging peak value of the input voltage using

its charge peak value until input voltage is given.

→ During second half cycle, the diode is reverse biased. Here the capacitor won't discharge until the switch is closed.

b) Schmitt trigger.



→ The Schmitt trigger is a voltage detector circuit.

→ Where there is a small change in the output voltage, it causes a large change in the output voltage.

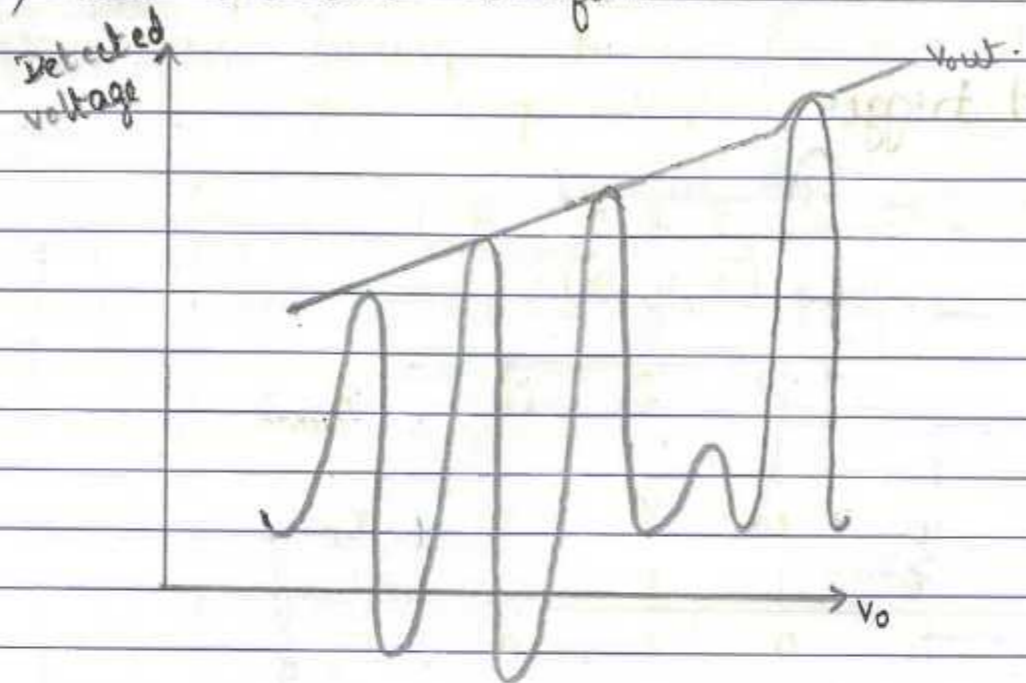
→ This output voltage forces reference voltage to maintain same polarity.

→ When the output voltage is low the reference voltage is also low ( $-V_{sat}$ ).

→ When the output voltage is high the reference voltage is also high ( $+V_{sat}$ ).

→ Hence schmitt trigger is a voltage detector circuit.

b) (i) Peak Detector waveform.



1) (a) Application of Astable Multivibrator.

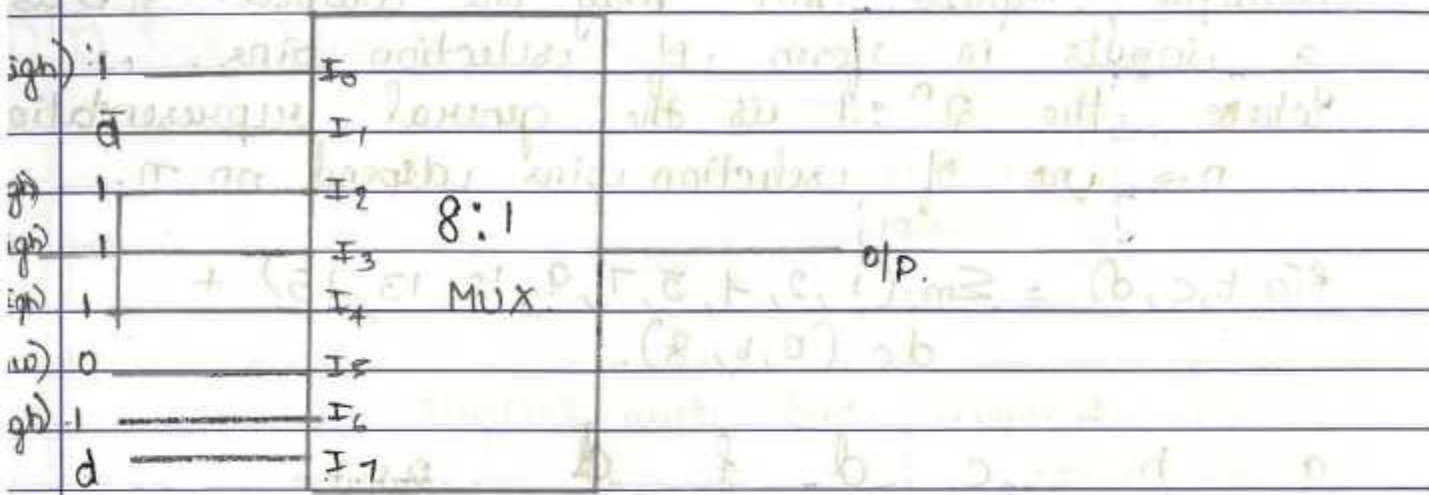
- It is a rectangular or square wave generator.
- It is a free running wave generator.
- It is used in frequency serial key generators.

3(a) Multiplexer is electronic circuit, that has multiple inputs but only one output. It has  $n$  inputs in form of selection pins. Where the  $2^n : 1$  is the general representation  $n \rightarrow$  no of selection pins depend on  $n$ .

$$f(a, b, c, d) = \sum m(1, 2, 4, 5, 7, 9, 12, 13, 15) + dc(0, 6, 8)$$

a	b	c	d	f	d	Output
0	0	0	0	X	1	$I_0$
0	0	0	1	1		
0	0	1	0	1	$\bar{d}$	$I_1$
0	0	1	1	0		
0	1	0	0	1	1	$I_2$
0	1	0	1	1		
0	1	1	0	X	1	$I_3$
0	1	1	1	1		
1	0	0	0	X	1	$I_4$
1	0	0	1	1		
1	0	1	0	0	0	$I_5$
1	0	1	1	0		
1	1	0	0	1	1	$I_6$
1	1	0	1	0		
1	1	1	0	0	$d$	$I_7$
1	1	1	1	1		

16:1 - ?



Using MEV method.

a	bc	bc	bc	bc
$\bar{a}$	0	1	1	0
a	1	0	1	0

$Y = \bar{B}\bar{C}(1) + \bar{A}B + B\bar{C}$

$Y = \bar{B}\bar{C} + \bar{A}B + B\bar{C}$

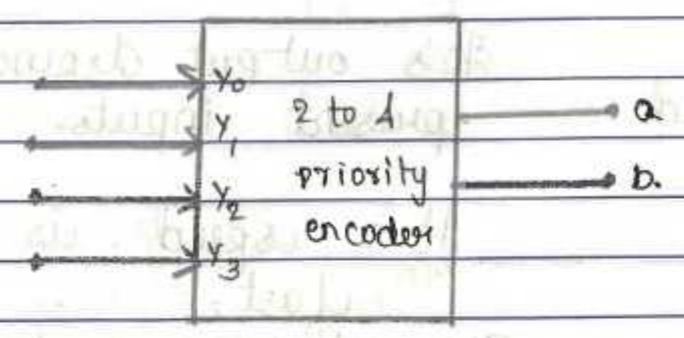
$Y = \bar{C}(B + \bar{B}) + \bar{A}B$

$Y = \bar{C} + \bar{A}B$

a	bc	bc	bc	bc
$\bar{a}$	x	1	x	x
a	x	0	1	x

$Y = \bar{a}c\bar{d} + bcd$

b) 4:2 priority encoder.



It has 4 inputs and two output.

Truth table

$Y_0$	$Y_1$	$Y_2$	$Y_3$	a	b
0	0	0	0	0	0
1	0	0	0	0	0
x	1	0	0	0	1
x	x	1	0	1	0
x	x	x	1	1	1

The priority encoder that do not has inputs but it has control pins.

In 4:2 priority encoder.

There are four control pins ( $Y_0, Y_1, Y_2, Y_3$ ) and two outputs a & b.

1a = 10  
1b = 5  
2a = 5  
3b = 5

25/30

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2a) Sequential Circuit

→ It's output depend upon the present and previous inputs.

→ It's speed is low.

→ The building blocks of sequential circuit is flipflops.

→ It's capable of storing a memory.

→ It's a memory storing element, it can store the data of previous and present inputs.

→ Example → Flipflops, counters.

Combinational circuit.

It's output depend upon present inputs.

It's speed is fast.

The building blocks of combinational circuit is Logic gates.

It's capable of performing ~~log~~ arithmetic and boolean functions operations.

It cannot store the data.

Example → Multiplexer, Demultiplexer, Encoder, Decoder.

b) Asynchronous counter :- It is the different flipflops has <sup>given</sup> different clock signal. It is called as serial counter. Where it has to wait for the previous output.

Synchronous counters :- The flipflop's has <sup>given</sup> same clock signals in a sequential manner. It is also called as parallel counters. Where it need not to wait for previous output.

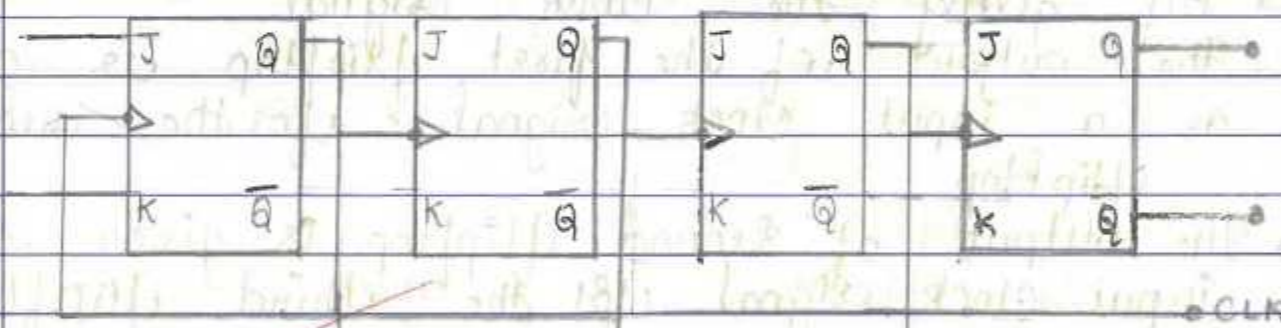
The Asynchronous counter is also called as serial counter.

The Example for Asynchronous counter is Binary up counter.

Binary down counter.

Binary updown counter.

→ Binary up counter.

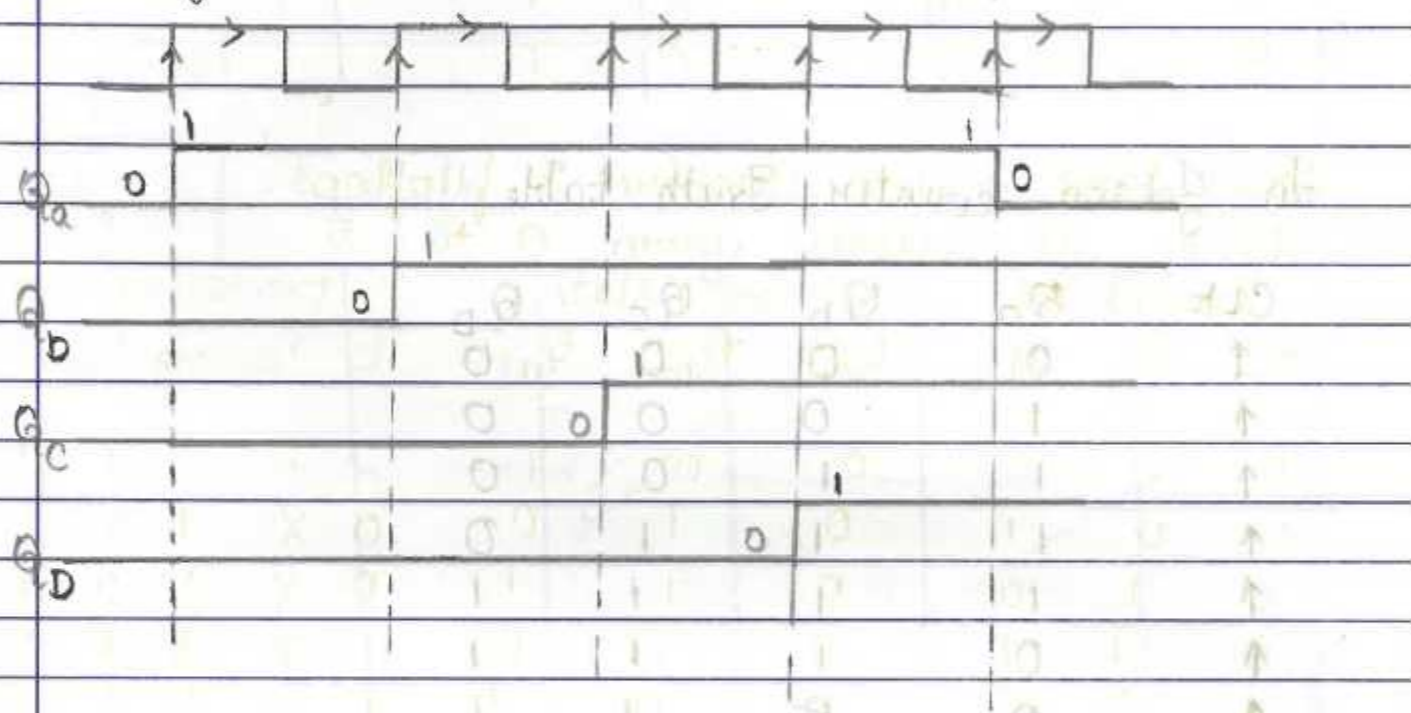


Truth tables <sup>Qc</sup> <sup>Qb</sup> <sup>Qa</sup>

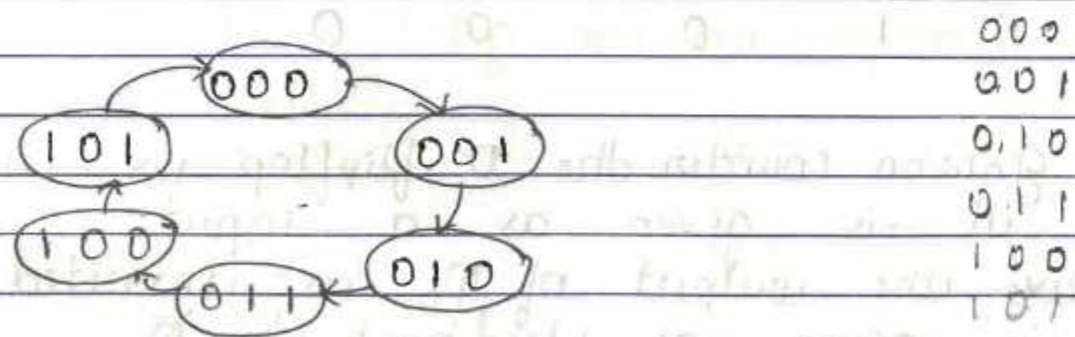
CLK	Qc	Qb	Qa	Q	Count
↑	0	0	0	0	0
↑	0	0	1		1
↑	0	1	0		2
↑	0	1	1		3
↑	1	0	0		4
↑	1	0	1		5
↑	1	1	0		6
↑	1	1	1		7

→ Hence the  $Q_D$  &  $Q_B$  are acting like  
whipping registers.  
→ The  $Q_A$  &  $Q_C$  plays major bit  
flipflop in Johnson counter.

Waveform



b) Mod 6  
(0-5)



Excitation table.

$Q_n$	$Q_{n+1}$	$J$	$K$
0	0	0	X
0	1	1	X
1	0	X	1
1	1	X	0

As Mod 6 we require 3 flipflops.

Hence it starts from 0 to 5.

present state			next state			excitation state					
$Q_c$	$Q_b$	$Q_a$	$Q_{c+1}$	$Q_{b+1}$	$Q_{a+1}$	$J_c$	$K_c$	$J_b$	$K_b$	$J_a$	$K_a$
0	0	0	0	0	1	0	X	0	X	1	X
0	0	1	0	1	0	0	X	1	X	X	1
0	1	0	0	1	1	0	X	X	0	1	X
0	1	1	1	0	0	1	X	X	1	X	1
1	0	0	1	0	1	1	X	0	X	1	X
1	0	1	0	0	0	X	1	0	X	X	1

By k-maps we can get:

$J_a$

$Q_b Q_a$	00	01	11	10
0	1	X	X	1
1	1	X	X	X

$K_a$

$Q_b Q_a$	00	01	11	10
0	X	1	1	X
1	X	1	X	X

where  $J_a = 1$

where  $K_a = 1$

$J_b$

$Q_c$	$Q_b$	$Q_a$		
	00	01	11	10
0	0 <sup>0</sup>	1 <sup>1</sup>	X <sup>2</sup>	X <sup>3</sup>
1	0 <sup>4</sup>	0 <sup>5</sup>	X <sup>6</sup>	X <sup>7</sup>

$J_b = Q_a$

$K_b$

$Q_c$	$Q_b$	$Q_a$		
	00	01	11	10
0	X <sup>0</sup>	X <sup>1</sup>	1 <sup>2</sup>	0 <sup>3</sup>
1	X <sup>4</sup>	X <sup>5</sup>	X <sup>6</sup>	X <sup>7</sup>

$K_b = Q_a$

$J_c$

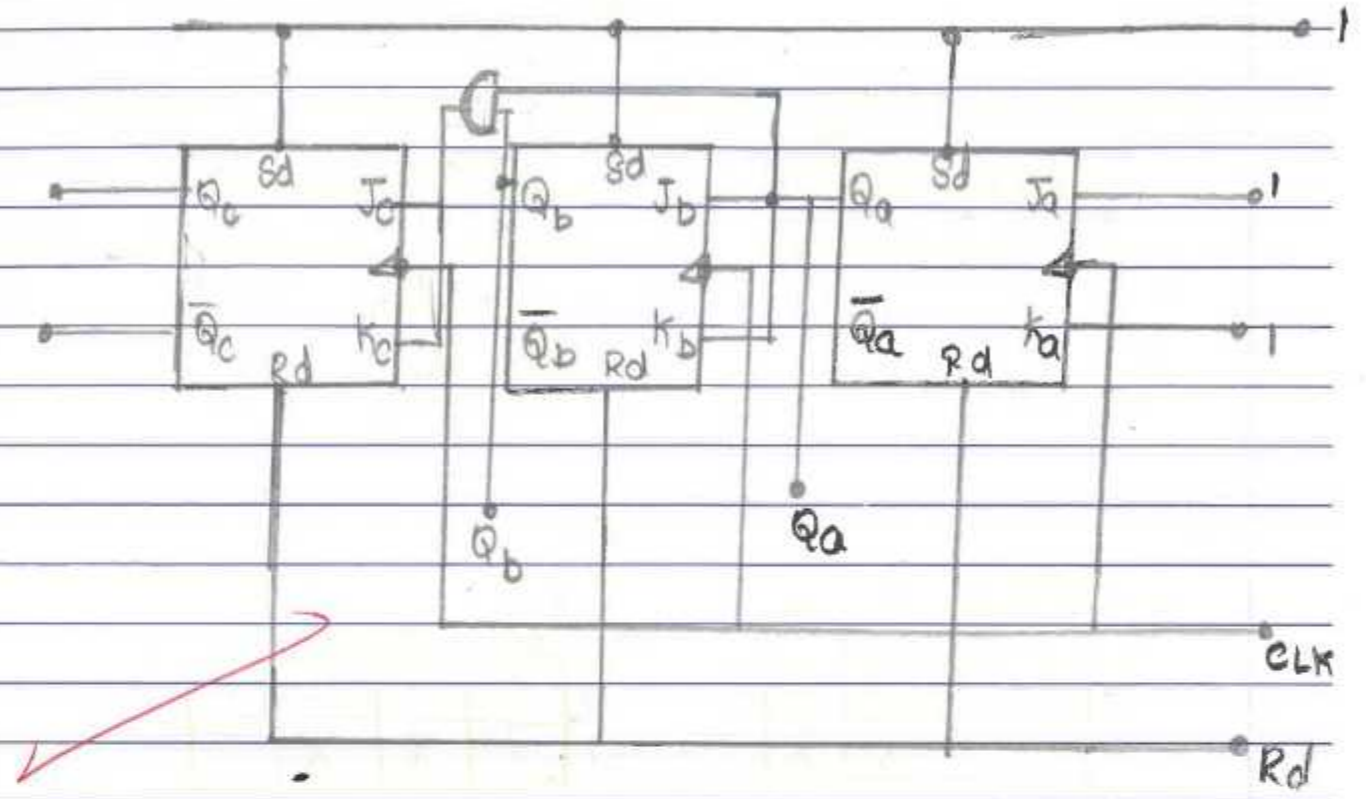
$Q_c$	$Q_b$	$Q_a$		
	00	01	11	10
0	0	0	1	0
1	1	X	X	X

$J_c = Q_b Q_a$

$K_c$

$Q_c$	$Q_b$	$Q_a$		
	00	01	11	10
0	X	X	X	X
1	X	1	X	X

$K_c = Q_b Q_a$



10

2a-10  
2b-10  
3a-5  
3b-10

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## AMC ENGINEERING COLLEGE

18th K.M, Bannerghatta Road, Kalkere, Bengaluru - 560083. Phone: 27828655

### CBCS SCHEME

Student Name: <u>Veesurandra Hegde</u>	USN: _____	Course-Name & Code: _____
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Internal Assessment Test	Q1			Q2			Q3			Q4			IA Test Marks ( )		Signature of Faculty Incharge
	a	b	C	a	b	c	a	b	c	a	b	c	Total Marks	Marks Reduce to	
CO															
Max marks	3	7	10	3	7	10	3	7	10			10	17/50		<u>Aditya</u>
IA Test 1	2	3	5	2	3	2									
CO															
Max marks	3	7	10	3	7	10	3	7	10			10	29/50		<u>Aditya</u>
IA Test 2	2	3	5	2	3	5	3	3				3			
CO															
Max marks	3	7	10	3	7	10	3	7	10			10	20/50		<u>Aditya</u>
IA Test 3	2	3	5	2	3	5									

Assessment Tool*	CO1( )	CO2( )	CO3( )	CO4( )	CO5( )	CO6( )	Total Marks( )	Marks Reduced to	Signature of Faculty Incharge
AT 1									
AT 2									
AT 3									

Final IA Marks	Final AT Marks
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## Certificate

This is to certify that Mr./Ms. ....has satisfactorily completed the course of assignment prescribed by the Visvesvaraya Technological University for Semester ..... Branch.....for the academic year 20 - 20

Final Continuous Internal Evaluation (CIE) Marks Awarded ( ) :

\* Assignment/Quiz/Seminar/Mini-Project

V. Hegde  
Signature of Student

H. S. Aditya  
Signature of Faculty Incharge

H. S. Aditya  
Signature of Course Coordinator



1

a) According to George " Communication is a process of info. interchange of communication or messages by thought ideas".

2) According to Robert Anderson " Managerial Communication is a process of interchange of thoughts, opinions or information by speech, writing or signs".

b) Purpose of Communication

\* Communicate to Inform :-

Communicate to Inform is the basic purpose of communication. It is the basic organisational goal. Communicate to inform involves or consist of facts and figures of data.

\* Communicate to Persuade :-

Communicate to Persuade means Persuading the managers by present working in an organisation. It involves the facts & figures.

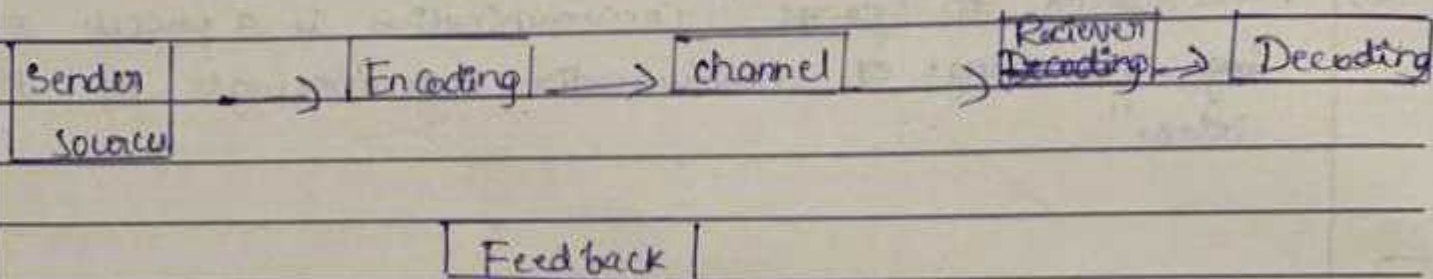
\* Communicate to Educate :-

Communicate to Educate means employees are communicate between managers. It shows the coordination between both.

3) \* Communicate to learn :-

Communicate to learn means learn something about the organisation, from managers, managers. Communication means exchange of thoughts, ideas, information from one person to another.

## Shannon - Weaver Model of communication



### 1) Sender Source :-

Sender Source is the first process of communication. It is the communication process in which information is sending to next model.

### 2) Encoding :-

Encoding is the process in which the information is encode by the employee.

### 3) channel :-

Channel means information is received from encoding and give to Receiver.

### 4) Receiver :-

Receiver mean information is received from channel and react.

3



D	D	M	M	Y	Y	Y	Y

Test No. : 

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Page No. :

3.

a) Conflicts means the information or thoughts or opinions are exchanged between two or more persons in the organisation.

b) Types of Communication

Communication may be 3 types there are some as follows

- \* On the basis of Persons received
- \* on the basis of Medium Employed
- \* On the basis of organisation.

On the basis of persons received

- 1) Intrapersonal communication
- 2) Interpersonal Communication.
- 3) Group Communication
- 4) Mass Communication.

1) Intra personal Communication :-

Intra personal communication means talking oneself on his one's own mind. Intra personal communication is talking himself and it is one way communication.

Ex:- Talking to Mirror, Radio, Drama Dialogue Practice etc.

2) Interpersonal communication :-

Interpersonal communication means information or communication are exchanged between two persons. Such communication



are called as Interpersonal communication. This is the two way communication. It occurs when two persons are interact or communicate.

Eg :- Face to face interview, Telephone talking etc.

### 3) Group Communication :-

Group Communication means messages are sent to be large or small group like Association, Classroom, Clubs or Organisation etc. Group Communication is important communication, there is each persons or employees are interact or communicate.

### 4) Mass Communication :-

Mass Communication means messages or information is sent to be large groups or organisation like Newspaper, T.V, Radio etc. In this communication the employees are faceless and difficult to inform or feedback.

On the basis of Medium Employed

- 1) Verbal Communication
- 2) Non Verbal Communication

#### 1) Verbal Communication :-

Verbal communication means communication, pictures (Objects), gestures or signs by exchange of writing, reading, listening.

2) Non-Verbal Communication :-  
Non-Verbal communication is a communication which involve facial expression etc. This is the last type of communication in Medium Employed.

On the basis of Organisation

- 1) Verticle Communication
- 2) Horizontal Communication
- 3) Top-to Bottom Communication
- 4) Bottom to Top Communication

1) Verticle communication :-  
Verticle communication means Vertically Communicate with managers in the organisation

2) Horizontal communication :-  
Horizontal communication means communication of same status, same position in the organisation

3) Top to Bottom Communication :-  
Top to Bottom communication mean Communicate or information send to top to Bottom i.e. Managers to employees in the organisation. This is communication between Superior to subordinate.

4) Bottom to Top communication :-  
This communication is send a message or information to employe to Manager or Subordinate to Superior relationships.

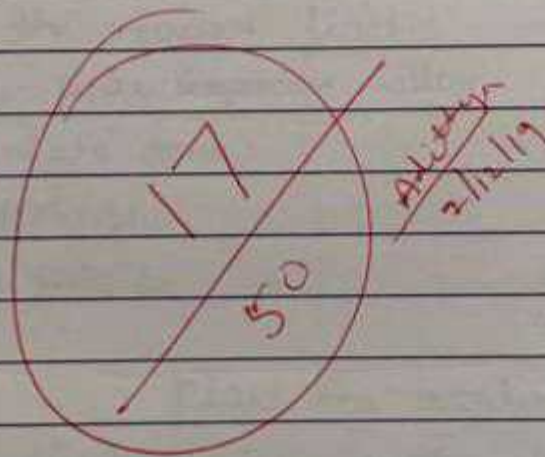
c) Oral communication is also known as verbal communication. The information is exchanged by one person to another person by writing, reading signs etc.

Principles of Oral Communication :-

- \* Clear pronunciation :-  
Oral communication is clear pronunciation and easy to understand the people
- \* Simplicity :-  
Simplicity means oral communication should be simple and easy to understand
- \* Legality :-  
The speaker should know the legality of communication in the organization.
- \* Avoids Emotions :-  
The speaker should avoid emotions in the oral communication, which helps to boost up the employees.
- \* Easy to understand :-  
It is easy to understand the people. And it is simple to understand to the people.
- \* Grammatical Errors :-  
The speaker should know how to avoid the grammatical errors and easy to understand.

4. Various Sources of conflicts.

Conflicts mean the information or messages are exchanged or interchanged between two or more persons





Part - A

1.

a) According to North Carolina "written communication is the process of information, exchange the ideas, messages, important information in structure of organization."

b) Principles of Effective Writing

The principles of effective writing communication are as follows :-

- \* Place the readers first
- \* Looking for ~~Reports~~ Letters
- \* Set the right tone
- \* Strong openings
- \* Look for details

Place the readers first

Place the readers first is the first of principles of effective writing communication. Writer have to write the letter which is easily understandable for the reader. Writer have to write the letter in a simple way and important information and he avoids grammar mistakes or unwanted topics. He only write a useful information and the reader understanding the one read.

Looking for ~~Reports~~ Letters

Looking for the ~~Report~~ <sup>Letter</sup> is the ~~report~~ Letter in which the writer must has to writing a letter in a simple understand and easy to communicate. It is the ~~Report~~ Letter in

contains "why he has to writing a letter" and "why would be achieved through letter". So these are the questions arise to the writer when he writing a letter. A letter must be easy & simple language & avoid unnecessary dramatic languages.

### Set the right tone

Set the right tone means he has to writing a letter which involves simple to understandable for readers and avoid the extra information or grammar or emotions of writers so that helps to set the right tone in a right way.

### Strong opening

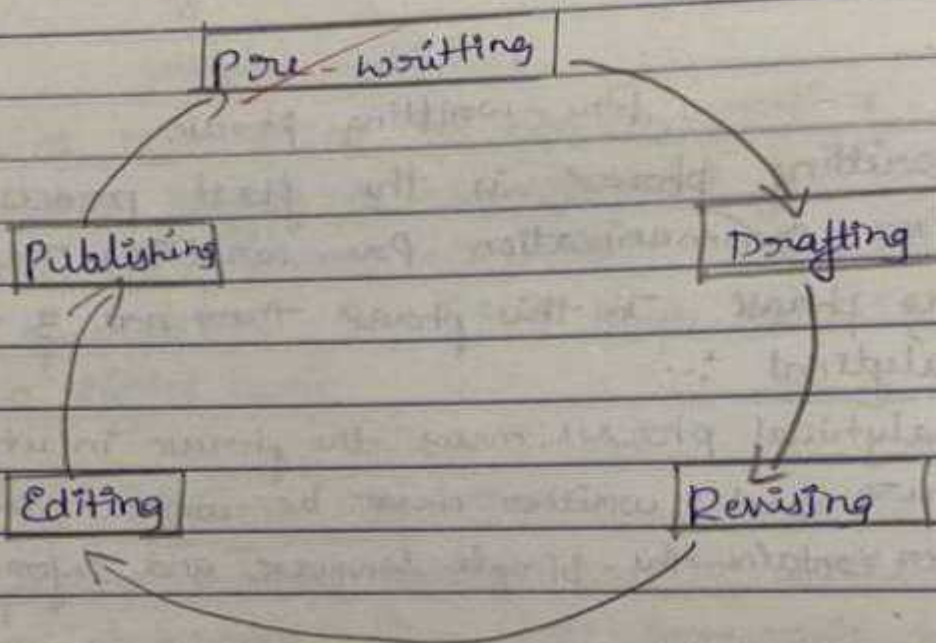
Strong opening means writer has to write information in beginning paragraph. In a first paragraph he has to write a simple language and easily understand to the readers. And then second paragraph he has to write a subject matter or issues in a letter so the readers can read only first paragraph. That's why the the beginning paragraph must be easy to understand to the readers.

### Look for Details

Look for Details is the details in which lastly he has to looking letter whether the grammatic mistakes or extra information. So writer must have to write a letter in simple language and best ways, avoiding unwanted information & he only write important information only.

### Writing phase

Writing phase is the second phase in the writing process  
In which writing phase



### Revising phase

Revising phase are the phase that involves the revising the letter he must writing all the information message  
Revising phase involves the revise and he must write simple language and easy to understand to the reader by first reading. It is the last phase which very important concepts in the writing process.

6

2.

a) Electronic writing means a letter has to be written electronically which involves the letter has to contain the good information and ideas. Electronic writing is the letter which is written through electronically, or machines.

b)

### Objective of Reports

There are some objectives as follows :-

- \* To provide information
- \* It helps to controlling
- \* It helps to co-ordinating
- \* It facilitates record keeping
- \* It maintains requisite contact.

#### To provide Information

It is the very important objectives of Reports. It gives the information to one department to another departments.

#### It helps in controlling

The Reports have controlled by the management. The report is sent to top level management from the organisation. So it helps to controlling by the management.



It helps Co-ordinating between different departments in the organisation or it helps to coordinating between diff Employees in the organisation.

It facilitate Record Keeping

It helps or facilitate to record keepin in the organisation. It also helps to future to take the decision making the organisation.

It maintain Requisite Contact

It also maintain the good contact in the organisation. It also aims at the good relationship between , Creditory governments , Suppliers etc -

Types Kinds of Reports

- \* Formal
- \* Informal

Formal Reports

Formal Reports are the Reports in which messages are transferred formally. It is very important kinds of Reports.

Informal Reports

Informal Reports are the Reports in which information are to -transformed informally. This is second kind of Report.



### c) Types of Business Letters

There are some types of Business letters are as follows

- \* Sales Letter
- \* Credit Letter
- \* Status Letter
- \* Claim Letter
- \* Payment Letter

#### Sales Letter

Sales Letter is the letter in which the goods and services to customers the seller would be written a letter. It is known as Sales Letter.

#### Credit Letter

Credit Letter is the letter in which credit payments are involved in this letter. If the customer buys the goods and he doesn't forget to payment such goods. The delay of payment the seller should be written a letter is known as Credit letter.

#### Status Enquiry Letter

Status Enquiry letter is the letter in which the status or enquiring the background or status of an customer. In such a way that it is known as the Enquiry Status letter



### Claim letter

Claim letter means the damaged of goods or services during the transportation due to carelessness of drivers and the buyers or customers would write a letter. It is known as claim letter.

### Refuse letter

Refuse letter is the letter in which the refuse or refusing the letter. It is known as Refuse letter. It is the very important Business letter. In which contains to Refusing the letters.

### Respond letter

Respond letter are the letter in which the sellers are receiving the claims letter and he has to write a letter with compensating money. It is known as Respond letter.

### Part - B

4) Report means 'Carry back'. It is derived from the Latin word Repute. Reports are the letter in which information are to Carry back. The Reports are the important letter.

Reports are the <sup>writing</sup> letter in which events are carry back or reach the person who is absent. It is known as Reports.

### Contents of Reports

There are some contents of Reports are as follows.

- \* Introduction about the topic
- \* Introduction about the Company
- \* Introduction about Industry
- \* Research methodology
- \* Framework of Study
- \* Analyse & Interpretation
- \* Results & Conclusion

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50  
Aditya  
01/11/2020

### Introduction about the topic

Introduction about the topic is the first contents in the Reports, It involves or study the topic. It is very important role in the communication.

### Introduction about Company

It is explain how about the company. And it also study about companies Review

### Introduction about Industry

Introduction about Industry means It study only the Industries. And it also explain small, medium and large Scale Industries.

### Research methodology

It is also study the research analytics or research methodology in the market, It is explain about Researching the methodologies. It is very important one or contents in Reports.





on practices before he presenting And he know the time  
sense ~~only~~ also, Presenter is the main elements. in a  
presentation.

### Purpose

Purpose means what purpose or what reason to presenting and  
Presentor main purpose is introducing a new product  
or selling the product. So the presentation must be  
specific, clear and easy to understand to the ~~customer~~ <sup>audience</sup>  
He avoids unnecessary extra, grammar mistakes, unwanted  
information etc.

There are some purpose to presentation are as follows:

- \* The main purpose is to introducing a new product in the market
- \* Another purpose is to selling the products
- \* The presentation is easy to understand and touch the heart to audience.

### Audience

Audience is the third & last element of presentation.  
Audience is the main person or listeners to listen the  
speech of Presenter. The ~~Audience~~ Presenter knows the knowledge  
attitude, skills of an Audience and ready to present.  
Audience are very clever to understand finding the errors  
in a presentation. So the Audience is also main element  
in a presentation.

These are the elements in presentation



3

a) Video Conferencing is the conferencing in which two or more persons are assembled and discussing the same topics. Video conference is the activity which are Audio visuals and video both are playing at the same time. Video Conferencing is very important now a days. The group of persons are discussing and sharing the information from one person to another is called Video Conferencing.

b) Curriculum Vitae is derived from Latin word which means "List of Life". The C.V full form is Curriculum Vitae. It is the main and very important document which involves the biography, Education qualification, work experience, Extra activity, etc. The CV and Resume are slight difference from one to another. Curriculum Vitae involves full details of an candidate, while Resume is short form.

There are so many types are as follows:

- 1) Biography
- 2) Education qualification
- 3) Work Experience / Professional Experience
- 4) Extra Activities such as skills, knowledges of an candidate or Awards etc.



1) Biography

Biography is the self introducing or personal details of an candidates who are seeking for the job. It involves the Name of the candidate, Address, date of birth, sex, pincode, e-mail, fax code, Phone no, etc...

Personal details

Name	Anil kumar
Date of Birth	10-11-1999
Address	K.R. Market Bangalore, Karnataka 500105

2) Education Qualification

Education Qualification States that he may be which course studies & which college & Universities. The candidate must mention the Education course colleges & Universities and passed year, and also subject & ~~the~~ grade.

Course	College	Subject	Year
MBA	AMC Engineering College	M.M, M.C, ME AFM & Statistics	2020
B.Tech	IIT College Kharagpur	Physic, Maths Biology etc.	2017.
XII	(BSE (Patna))		2015
X	(BSE (Patna))		2013

Q) Writing process are some as follows :-

- 1) Pre-writing phase
- 2) Writing phase
- 3) Revising phase

Pre-writing phase

Pre-writing phase is the first process in the writing communication. Pre-writing means initial writing phase. In this phase there are 3 types as follows

i) Analytical :-

Analytical phase means the phase in which analytical in nature and writer must be write in a analytical way. The letter contains the simple language and information

ii) Anticipate :-

Anticipate means anticipating the letter in which contains the anticipating the writer to a write a letter and he write a letter in a best way.

iii) Adopt :-

Adopt means Adoption of work in a simple way and he has to avoided the unwanted messages. The Adopt is the ~~one~~ <sup>last</sup> type of pre-writing phase.

2019-20 III SEM

# BLUE BOOK

## INTERNAL ASSESSMENT BOOK

Name AKSHAY JADHAV (1AM19C5010)

Subject MATHEMATICS - 18MA131 Class .....

Sl.No.	PARTICULARS	Test Date	Page No	Marks Awarded	Signature of Staff Incharge
1	TEST - I			23	
2	TEST - II			28	
3	TEST - III			30	
4					
5					

### Certificate

This is to certify that ~~Smt.~~ / Sri. AKSHAY JADHAV has satisfactorily completed the course of Assignment prescribed by the.....University for the semester.....Degree Course in the Year 20 20 -20 21

MARKS	
MAX	OBTAINED
40	37

Akshay J  
Signature of the Student

G. Jadhav  
Signature of H.O.D.

[Signature]  
Signature of the Staff Member  
(Incharge of the Batch)

TA - I

12/10/2020

18mat31

IAM19CS010

1. a.)  $L\{\cos 3t \cdot \sin^2 t\}$

$$f(t) = \cos 3t \cdot \sin^2 t$$

$$\cos 3t \cdot \sin^2 t = \cos 3t \left( \frac{1 - \cos 2t}{2} \right)$$

$$\cos 3t \cdot \sin^2 t = \frac{\cos 3t}{2} - \frac{\cos 3t \cdot \cos 2t}{2}$$

$$\cos 3t \cdot \sin^2 t = \frac{\cos 3t}{2} - \frac{1}{2} \left[ \frac{1}{2} (\cos(5t) + \cos t) \right]$$

$$= \frac{\cos 3t}{2} - \frac{\cos 5t}{4} - \frac{\cos t}{4}$$

$$= \frac{1}{2} L(\cos 3t) - \frac{1}{4} L(\cos 5t) - \frac{1}{4} L(\cos t)$$

$$= \frac{2}{2(s^2+9)} - \frac{5}{4(s^2+25)} - \frac{2}{4(s^2+1)}$$

ii)  $L\{e^{-2t} u(t-1) + s^t\}$

$$f(t) = u(t-1)$$

$$f(s) = \frac{e^{-s}}{s}$$

$$L\{e^{-at} f(t)\} = f(s+a)$$

$$L\{e^{-2t} f(t)\} = f(s-2)$$

$$L\{e^{-2t} u(t-1)\} = \frac{e^{-s-2}}{(s-2)} \rightarrow \textcircled{i}$$

$$L[s^t] = \frac{1}{s - \log s} = f(s)$$

$$L\{t s^t\} = -\frac{d}{ds} f(s) = -\frac{d}{ds} \left[ \frac{1}{s - \log s} \right]$$

$$= -\left[ \frac{s - \log s(0) - 1(1)}{(s - \log s)^2} \right] = \frac{1}{(s - \log s)^2} \rightarrow (2)$$

$$\therefore L[e^{-2t} u(t-1) + s^t t] = \frac{e^{-s+2}}{s+2} + \frac{1}{(s - \log s)^2}$$

b.

$$f(t) = \begin{cases} a & ; 0 < t < \pi \\ 0 & ; \pi < t < 2\pi \\ \sin at & ; t > 2\pi \end{cases}$$

$$f_1(t) = a \quad f_2(t) = 0 \quad f_3(t) = \sin at$$

$$a = \pi, \quad b = 2\pi$$

$$f(t) = f_1(t) + [f_2(t) - f_1(t)]u(t-a) + [f_3(t) - f_2(t)]u(t-b)$$

$$= a + (a-a)u(t-\pi) + (\sin at - 0)u(t-2\pi)$$

$$= a + (-a)u(t-\pi) + \sin at u(t-2\pi)$$

$$= a + g(t-\pi)u(t-\pi) + h(t-2\pi)u(t-2\pi)$$

$$L\{f(t)\} = \frac{a}{s} + e^{-\pi s} L\{g(t)\} + e^{-2\pi s} L\{h(t)\}$$

Now,  $g(t) = -a$

$$L\{g(t)\} = \frac{-a}{s}$$

$$h(t) = \sin at$$

$$= \sin a(t+2\pi)$$

$$= \sin t$$

$$L\{h(t)\} = \frac{1}{s^2+1}$$

$$\Rightarrow L\{f(t)\} = \frac{a}{s} + e^{-\pi s} \left( \frac{-a}{s} \right) + e^{-2\pi s} \left( \frac{1}{s^2+1} \right)$$

$\therefore$  Hence proved.

4a.

$$\frac{s}{(s-1)(s^2+4)}$$

$$= \frac{1}{(s-1)} - \frac{s}{s^2+4}$$

$$F(s) = \frac{1}{s-1}; \quad G(s) = \frac{s}{s^2+4}$$

$$L^{-1}[F(s)] = f(t) = e^t$$

$$L^{-1}[G(s)] = g(t) = \cos 2t$$

According to convolution theorem.

$$L^{-1}[F(s) \cdot G(s)] = \int_0^t f(u)g(t-u)du$$

$$L^{-1}\left[ \frac{s}{(s-1)(s^2+4)} \right] = \int_0^t e^u \cos(2t-2u) du$$

$$\int e^{ax} \cos(bx+c) dx = \frac{e^{ax}}{a^2+b^2} [a \cos(bx+c) + b \sin(bx+c)]$$

$$a=1, \quad b=-2, \quad c=2t, \quad x=u$$

$$L^{-1}\left[ \frac{s}{(s-1)(s^2+4)} \right] = \left[ \frac{e^u}{5} (\cos(-2u+2t) - 2 \sin(-2u+2t)) \right]_{u=0}^t$$

$$L^{-1}\left[ \frac{s}{(s-1)(s^2+4)} \right] = \frac{1}{5} [e^t - \cos 2t + 2 \sin^2 t]$$

b.

$$2 \frac{d^2 y}{dt^2} - 5 \frac{dy}{dt} + 2y = 3 \sin t$$

$$\Rightarrow 2 \cdot y''(t) - 5y'(t) + 2y(t) = 3 \sin t$$

$$2 \cdot L(y''(t)) - 5L(y'(t)) + 2L(y(t)) = L(3 \sin t)$$

$$\Rightarrow 2 \cdot [s^2 L(y(t)) - s(y(0)) - 1(0)] - 5L(y(t)) - 5L(y(t)) + 2L(y(t)) = 3 \cdot \frac{1}{s^2+1}$$

$$= 2 \cdot s^2 L(y(t)) - s L(y(t)) + 2L(y(t)) = \frac{3}{s^2+1}$$

$$\Rightarrow (2s^2 - s + 2) L(y(t)) = \frac{3}{s^2+1}$$

$$L(y(t)) = \frac{3}{(s^2+1)(2s^2-s+2)}$$

27/30

1.  $\frac{dy}{dx} = 2y + 3e^x$ ;  $y(0) = 0$   $y$  at  $x=0.2$

$$y' = 2y + 3e^x; x_0 = 0; y_0 = 0$$

$$y' = 2x_0 + 3e^0 = 3$$

$$y'' = 2y' + 3e^x \Rightarrow y''_0 = 2 \times 3 + 3e^0 = 6 + 3 = 9$$

$$y''' = 2y'' + 3e^x \Rightarrow y'''_0 = 2 \times 9 + 3e^0 = 18 + 3 = 21$$

$$y^{(4)} = 2y''' + 3e^x \Rightarrow y^{(4)}_0 = 2 \times 21 + 3e^0 = 42 + 3 = 45$$

$$y^{(5)} = 2y^{(4)} + 3e^x \Rightarrow y^{(5)}_0 = 2 \times 45 + 3e^0 = 93$$

$$y(x) = y_0 + x y'_0 + \frac{x^2}{2!} y''_0 + \frac{x^3}{3!} y'''_0 + \dots$$

$$= 0 + 3x + \frac{x^2}{2} \times 9 + \frac{x^3}{6} \times 21 + \frac{x^4}{24} \times 45 +$$

$$\frac{x^5}{120} \times 93 + \dots$$

$$= 3x + \frac{9}{2} x^2 + \frac{7}{2} x^3 + \frac{15}{8} x^4 + \frac{31}{40} x^5 + \dots$$

$$y(0.2) = 3 \times 0.2 + \frac{9}{2} (0.2)^2 + \frac{7}{2} (0.2)^3 + \frac{15}{8} (0.2)^4 + \frac{31}{40} (0.2)^5 + \dots$$

$$= 0.811248.$$

Direct method:  $\frac{dy}{dx} - 2y = 3e^x$

$$I.f = e^{\int -2 dx} = e^{-2x} = e^{-2x}$$

$$y e^{-2x} = \int e^{-2x} \cdot 3e^x dx = 3 \int e^{-x} dx = -3e^{-x} + C$$

$$y = -3e^x + C e^{2x}, \text{ but } y=0 \text{ when } x=0, C=3$$



$$\therefore y = 3e^x + 3e^{-x} = 3(e^x + e^{-x})$$

$$y(0.2) = 3(e^{0.4} + e^{-0.4}) = 0.811266$$

1b.  $\frac{dy}{dx} = \frac{y-x}{y+x}, \quad y(0) = 1, \quad h = 0.2$

$$\frac{dy}{dx} = \frac{y-x}{y+x}$$

we shall compare  $k_1, k_2, k_3, k_4$

$$k_1 = hf(x_0, y_0)$$

$$= 0.2 \left( \frac{y_0 - x_0}{y_0 + x_0} \right) = 0.2 \left( \frac{1-0}{1+0} \right) = 0.2$$

$$k_2 = hf \left( x_0 + \frac{h}{2}, y_0 + \frac{k_1}{2} \right)$$

$$= 0.2 \left( \frac{0+0.2}{1+0.2} \right) = 0.2(0.1, 1.1)$$

$$= 0.2 \left( \frac{1.1-0.1}{1.1+0.1} \right) = 0.1667$$

$$k_3 = hf \left( x_0 + \frac{h}{2}, y_0 + \frac{k_2}{2} \right)$$

$$= 0.2 \left( \frac{0+0.2}{1+0.1667} \right) = 0.2(0.1, 1.0833)$$

$$= 0.2 \left( \frac{1.0834-0.1}{1.0834+0.1} \right) = 0.1662$$

$$k_4 = hf(x_0 + h, y_0 + k_3)$$

$$= 0.2(0.2, 1.1662) = 0.2(0.2, 1.662)$$

$$= 0.2 \left( \frac{1.662-0.2}{1.662+0.2} \right) = 0.1414$$

$$y(0.2) = y_0 + k = 1 + 0.1678 = 1.16786$$

$$k = \frac{1}{6} (0.2 + 2(0.1667) + 2(0.1662) + 0.1414)$$

$$k = 0.16786$$

$x$	$y$	$y' = -(y+xy^2)$
$x_0 = 0$	$y_0 = 1$	$y'_0 = 1$
$x_1 = 0.1$	$y_1 = 0.9008$	$y'_1 = -0.9819$
$x_2 = 0.2$	$y_2 = 0.8666$	$y'_2 = -0.9367$
$x_3 = 0.3$	$y_3 = 0.722$	$y'_3 = -0.8784$
$x_4 = 0.4$	$y_4 = ?$	

$$y_4^{(P)} = y_3 + \frac{h}{24} (55y'_3 - 59y'_2 + 37y'_1 - 9y'_0)$$

$$y_4^{(P)} = 0.6371$$

$$y_4^{(I)} = -(y_4 + x_4 y_4^2) = -0.7995$$

$$y_4^{(C)} = y_3 + \frac{h}{24} (19y'_4 + 19y'_3 - 5y'_2 + y'_1)$$

$$y_4^{(C)} = 0.6379$$

$$y_4^{(I)} = -(0.6379 + (0.4)(0.6379)^2) = -0.8007$$

$$y_4^{(C)} = 0.6379$$

$$y(0.4) = 0.6379$$

8b.  $\Rightarrow \frac{d^2y}{dx^2} = x \frac{dy}{dx} - y^2$

$$\frac{dy}{dx} = 2, \quad \frac{d^2y}{dx^2} = \frac{d^2y}{dx^2}$$

$$\frac{dy}{dx} = f(x, y, z) = 2, \quad \frac{dz}{dx} = g(x, y, z) = xz - y^2$$

$$\frac{dz}{dx} = g(x, y, z) = xz - y^2$$

$$x_0 = 0, \quad y_0 = 1, \quad z_0 = 0$$

$$x = x_0 + h = 0.2$$

$$h = 0.2$$

compute K & L values

$$K_1 = h f(x_0, y_0, z_0) = 0.2 f(0, 1, 0) = 0$$

$$L_1 = h g(x_0, y_0, z_0) = 0.2 g(0, 1, 0) = 0.2$$

$$K_2 = h f(x_0 + \frac{1}{2}h, y_0 + \frac{1}{2}K_1, z_0 + \frac{1}{2}L_1) \\ = 0.2 f(0.1, 1, -0.1) = -0.02$$

$$L_2 = h g(x_0 + \frac{1}{2}h, y_0 + \frac{1}{2}K_1, z_0 + \frac{1}{2}L_1) \\ = 0.2 g(0.1, 1, -0.1) = -0.202$$

$$K_3 = h f(x_0 + \frac{1}{2}h, y_0 + \frac{1}{2}K_2, z_0 + \frac{1}{2}L_2) \\ = 0.2 f(0.1, 0.99, -0.101) = -0.0202$$

$$L_3 = h g(x_0 + \frac{1}{2}h, y_0 + \frac{1}{2}K_2, z_0 + \frac{1}{2}L_2) \\ = 0.2 g(0.1, 0.99, -0.101) = -0.19804$$

$$K_4 = h f(x_0 + h, y_0 + K_3, z_0 + L_3) \\ = 0.2 f(0.2, 0.9798, -0.19804) \\ = -0.03961$$

$$L_4 = h g(x_0 + h, y_0 + K_3, z_0 + L_3) \\ = 0.2 g(0.2, 0.9798, -0.19804) \\ = -0.1999$$

$$\Rightarrow y(x_0 + h) = y_0 + \frac{1}{6} [K_1 + 2K_2 + 2K_3 + K_4]$$

$$= 0.97999$$

$$z(x_0 + h) = z_0 + \frac{1}{6} [L_1 + 2L_2 + 2L_3 + L_4]$$

$$= -0.19999 \times 0.2 = -0.039998$$

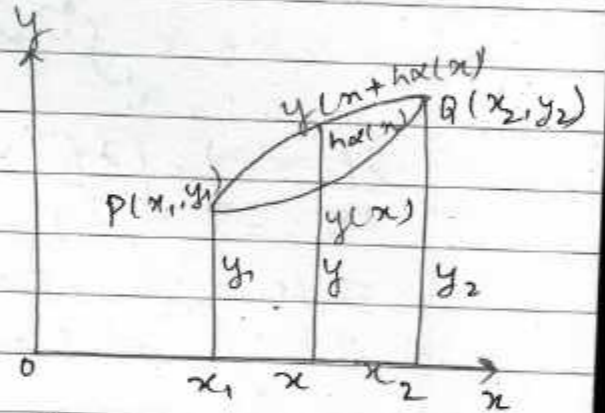
$$y(0.2) = 1 + \frac{1}{6} [0 + 2(-0.02) + 2(-0.01998) - 0.039998] = 0.9801$$

La. condition for integral.

$$I = \int_{x_1}^{x_2} f(x, y, y') dx \quad \text{where } y(x_1) = y_1, \quad y(x_2) = y_2$$

$$\frac{\partial f}{\partial y} - \frac{\partial}{\partial x} \left( \frac{\partial f}{\partial y'} \right) = 0$$

proof: Let  $I$  be an extremum along some curve  $y = y(x)$  passing through  $P(x_1, y_1)$  and  $Q(x_2, y_2)$ .



$$\text{let } y = y(x) + h\alpha(x) \rightarrow (1)$$

$$\alpha(x_1) = 0 \text{ at } P$$

$$\alpha(x_2) = 0 \text{ at } Q$$

$$I = \int_{x_1}^{x_2} f(x, y(x) + h\alpha(x), y'(x) + h\alpha'(x)) dx \rightarrow (2)$$

$$\frac{dI}{dh} = 0 \quad \text{where } h=0$$

$$\frac{dI}{dh} = \int_{x_1}^{x_2} \frac{\partial}{\partial h} f(x, y(x) + h\alpha(x), y'(x) + h\alpha'(x)) dx \rightarrow (3)$$

$$\frac{dI}{dh} = \int_{x_1}^{x_2} \left( \frac{\partial f}{\partial x} \frac{\partial x}{\partial h} + \frac{\partial f}{\partial y} \frac{\partial y}{\partial h} + \frac{\partial f}{\partial y'} \frac{\partial y'}{\partial h} \right) dx$$

$$\frac{\partial x}{\partial h} = 0$$

$$y' = y'(x) + h\alpha'(x) \rightarrow (4)$$

$$\frac{\partial y}{\partial h} = \alpha(x) \quad \frac{\partial y'}{\partial h} = \alpha'(x)$$

using (3).

$$\frac{dl}{du} = \int_{x_1}^{x_2} \left( \frac{\partial f}{\partial y} \alpha(x) + \frac{\partial f}{\partial y'} \alpha'(x) \right) dx \rightarrow (1)$$

$$\frac{dl}{du} = \int_{x_1}^{x_2} \frac{\partial f}{\partial y} \alpha(x) dx + \left\{ \left( \frac{\partial f}{\partial y'} \alpha(x) \right)_{x_1}^{x_2} - \int_{x_1}^{x_2} \alpha(x) \frac{d}{dx} \left( \frac{\partial f}{\partial y'} \right) dx \right\}$$

$$= \int_{x_1}^{x_2} \frac{\partial f}{\partial y} \alpha(x) dx + \left\{ \frac{\partial f}{\partial y'} \alpha(x_2) - \frac{\partial f}{\partial y'} \alpha(x_1) \right\}$$

$$- \int_{x_1}^{x_2} \alpha(x) \frac{d}{dx} \left( \frac{\partial f}{\partial y'} \right) dx$$

$$\frac{\partial f}{\partial y} - \frac{d}{dx} \left( \frac{\partial f}{\partial y'} \right) = 0$$

This is the required Euler's equation.

$$I = \int_{x_1}^{x_2} f(x, y, y') dx$$

16.  $f(x) = \begin{cases} 1 & \text{for } |x| < a \\ 0 & \text{for } |x| \geq a \end{cases}$ . Find  $f(x)$

$\int_0^{\infty} \frac{\sin x}{x} dx$ . Hence evaluate above.

$\Rightarrow$  complex fourier transform of  $f(x)$  is given by  $f(u) = \int_{-\infty}^{\infty} f(x) e^{iux} dx$

$$f(u) = \int_{-a}^a 1 \cdot e^{iux} dx \quad f(x) = \begin{cases} 1 & \text{for } -a \leq x \leq a \\ 0 & \text{otherwise} \end{cases}$$

$$f(u) = \left[ \frac{e^{iux}}{iu} \right]_{x=-a}^a = \frac{1}{iu} \left\{ e^{iua} - e^{-iua} \right\}$$

$$f(u) = \frac{1}{iu} \left\{ (\cos au + i \sin au) - (\cos au - i \sin au) \right\}$$

$$f = \frac{1}{iu} (2i \sin au) = \frac{2 \sin au}{u}$$

$$f(u) = \frac{2 \sin au}{u}$$

$$\int_0^{\infty} \frac{\sin x}{x} dx$$

$$f(u) = \frac{2 \sin au}{u}$$

inverse fourier transform is

$$\frac{1}{2\pi} \int_{-\infty}^{\infty} f(u) e^{-iux} du = f(x)$$

$$f(x) = \frac{1}{2\pi} \int_{-\infty}^{\infty} \frac{2 \sin au}{u} e^{-iux} du$$

$$= \frac{1}{\pi} \int_{-\infty}^{\infty} \frac{\sin au}{u} e^{-iux} du$$

put  $x=0$

$$f(0) = 1 \quad \therefore f(x) = 1 \quad \text{for } |x| \leq a$$

$$\frac{1}{\pi} \int_{-\infty}^{\infty} \frac{\sin au}{u} du = 1 \quad e^0 = 1$$

$$\frac{2}{\pi} \int_0^{\infty} \frac{\sin au}{u} du = 1, \quad \text{since } \frac{\sin au}{u} \text{ is even fn of } u$$

$$\therefore \int_0^{\infty} \frac{\sin au}{u} du = \frac{\pi}{2}; \quad \text{Take } a=1$$

$$a=1, \quad \int_0^{\infty} \frac{\sin u}{u} du = \frac{\pi}{2}$$

$$u=x \quad \boxed{\int_0^{\infty} \frac{\sin x}{x} dx = \frac{\pi}{2}}$$

4a.  $f(x) = \frac{a_0}{2} + \sum_{n=1}^{\infty} a_n \cos nx + \sum_{n=1}^{\infty} b_n \sin nx \rightarrow \textcircled{1}$

$$a_0 = \frac{1}{\pi} \int_0^{2\pi} f(x) dx = \frac{1}{\pi} \int_0^{2\pi} x(2\pi - x) dx$$

$$= \frac{1}{\pi} \int_0^{2\pi} (2\pi x - x^2) dx$$

$$= \frac{1}{\pi} \left[ 2\pi \frac{x^2}{2} - \frac{x^3}{3} \right]_0^{2\pi} = \frac{1}{\pi} \left[ \pi (2\pi)^2 - \frac{(2\pi)^3}{3} - (0-0) \right]$$

$$= \frac{1}{\pi} \left[ 4\pi^3 - \frac{8\pi^3}{3} \right] = \frac{1}{\pi} \left[ \frac{4\pi^3}{3} \right]$$

$$a_n = \frac{1}{\pi} \int_0^{2\pi} f(x) \cos nx dx = \frac{1}{\pi} \int_0^{2\pi} (2\pi x - x^2) \cos nx dx$$

$$= \frac{1}{\pi} \left[ (2\pi x - x^2) \frac{\sin nx}{n} - (2\pi - 2x) \left( -\frac{\cos nx}{n^2} \right) + (-2) \right.$$

$$\left. \left( -\frac{\sin nx}{n^3} \right) \right]_0^{2\pi}$$

$$= \frac{1}{\pi} \left[ 0 - \frac{2\pi}{n^2} + 0 - \left( 0 + \frac{2\pi}{n^2} + 0 \right) \right]$$

$$= \frac{1}{\pi} \left[ -\frac{2\pi}{n^2} + \frac{2\pi}{n^2} \right] = \frac{1}{\pi} \left[ -\frac{4\pi}{n^2} \right] = -\frac{4}{n^2}$$

$$b_n = \frac{1}{\pi} \int_0^{2\pi} f(x) \sin nx dx = \frac{1}{\pi} \int_0^{2\pi} (2\pi x - x^2) \sin nx dx$$

$$= \frac{1}{\pi} \left[ (2\pi x - x^2) \left( -\frac{\cos nx}{n} \right) - (2\pi - x) \left( -\frac{\sin nx}{n^2} \right) + (-2) \right.$$

$$\left. \left( \frac{\cos nx}{n^3} \right) \right]_0^{2\pi}$$

$$= \frac{1}{\pi} \left[ 0 + 0 - \frac{2}{n^3} - 0 \left( 0 + 0 - \frac{2}{n^3} \right) \right]$$

Substitute  $a_0, a_n, b_n$  value in equation

$$f(x) = \frac{a_0}{2} + \sum_{n=1}^{\infty} a_n \cos nx + \sum_{n=1}^{\infty} b_n \sin nx$$

$$x(2\pi - x) = \frac{4\pi^2}{6} = \sum_{n=1}^{\infty} \frac{4}{n^2} \cos nx + 0$$

put  $x=0$  on b.s.

$$0 = \frac{4\pi^2}{6} - \sum_{n=1}^{\infty} \frac{4}{n^2} \cos nx + 0$$

$$\frac{4\pi^2}{6} = \sum_{n=1}^{\infty} \frac{4}{n^2}$$

$$\frac{\pi^2}{6} = \sum_{n=1}^{\infty} \frac{1}{n^2}$$

4b.  $f(x) = |x| \Rightarrow f(x) = |-x| = |x| = f(x)$  is even  
 $\therefore b_n = 0$

$$a_0 = \frac{2}{\pi} \int_0^{\pi} f(x) dx = \frac{2}{\pi} \int_0^{\pi} |x| dx = \frac{2}{\pi} \left[ \frac{x^2}{2} \right]_0^{\pi} = \frac{1}{\pi} \left[ \pi^2 - 0 \right] = \pi$$

$$a_n = \frac{2}{\pi} \int_0^{\pi} f(x) \cos nx dx = \frac{2}{\pi} \int_0^{\pi} |x| \cos nx dx$$

$$= \frac{2}{\pi} \int_0^{\pi} x \cos nx dx = \frac{2}{\pi} \left[ x \frac{\sin nx}{n} - (1) \left( -\frac{\cos nx}{n^2} \right) \right]_0^{\pi}$$

$$= \frac{2}{\pi} \left[ 0 + \frac{\cos nx}{n^2} \right] - \left[ 0 + \frac{1}{n^2} \right]$$

$$= \frac{2}{\pi} \left[ \frac{(-1)^n}{n^2} - \frac{1}{n^2} \right] = \frac{2}{\pi n^2} \left[ (-1)^n - 1 \right]$$

$$f(x) = \frac{a_0}{2} + \sum_{n=1}^{\infty} a_n \cos na$$

$$|x| = \frac{\pi}{2} + \sum_{n=1}^{\infty} \frac{2}{\pi n^2} \left[ (-1)^n - 1 \right] \cos nx$$

put  $x=0$

$$0 = \frac{\pi}{2} + \sum_{n=1}^{\infty} \frac{2}{\pi n^2} [(-1)^n - 1]$$

$$\frac{\pi}{2} = \sum_{n=1}^{\infty} \frac{2}{\pi n^2} [1 - (-1)^n]$$

$$\frac{\pi^2}{4} = \sum_{n=1}^{\infty} \left[ \frac{1 - (-1)^n}{n^2} \right] = \frac{2}{1^2} + \frac{2}{3^2} + \frac{2}{5^2} + \dots$$

$$\frac{\pi^2}{8} = \frac{1}{1^2} + \frac{1}{3^2} + \frac{1}{5^2} + \dots$$

$$\boxed{\frac{\pi^2}{8} = \sum_{n=1}^{\infty} \frac{1}{(2n-1)^2}}$$

//



# AMC

## ENGINEERING COLLEGE

Affiliated to Visvesvaraya Technological University, Belagavi,  
Approved by Government of Karnataka, Recognized by AICTE, New Delhi.

18<sup>th</sup> K.M. Bannerghatta Road, Kalkere, Bengaluru - 560 083

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Website: [www.amcgroup.edu.in](http://www.amcgroup.edu.in)



Accredited by NAAC & NBA (2009-2012), Ministry of HRD, New Delhi.

### Department of Computer Science and Engineering

Test	Date	Signature of Student	Signature of Invigilator
Test - I	23-09-19	<i>Deeksha</i>	<i>NA</i>
Test - II	11-11-19	<i>Deeksha</i>	<i>NA</i>
Test - III	16-12-19	<i>Deeksha</i>	<i>Kanvesi</i>

BLUE BOOK

Name : DEEKSHA.S  
 USN : 1AM19CS051 Semester : 1<sup>st</sup> Semester.  
 Program: B.E  
 Section : A Class Roll No : 51  
 Course : ENGINEERING PHYSICS



### AMC ENGINEERING COLLEGE

18th K.M, Bannerghatta Road, Kalkere, Bengaluru - 560083, Phone: 27828655

CBCS SCHEME

Student Name: **DEEKSHA S** . USN: \_\_\_\_\_ Course-Name & Code: - **ASPHY12**.

Internal Assessment Test	Q1			Q2			Q3			Q4			IA Test Marks ( )	Signature of Faculty Incharge
	a	b	c	a	b	c	a	b	c	a	b	c		
CO	1	1	1							4	4	4	18	<i>[Signature]</i> 26/11/19
Max marks	6	6	3							6	5	9		
IA Test 1	6	3	2							5	2	0		
CO	2	2	2							4	4	4	23	<i>[Signature]</i>
Max marks	6	5	4							6	5	4		
IA Test 2	5	4	3							5	4	2		
CO	4	1	1							4	4	4	29	
Max marks	6	5	4							6	5	4		
IA Test 3	6	5	3							8	5	4		
Assessment Tool*	CO1 ( )	CO2 ( )	CO3 ( )	CO4 ( )	CO5 ( )	CO6 ( )	Total Marks ( )	Marks Reduced to	Signature of Faculty Incharge					
AT 1							10	10	<i>[Signature]</i>					
AT 2							10	10	<i>[Signature]</i>					
AT 3							10	10	<i>[Signature]</i>					
Final IA Marks	<b>23</b>						Final AT Marks	<b>30</b>						

### Certificate

This is to certify that Mr./Ms. .... **DEEKSHA S** ..... has satisfactorily completed the course of assignment prescribed by the Visvesvaraya Technological University for Semester ... **1<sup>st</sup>** ... Branch... **CS.E...**...for the academic year **20 19- 20 20**

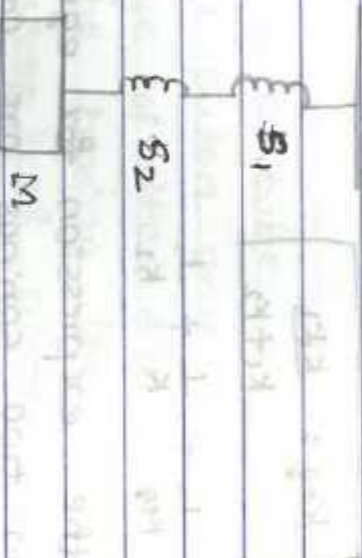
Final Continuous Internal Evaluation (CIE) Marks Awarded ( ) : **33/100**

Signature of Student  
*Deeksha*

Signature of Faculty Incharge  
*[Signature]*

Signature of Course Coordinator  
*Murali*  
23/12/19

1. b)



Consider two springs  $k_1$  and  $k_2$  are attached end to end of the spring and having the mass  $m_1$

By Using hook's law.

$$F_1 = -k_1 x_1$$

$$F_2 = -k_2 x_2$$

$$F_3 = -k_{eq} (x_1 + x_2)$$

By using the principle of buckling of spring is avoided if  $F_1 = F_2$

$$F_1 = -k_1 x_1$$

$$F_2 = -k_2 x_2$$

$$x_2 = \frac{k_1}{k_2} x_1$$

Substituting the  $x_2$  value in  $F_2$

$$F_2 = -k_{eq} \left[ x_1 + \frac{k_1}{k_2} x_1 \right]$$

$$F_3 = -k_{eq} \left[ \frac{k_2 + k_1}{k_2} \right] x_1$$

Now equating  $F_3 = F_1$

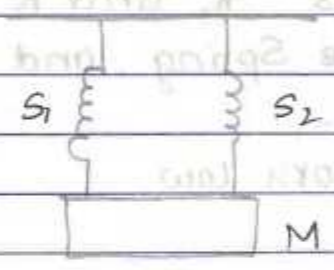
$$-k_{eq} \left[ \frac{k_2 + k_1}{k_2} \right] x_1 = -k_1 x_1$$



$$K_{eq} = \frac{k_1 k_2}{k_1 + k_2}$$

i.e  $\frac{1}{K_{eq}} = \frac{1}{k_1} + \frac{1}{k_2}$

This is the expression for equivalent forces constant when two springs are connected in series.



$$F_1 = -k_1 x_1$$

$$F_2 = -k_2 x_2$$

$$F_p = F_1 + F_2$$

$$F_p = -k_1 x_1 + (-k_2 x_2)$$

$$F_p = -k_1 x_1 - k_2 x_1$$

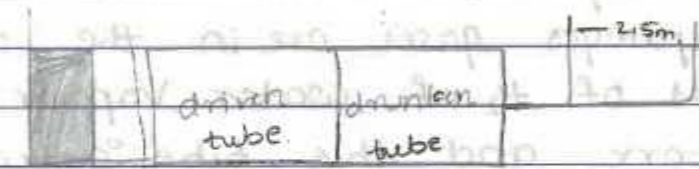
$$F_p = -x_1 (k_1 + k_2)$$

Hence the Springs are connected in parallel.  $K_{eq} = k_1 + k_2$  is the force constant of the Spring.

a) Construction :->

Reddy shock tube work on the principle of conventional piston and its made by medical Syringe of the following ways.

Reddy tube having the diameter 2.5 m and it consists of piston moving outside and inside. it has two tubes driven tube and drunken tube.



3 Working :-> Reddy shock tube helps to working the tubes. Like driven and drunken tube. piston converts the en waves by the action of moving outside and inside the Reddy shock tube. It is very important to shock wave flow a days.

c) Given :->  $F = 600 \text{ N}$

$$x = 1 \times 10^{-2} \text{ m}$$

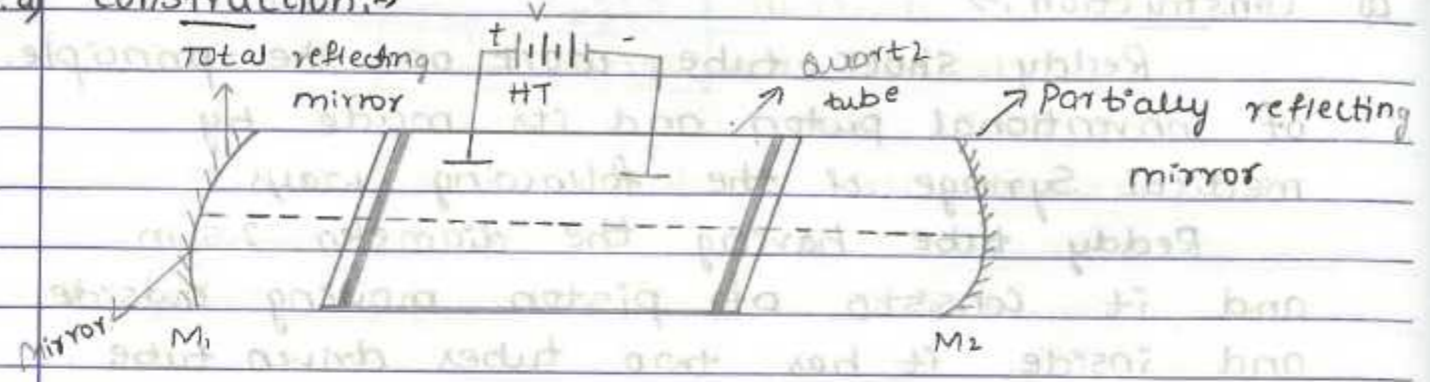
$$F = -x \times K$$

$$600 = -1 \times 10^{-2} K$$

$$K = \frac{600}{-1 \times 10^{-2}}$$

$$K = -60000 \text{ N/m}$$

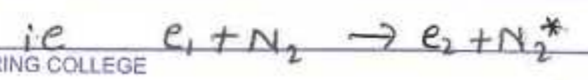
4. a) Construction:->



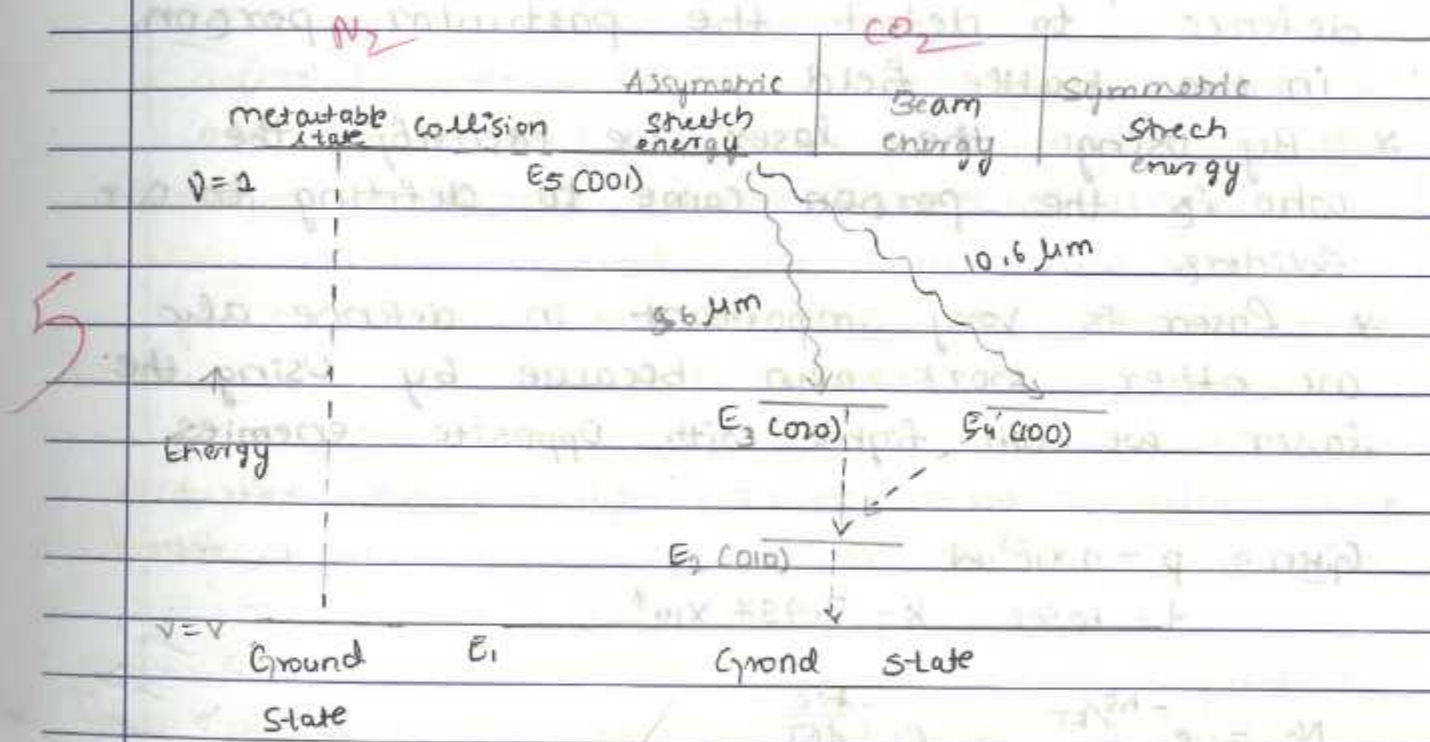
- \* Carbon dioxide laser consists of discharge tube with diameter 2.5cm and length 5m
- \* The discharge tube filled with Nitrogen, Helium, hydrogen gases are in the ratio 1:2:3 with excess of H<sub>2</sub> of water vapour of pressure 6-17 torr, and this tube is water cooled.
- \* It consists of two mirrors one is fully silvered and other one is one half silvered and placed that are placed normal to its axis
- \* If fully silvered mirror gives 100% reflectivity and half silvered mirror not give 100% reflectivity.

Working:->

When the suitable voltage applied to the electrodes of the tube glow discharge of gasses initiated in the tube. During the discharge of electrons the atoms (or) molecules move towards positive electrode, and the N<sub>2</sub> and O<sub>2</sub> molecules collide with each other, 'N<sub>2</sub>' molecules excites to the vibrational level v=1. It is the metastable state of 'N<sub>2</sub>' molecule.



Likewise CO<sub>2</sub> molecules excites (002) energy levels (It is not metastable state of an atom). For 'N<sub>2</sub>' molecule it is the v=1 state. The molecule in the vibrational state increase the population inversion. N<sub>2</sub> molecules come collides with CO<sub>2</sub> molecules because of same energy levels. the radiation energy transfers the N<sub>2</sub> and CO<sub>2</sub> molecules. the CO<sub>2</sub> molecules excites the 'N<sub>2</sub>' molecules come to their ground state.



- \* Transition of energy E<sub>5</sub> to E<sub>4</sub> give radiation of wavelength 10.6 micrometers in their in IR region
- \* Transition of energy E<sub>3</sub> to E<sub>2</sub> give the radiation of wavelength 9.6 micrometers in also their in IR region.

Conclusion?

b) LASER can be defined as the light amplification by stimulated emission of radiation.

The Application of Laser in defense:

- \* Laser used in the defence to know the enemy of us.
- \* Laser plays a important role in the defence to detect the particular person in the battle field.
- \* By using the laser we identify the who is the person came to defeting to our soldiers.
- \* Laser is very important in defence also on other work also because by using the laser we can fight with opposite enemies.

c) Given:  $p = 1 \times 10^3 \text{ W}$   
 $t = 10 \text{ sec}$      $k = 3.497 \times 10^7$

(A)  
 $a = 5$   
 $b = -20$   
 $c = 0$

$$\frac{N_2}{N_1} = e^{-h\nu/kT} = e^{-\frac{hc}{\lambda kT}}$$

$$\frac{hc}{\lambda kT} = \frac{6.628 \times 10^{-34} \times 3 \times 10^8}{1 \times 3.497 \times 10^7 \times 10 \text{ sec}}$$

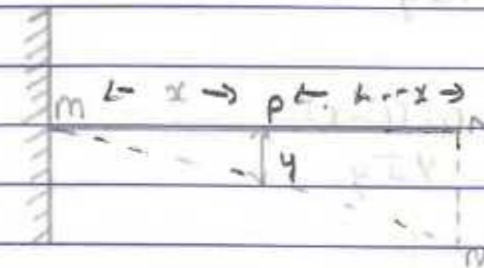
$$1 = 19.88 \times 10^{-39}$$

$$34.97 \times 10^{-7}$$

$$1 = 0.5685 \times 10^{-39-7}$$

$$1 = 0.5685 \times 10^{-46} \text{ m.}$$

1. a) "Within the elastic limit the ratio of longitudinal stress to linear strain"



Consider the distance 'x' separated by point 'p' into two parts 'x' and 'L-x' and MN and the length and 'N' is extended to 'N'.

$$\text{Bending moment} = \text{Force} \times \text{perpendicular distance} = W(L-x)$$

Let the Bending moment is given by  $\frac{Y}{R} I_g$ .

$$\frac{Y}{R} I_g = W(L-x) \quad \text{--- (1)}$$

$$\frac{1}{R} I_g = \frac{W(L-x)}{Y}$$

$$\frac{1}{R} = \frac{W(L-x)}{Y I_g} \quad \text{--- (2)}$$

If 'y' is the depression of point 'p' is given by.

$$\frac{1}{R} = \frac{d^2 y}{dx^2} \quad \text{--- (3)}$$



Comparing eqn ② and ③

$$\frac{d^2y}{dx^2} = \frac{w(L-x)}{YI_g}$$

$$\frac{d}{dx} \left( \frac{dy}{dx} \right) = \frac{w(L-x)}{YI_g}$$

$$d \left( \frac{dy}{dx} \right) = \frac{w(Ldx - xdx)}{YI_g}$$

Integrating on B.S

$$\frac{dy}{dx} = \frac{w \left[ Lx - \frac{x^2}{2} \right]}{YI_g} + C_1 \quad \text{--- (4)}$$

∴ C<sub>1</sub> is constant

$$\frac{dy}{dx} = \frac{w \left[ Lx - \frac{x^2}{2} \right]}{YI_g}$$

$$dy = \frac{w \left[ Lx - \frac{x^2}{2} \right]}{YI_g} dx$$

Integrating on B.S.



$$dy = \frac{w \left[ Lx^2 - \frac{x^3}{6} \right]}{YI_g} + C_2 \quad \text{--- (5)}$$

∴ C<sub>2</sub> is constant

$$y = \frac{w \left[ Lx^2 - \frac{x^3}{6} \right]}{YI_g} + C_2$$

At loaded end y = y<sub>0</sub>, x = L.

$$y_0 = \frac{w \left[ \frac{L^3}{2} - \frac{L^3}{6} \right]}{YI_g}$$

Depression at the loaded end

$$y_0 = \frac{wL^3}{3YI_g}$$

Therefore the Young's modulus of the given cantilever material is.

$$Y = \frac{wL^3}{3y_0I_g} \quad \text{--- (6)}$$

$$Y = \frac{4wL^3}{y_0I_g}$$

b) "Beam is defined as the homogeneous mixture of force and its perpendicular distance"

Types of beams

*Figure*

- \* Fixed beam
- \* Cantiliver beam
- \* Continuous beam
- \* Simple beam

Fixed beam  $\Rightarrow$  The beam in which both the ends are fixed.

Cantiliver beam  $\Rightarrow$  The beam in which one end is fixed and other end is free.

Continuous beam  $\Rightarrow$  The beam in which the bar which is acting upon the two (or more) supports.

Simple beam  $\Rightarrow$  The beam in which the bar acting on their with one of the other supports.

Applications of the Beam

- \* Beam is used in the elevators.
- \* Beam is used in construction of platforms and bridges.
- \* Beam is used in trolley ways.

c) Given  $\Rightarrow L = 2m$

$R = 0.013 \times 10^{-2} m$

$F = 14.7 N$

$Y = 2.1 \times 10^{11} N/m^2$

$\Delta = ?$

$Y = \frac{2L}{\Delta x}$

$\Delta x$

$Y = \frac{2L}{\pi R^2 \times x}$

$2.1 \times 10^{11} = \frac{2 \times 2}{\pi R^2 \times x}$

$3.14 \times (0.013 \times 10^{-2})^2 \times x$

$2.1 \times 10^{11} = \frac{4}{0.0005 \times 10^{-4} x}$

$0.0005 \times 10^{-4} x$

$x = \frac{4}{2.1 \times 10^{11} \times 0.0005 \times 10^{-4}}$

$2.1 \times 10^{11} \times 0.0005 \times 10^{-4}$

$x = 3809.52 \times 10^{-7}$

$x = 38.0952 \times 10^{-9} m$

$x = 38.09 mm$



3.a) Consider a electron of rest mass 'm' and velocity 'v' acting on the potential difference 'V'. The work done of the electron:  $W = eV$

$\therefore eV = \frac{1}{2}mv^2 \quad v = \sqrt{\frac{2eV}{m}}$

The de-broglie wavelength is

$\lambda = \frac{h}{mv}$

$= \frac{h}{m\sqrt{\frac{2eV}{m}}}$

$= \frac{h}{\sqrt{2m^2eV}}$

$\lambda = \frac{h}{\sqrt{2meV}}$

$\therefore h = 6.623 \times 10^{-34} \text{ Js} \quad m = 9.1 \times 10^{-31} \text{ kg} \quad e = 1.6 \times 10^{-19} \text{ C}$

$\lambda = \frac{6.623 \times 10^{-34}}{\sqrt{2 \times 9.1 \times 10^{-31} \times 1.6 \times 10^{-19} \times V}}$

$\lambda = \frac{1.227 \text{ nm}}{\sqrt{V}}$

$\therefore$  The debroglie wavelength should be equal to  $\frac{1.227}{\sqrt{V}}$  nm



b) "The Acceptable values wave function are called Eigen function"

properties is

*wave function is eigen function difference*

\*  $\psi$  must be single valued and finite everywhere

\*  $\psi$  must be finite everywhere

\*  $\psi$  must be continuous and should be

\* For Bounded  $\psi$  should be vanish at infinity

c) Given:  $m = 940 \text{ mev}/c^2 = 940$   
 $K.E = 0.5 \text{ keV} = 0.5 \times 10^3 \text{ eV}$

$\frac{23}{30}$

$\lambda = ?$

$e = V = 3 \times 10^8 \text{ m/s}$

$KE = \frac{h^2}{2m\lambda^2}$

$a=5$   
 $b=4$   
 $c=3$

$0.5 \times 10^3 = \frac{6.623 \times 10^{-34}}{2 \times 940 \times 3 \times 10^8 \cdot \lambda^2}$

$\frac{12}{12}$

$0.5 \times 10^3 = \frac{6.623 \times 10^{-34}}{1880.0 \lambda^2}$

$\frac{3}{a=5$   
 $b=4$   
 $c=2$

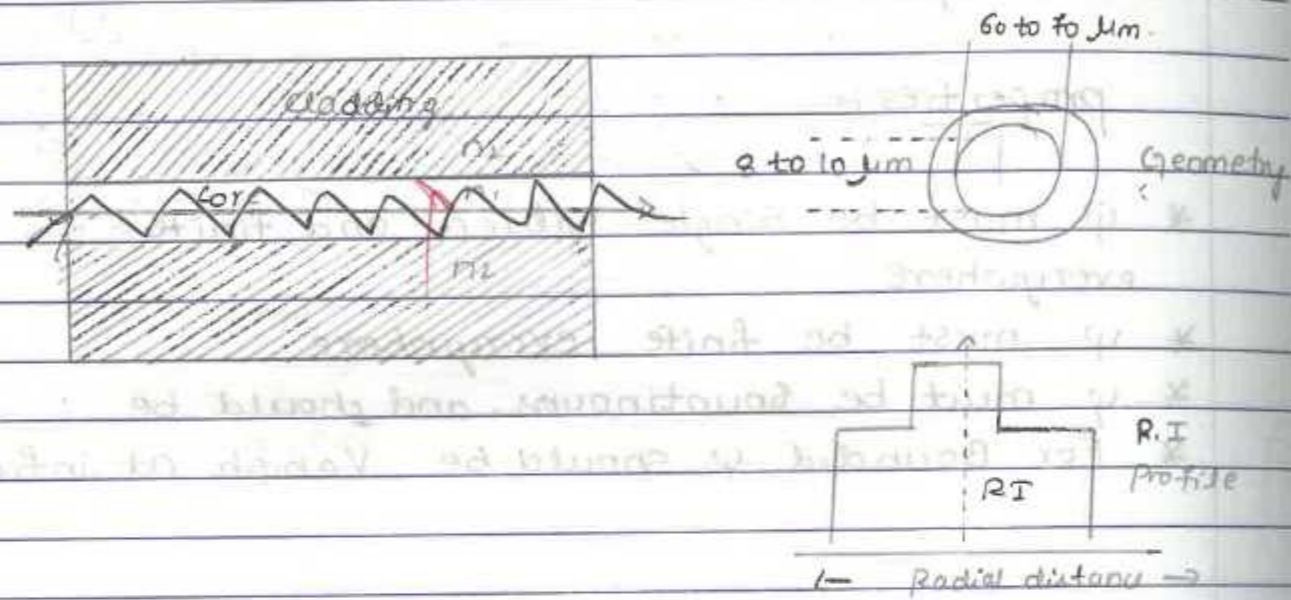
$\lambda^2 \cdot 940 \times 10^3 = 6.623 \times 10^{-34}$

$\lambda^2 = 0.0070 \times 10^{-37}$

$\lambda = 0.0837 \times 10^{-37}$

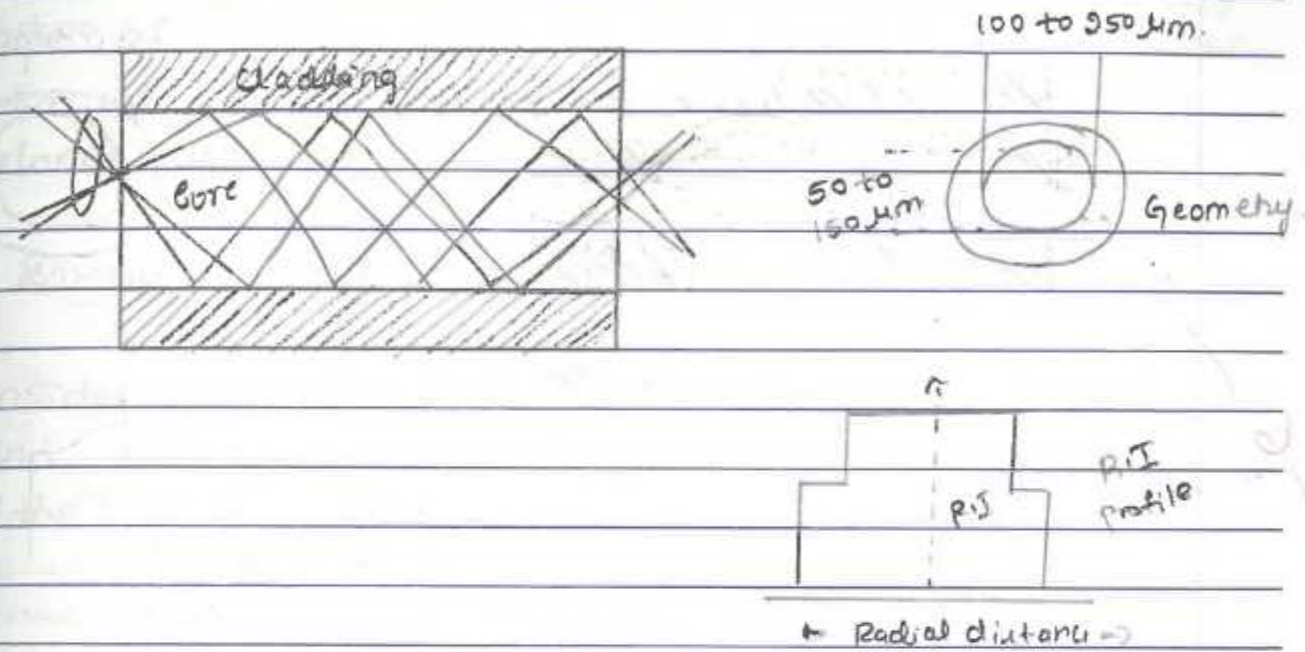
$\lambda = 8.37 \times 10^{-35} \text{ m}$

i) Step-Index single mode fiber



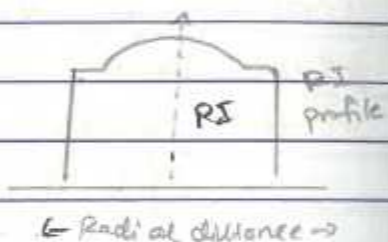
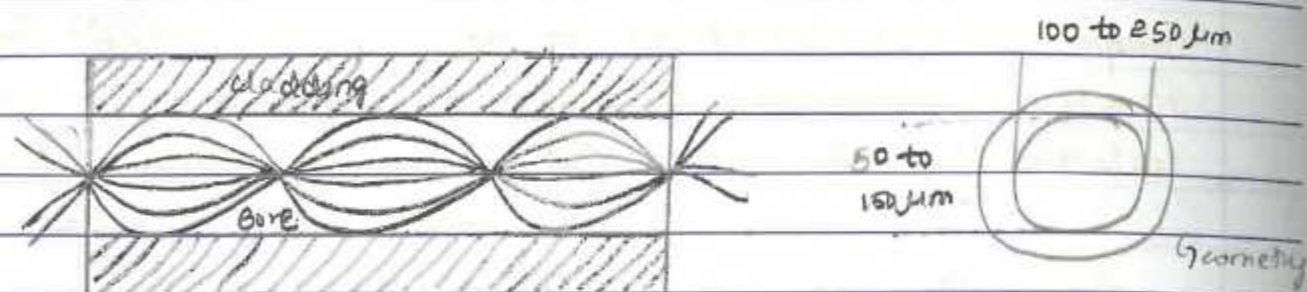
In step-index single mode fiber the core of material of uniform refractive index ( $n_1$ ) and the cladding material of refractive index ( $n_2$ ). But the R.I of cladding is lower compared to the refractive index of core. The diameter of core is 8 to 10  $\mu\text{m}$  and the outer diameter of cladding is 60 to 70  $\mu\text{m}$  and Refractive index profile is step in shape.

ii) Step-Index Multi mode fiber



In step index multi-mode fiber the core diameter of the step index single mode fiber is less compared to multi-mode fiber. It is same as to single mode fiber. So that the light rays propagate through this fiber. The diameter of core is 50 to 150  $\mu\text{m}$  and diameter of cladding is 100 to 250  $\mu\text{m}$ . R.I profile is also in step in shape. It is zig-zag in manner. Source used in this fiber is LED (or) Laser.

iii) Graded - Index Multimode fiber



In Graded index multimode fiber. it is the specialised fiber and decrease gradually in outward direction of radial distance. and the diameter of Bore is 50 to 150 μm and the outer diameter of cladding is 100 to 250 μm.

In Geo-metry Step-index multimode fiber and graded index multimode fiber is same. Refractive Index profile is Graded in shape.

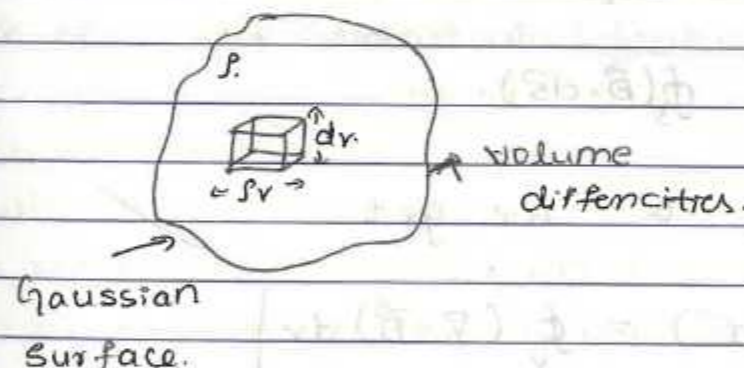
b) Statement is The integral normal Component of the flux density over a closed surface area in any shape of electric field to the equal to the volume Integral divergence of flux throughout the space enclosed by Gaussian surface.

Divergence to  $\vec{D}$

Consider a Vector field  $\vec{D}$ . Consider a point in the point vector field.  $\rho_v$  be the density of charges in the vector field.

$$\nabla \cdot \vec{D} = \rho_v$$

Maxwell's first Equation.



Consider a  $\rho_v$  be the charge density  $\nabla$  be the Volume  $\oint_s$  be the Gaussian Surface.

$$\oint_s (\vec{D} \cdot d\vec{s}) = \oint_v (\nabla \cdot \vec{D}) dv$$

proof is. Consider  $\vec{D}$  the Vector field and  $\rho_v$  be the density of charges.

$$\rho_v = \frac{dq}{dv}$$



$$dQ = \rho_v dv$$

The total charge enclosed by the Gaussian surface is

$$Q = \oint dQ$$

$$Q = \int_V \rho_v dv$$

Substituting maxwell's first eq<sup>n</sup>

$$Q = \int_V (\nabla \cdot \vec{D}) dv$$

According to Gauss electrostatics.

$$Q = \oint_S (\vec{D} \cdot d\vec{s})$$

Then equating 'Q' we get.

$$\oint_S (\vec{D} \cdot d\vec{s}) = \int_V (\nabla \cdot \vec{D}) dv$$

c) Given:  $P_{out/in} = 8.6 \text{ mW}$   
 $P_{out} = 7.5 \text{ mW}$   
 $L = 500 \text{ m}$

$$\alpha = -10 \log_{10} \left( \frac{P_{out}}{P_{in}} \right)$$

$$= -10 \log_{10} \left( \frac{8.6}{7.5} \right)$$

$$= -0.02 \log_{10} (1.14)$$

$$= -0.02 (0.0569)$$

$$\alpha = -0.001138$$

∴ The loss specification of cable is  $(-0.001138)$



a) Clausius - Mossotti Equation

The Local field is

$$E_i = \frac{E + P}{3\epsilon_0}$$

Substituting  $p = \epsilon_0(\epsilon_r - 1)E$  - (1)

$$E_i = \frac{E + P}{(\epsilon_r - 1)\epsilon_0}$$
 - (2)

If 'N' is the number of atoms/unit Volume. dipole moment  $\mu$  is.

dipole moment/unit Volume =  $N\mu$  - (3)

$$\mu = \alpha_e E_i$$
 - (4)

dipole moment/unit Volume  $\cdot p = N\alpha_e E_i$  - (5)

Substituting eqn (5) in (2)

$$P = \frac{P}{(\epsilon_r - 1)\epsilon_0} + \frac{P}{3\epsilon_0}$$
 - (6)

$\frac{(\epsilon_r - 1)}{(\epsilon_r + 1)} = \frac{N\alpha_e}{3\epsilon_0}$	- (7)
---	-------

This relation is Clausius - Mossotti eqn



The above relation is Clausius - Mossotti Equation used to solved by dielectric material in the form of eqn is

$\alpha_e = \frac{3\epsilon_0}{N} \frac{(\epsilon_r - 1)}{(\epsilon_r + 2)}$
--

b) Merits of Quantum free electron theory

(i) Temperature dependence of conductivity of metals

The quantum free electron theory gives correct order of temperature dependence of conductivity of metals.

According to the conductivity Expression of Quantum free electron theory.

$$\sigma \propto \lambda$$

Since  $\lambda \propto \frac{1}{\pi r^2}$

where 'r' is the amplitude of lattice vibrations. is directly proportional to the temperature.  $\therefore r^2 \propto T^2$

$$\lambda \propto \frac{1}{T}$$

Since  $\sigma \propto \lambda$

$$\therefore \sigma \propto \frac{1}{T}$$



(ii) Dependence of ↑ <sup>technical</sup> conductivity in electron conduction.

The electrical conductivity of electron is given by  $\sigma = \frac{ne^2 \tau}{m^* v_F}$

It is the ratio of electrical conductivity in electron conduction  $v_F / m^*$ .

c) Given:  $\sigma = 10^6 \Omega^{-1} m$

$\mu_e = 0.85 m^2 V^{-1} s^{-1}$

$\mu_h = 0.04 m^2 V^{-1} s^{-1}$

$N_i = ?$

$\sigma = N_i e (\mu_e + \mu_h)$

$10^6 = N_i \times (1.6 \times 10^{19}) [0.85 + 0.04]$

$10^6 = N_i (1.6 \times 10^{19}) [0.89]$

$10^6 = 1.4240 \times 10^{19} \cdot N_i$

$N_i = \frac{10^6}{1.4240 \times 10^{19}}$

$N_i = 0.70224 \times 10^{13}$

$N_i = 7.0224 \times 10^{12} m^{-3}$

~~3  
a=6  
b=5  
c=4  
15~~

~~17-6  
b=13  
c=13  
17~~

~~99/30  
10/10/25~~





# AMC

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### Vision of the Institution

*"To be a Leader in Imparting Value Based Technical Education and Research for the Benefit of Society"*

### Mission of the Institution

M1	To Provide State of the art Infrastructure facilities.
M2	To Implement modern Pedagogical methods in delivering the Academic programs with Experienced and Committed faculty.
M3	To Create a vibrant ambience that promotes Learning, Research, Invention and Innovation.
M4	To Undertake Skill Development Programs for Academic Institutions and Industries.
M5	To Enhance Institute Industry Interaction through Collaborative Research and Consultancy.
M6	To Relentlessly pursue Professional Excellence with Ethical and Moral Values.

18<sup>th</sup> K.M. Bannerghatta Road, Kalkere, Bengaluru - 560 083  
E-mail: principal@amcec.edu.in / hodise@amceducation.in  
Website: www.amcgroup.edu.in

PHY LAB



# AMC

## ENGINEERING COLLEGE

Affiliated to Visvesvaraya Technological University, Belagavi,  
Approved by Government of Karnataka, Recognized by AICTE, New Delhi.

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Accredited by NAAC & NBA (2009-2012), Ministry of HRD, New Delhi.



### Department of Information Science and Engineering

Test	Date	Signature of Student	Signature of Invigilator
Test - I	23/09/19		
Test - II	11/11/19		
Test - III	16/12/19		

BLUE BOOK

Name : Srujan Raj. A.  
USN : \_\_\_\_\_ Semester : I sem  
Program: \_\_\_\_\_  
Section : J-1 Class Roll No : 83  
Course : BE Engineering Chemistry.



## Department of Information Science and Engineering

### Vision of the Department

To develop the Department as a center of Excellence in the area of Information Science and Engineering for the Benefit of Society"

### Mission of the Department

M1	To provide the State-of-the-Art Infrastructure and Technology in the field of Information Science and Engineering.
M2	To deliver value based education through modern teaching pedagogy.
M3	To impart theoretical, computational and practical knowledge in the area of Information Technology.
M4	To collaborate with Institute, Industry and Research Organizations for the Cutting Edge Technologies.
M5	To develop an Entrepreneurial, Ethical and Socially responsible professionals.

### Program Educational Objectives (PEOs)

PEO 1	Lead a successful professional career with proficiency in designing IT solutions.
PEO 2	Pursue higher studies with practical knowledge of concepts and skills in the field of Information Technology.
PEO 3	Exhibit professionalism, team work and expose to current trends towards continuous learning.



## AMC ENGINEERING COLLEGE

18th K.M, Bannerghatta Road, Kalkere, Bengaluru - 560083. Phone: 27828655

### CBCS SCHEME

Student Name: <u>Soujanya Raj - A</u>		USN: <u>1AM1915093</u>		Course-Name & Code:											
Internal Assessment Test	Q1			Q2			Q3			Q4			IA Test Marks ( )		Signature of Faculty Incharge
	a	b	C	a	b	c	a	b	c	a	b	c	Total Marks	Marks Reduce to	
CO	1	1	1	1	1	1	3	3	3	3	3	3			
Max marks	6	4	5	5	5	5	6	4	5	5	5	5			
IA Test 1	6	4					5					5	2	17	
CO	2	2	2	2	2	2	4	4	3	4	4	4			
Max marks	6	5	4	6	4	5	6	4	5	6	4	5			
IA Test 2	6	5	4				6	4	5					30	
CO	5	5	5	5	5	5	4	4	4	4	4	4			
Max marks	6	5	4				6	4	5						
IA Test 3	4	4	4				4	4	0					20	23
Assessment Tool*	CO1( )	CO2( )	CO3( )	CO4( )	CO5( )	CO6( )	Total Marks( )	Marks Reduced to	Signature of Faculty Incharge						
AT 1															
AT 2															
AT 3															
Final IA Marks							Final AT Marks								

### Certificate

This is to certify that Mr./Ms. Soujanya Raj - A .....has satisfactorily completed the course of assignment prescribed by the Visvesvaraya Technological University for Semester I Branch ITC.....for the academic year 2019 - 2020

Final Continuous Internal Evaluation (CIE) Marks Awarded ( ) : 33/40

\* Assignment/Quiz/Seminar/Mini-Project 10

Soujanya Raj - A  
Signature of Student

[Signature]  
Signature of Faculty Incharge

[Signature]  
Signature of Course Coordinator

23/67/3



1.

a. Free Energy - The thermodynamic free energy is the amount of work that a thermodynamic system can perform

Entropy - The thermodynamic quantity that represents the unavailability of thermal energy required for conversion into mechanical work, often interpreted as the degree of disorder or randomness of a system.

Nernst Equation

Consider a single electrode rxn which is reversible



The decrease in energy

$$-\Delta G = W_{max} \quad \text{--- (1)}$$

$$\Delta G = -nFE \quad \text{--- (2)}$$

$$\Delta G^\circ = -nFE^\circ \quad \text{--- (3)}$$

$$K_c = \frac{\Delta G^\circ}{RT \ln 10}$$

$$\Delta G = \Delta G^\circ + RT \ln [c] \quad \text{--- (4)}$$

$$K_c = \frac{[Mn^*]}{[Mn]}$$

at STP,  $Mn = 1$

*[Faint handwritten notes and diagrams on the left page, including a table of numbers and some chemical symbols.]*

$$\frac{33}{4}$$

*[Faint handwritten notes and diagrams on the bottom left page.]*

$\therefore K_c = \frac{1}{[Mn^+]}$

Sub the value of  $K_c$  in Eq. (1)

$\Delta G = \Delta G^\circ + RT \ln \left[ \frac{1}{[Mn^+]} \right]$

From Eq. (2) & (3)

$-nFE = -nFE^\circ - RT \ln [Mn^+]$

$\div$  by  $-nF$  throughout

$E = E^\circ - \frac{RT}{nF} \ln [Mn^+]$

by converting into common log.

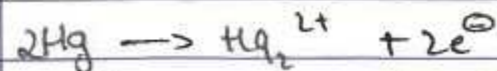
$\ln = 2.303 \log$

At 298K,  $R = 8.314$

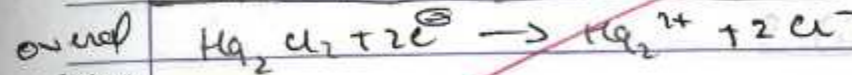
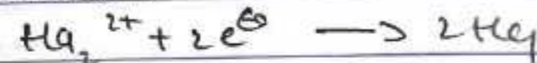
$F = 96500$

$\therefore E = E^\circ - \frac{0.0591}{n} \log [Mn^+]$

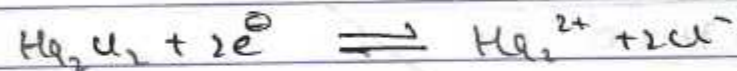
b. when H act as anode.



when it acts as Cathode.



The Net cell reaction:-



c.

3.

a. GCV of a fuel is defined as the <sup>total</sup> amount of heat released by one unit mass or one unit volume of fuel is burnt completely in presence of excess of air or oxygen and allows the products of combustion to cool at room temperature.

NCV of a fuel is defined as the net amount of heat released by one unit mass or one unit volume of fuel is burnt completely in presence of excess of air or oxygen and allows the product of combustion to escape out.

fuel taken  $x = 0.76 \times 10^{-3} \text{ kg}$

Water taken in calorimeter =  $2.5 \text{ kg} = W_1$

Water Equivalent to the calorimeter =  $0.486 \text{ kg} = W_2$

temperature  $t_1$  &  $t_2$  respectively =  $25^\circ\text{C}$  &  $28^\circ\text{C}$

Specific heat =  $4.187 \text{ kJ/kg}^\circ\text{C}$



% of H = 12.5  
Latent heat = 2457 kJ/kg

$$HCV = \frac{(W_1 + W_2)(T_2 - T_1) S}{X}$$

$$Q = \frac{(0.5 + 6.486)(28 - 25) 4.187}{0.76 \times 10^{-3}}$$

$$\frac{2.986 \times 3 \times 4.187}{0.76 \times 10^{-3}}$$

$$\frac{37.50714 \times 10^3}{0.76}$$

$$= 49.3515 \times 10^3$$

$$49351.51 \text{ kJ/kg}^\circ\text{C}$$

$$NCV = HCV - 0.09H \times L$$

$$49351.51 - 0.09(12.5)(2457)$$

$$49351.51 - 0.10935$$

$$= 49351.40065 \text{ kJ/kg}$$

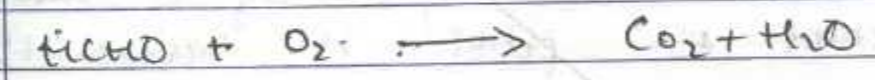
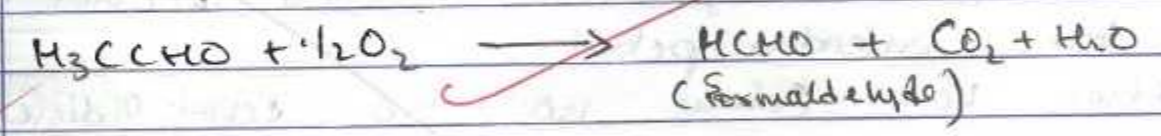
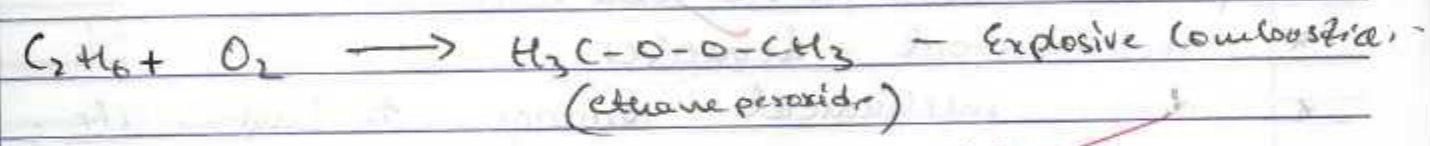
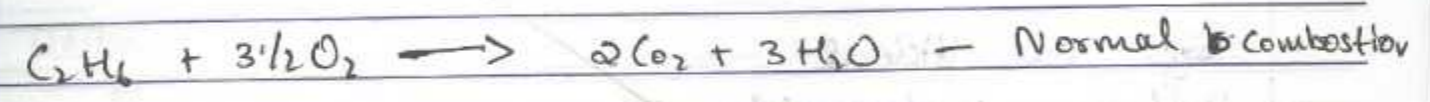
b.  
c.

4.  
a.



b. Knocking is the Undesirable noise or rattling sound produced by an IC Engine when it undergoes Explosive Combustion.

Mechanism.



During normal Combustion, a few oxygen molecules are formed which are combined with hydrocarbons. These hydrocarbons combine with adjacent hydrocarbons which undergo complete and smooth combustion of fuel.

But during Explosive Combustion, first forms ethane peroxide which readily decomposes to form acetaldehyde and later gets converted into formaldehyde and later into CO<sub>2</sub> and H<sub>2</sub>O. So a no. of oxides are formed which produces



Shock wave And the gas molecules hit the parts of the I.C. Engine by producing rattling sound or undesirable noise called Knocking.

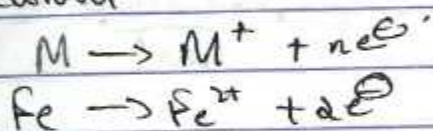
Effects:

- \* ~~low~~ low efficient
- \* Produces Undesirable ~~noise~~ noise
- \* Power Output decreases
- \* does mechanical damage to Engine. etc.
- \* Power Output is good when added alcohol to ~~one lead~~ unleaded petrol.
- \* Alcohol has Cetane no. 20. Petrol which has Cetane no. 60-70. So by adding a small amount of ethyl alcohol to petrol. it increase the Cetane no.
- \* when added anti-knocking agents, it results in good emission.
- \* By mixing power Alcohol (20%) to ~~petrol~~ unleaded petrol it becomes more efficient.
- \* Renewable sources are added to power alcohol for increased output.

Internal

1.a. Destruction of deterioration and consequent loss of metal by chemical or electrochemical attack by the Environment is called Corrosion.

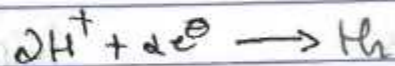
\* Anodic reaction: here oxidation of metal takes place. i.e. metal gets converted into their ions by liberating electrons.



Cathodic reaction:

\* liberation of hydrogen in the absence of oxygen.

→ If the solution is deaerated and acidic.

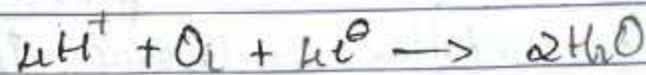


→ If the solution is deaerated and neutral.



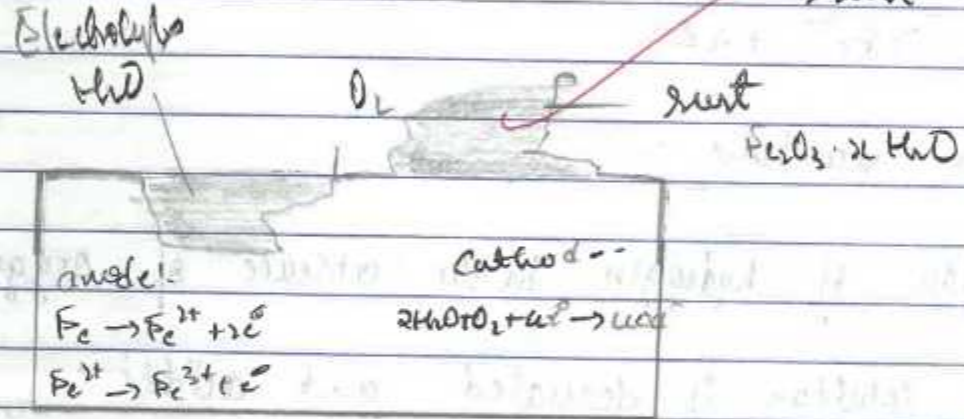
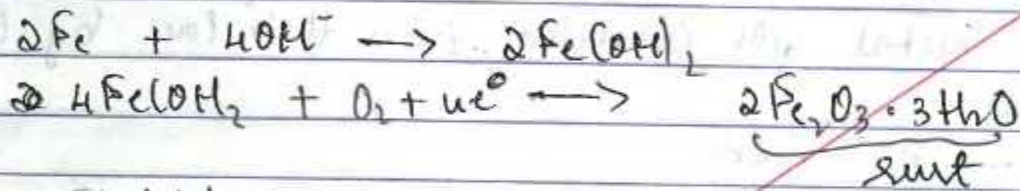
\* ~~liberation~~ absorption of oxygen in the presence of oxygen.

→ If the solution is acidic.



→ If the solution is neutral  
 $2H_2O + O_2 + 4e^- \rightarrow 4OH^-$

Corrosion of Iron



Particulars	Cyanide bath	Sulphate bath
* bath composition	20g of Chromic acid + 2.5g of H <sub>2</sub> SO <sub>4</sub> per dm <sup>3</sup>	200g of Chromic acid + 20g of H <sub>2</sub> SO <sub>4</sub> per dm <sup>3</sup>
* required Temperature	20-40 °C	20-40 °C
* Current density	20-40 mA/cm <sup>2</sup>	30-60 mA/cm <sup>2</sup>
* Anode	Insoluble Pb-Sn alloy with PbO <sub>2</sub> coating	Insoluble Pb-Sn alloy with PbO <sub>2</sub> coating
* Cathode	Substrate to be coated	Substrate to be coated

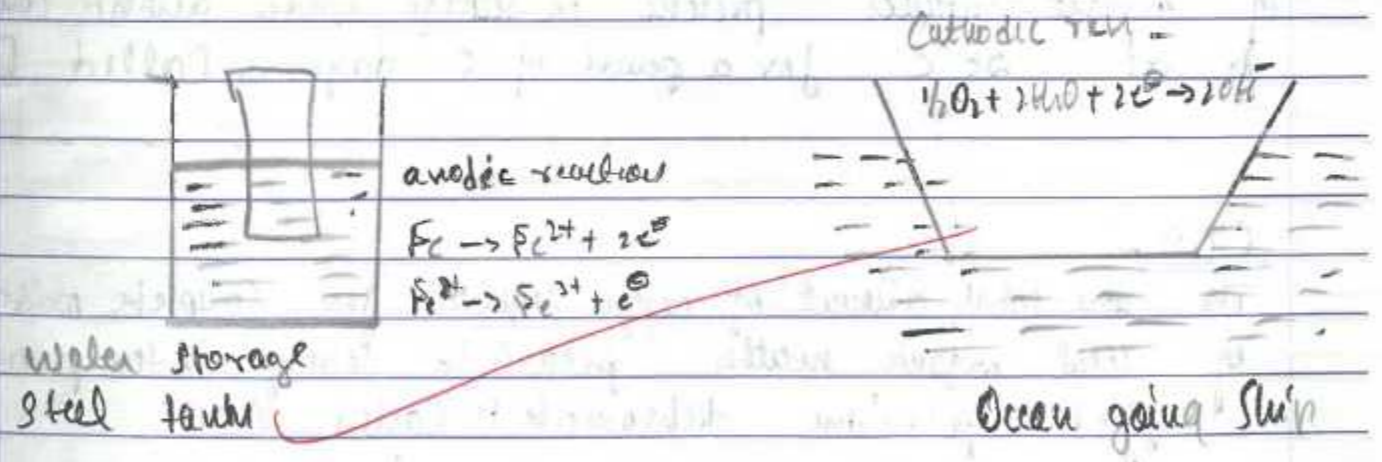
Electroplating of Chromium is done in the presence of chromic acid solution where the oxidation of Chromic is (VI). The Chromium must be reduced to a oxidation (III), when finally the Chromium is reduced to a oxidation of (III) it is in

the form of molten Chromium.  
 Chromium (VI) → Chromium (III) → Molten Chromium

Applications

- \* Black Chromium is used as operating heaters etc.
- \* efficient coating on solar energy panels.

c. Waterline Corrosion - Waterline corrosion is basically a form of differential aeration corrosion. Waterline corrosion is formed exposure of metal in differential oxygen concentration and found in can like Ocean going ships and water storage steel tanks.



In Water storage tanks, Corrosion occurs due to the exposure of metal to the dissolved oxygen present in water. The part of the metal which is less aerating to the atmosphere i.e. inside the water acts as anode and the part of the metal which is highly exposed to the atmosphere acts as Cathode. The anodic part

undergoes Corrosion which results in formation of rust. When a Cathodic part is unattached. A brown line is formed just below the water line due to corrosion by rust formation. But in Ocean going ships, No differential aeration Corrosion takes place, due to height of ship inside the water. The part of the ship inside the water and above the water the Corrosion is small and hence negligible. So the Ocean going ship does not undergo differential aeration Corrosion.

A. Biological oxygen demand:-

The amount of oxygen required for the biological oxidation of organic matter present in sewage, under aerobic condition at 25°C for a period of 5 days, is called BOD.

COD:-

The total amount of oxygen required for complete oxidation of total organic matter present in sewage in the presence of Acidified potassium dichromate is called COD.

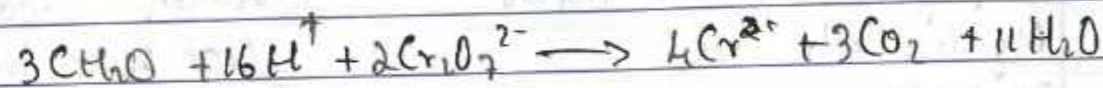
Experimental Method:-

Principle:-

The main aim is to add excess of standard solution of potassium dichromate acidified with sulphuric acid to a well known sample and back titrating the excess of

Potassium dichromate against Standard Ferrous ammonium solution using Ferrous as indicator.

General Equation:-



Procedure:-

- To a well measured volume of waste water sample, add 10cm<sup>3</sup> of 0.02N K<sub>2</sub>Cr<sub>2</sub>O<sub>7</sub> and followed by 30cm<sup>3</sup> of 6N H<sub>2</sub>SO<sub>4</sub>.
- Add 1g of Ag<sub>2</sub>SO<sub>4</sub> followed by HgSO<sub>4</sub>.
- Attach a reflux to the Condenser and reflux the contents for 2 hours.
- Cool and titrate the excess potassium dichromate solution against Standard FAS solution until its colour changes from bluish green to reddish brown.
- Then <sup>Blank</sup> titrate the solution by using freshly distilled water inst. place of waste water sample.

$$\text{COD of Sample} = \frac{8000(B-A)N}{V} \text{ mg/dm}^3$$

where-

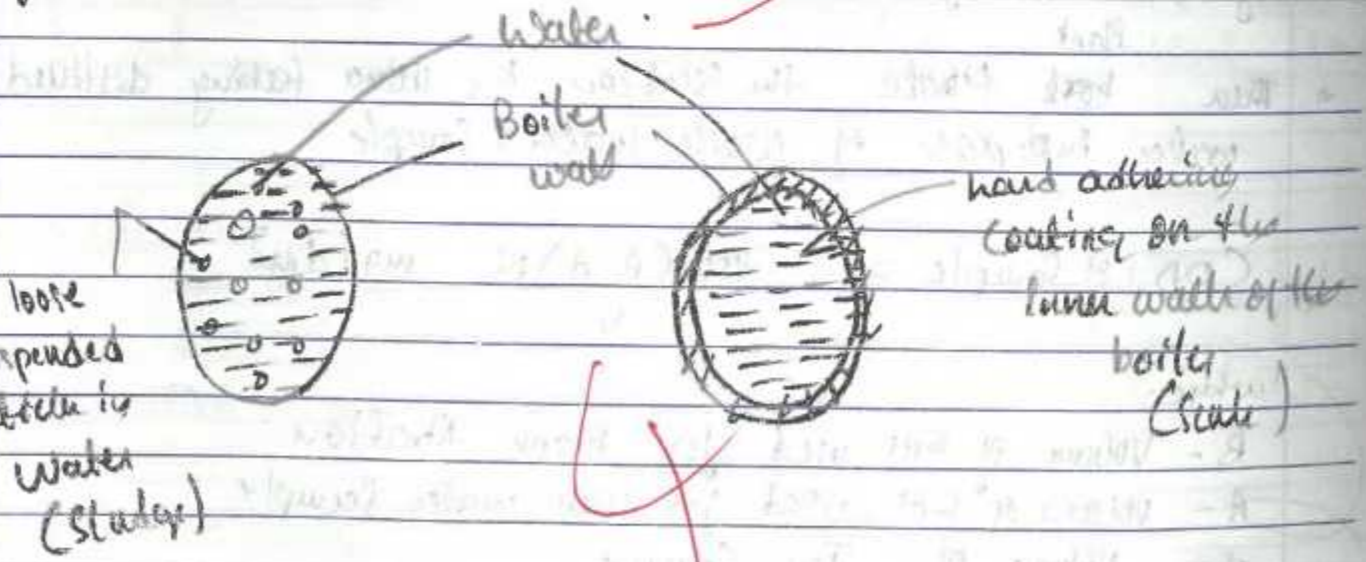
- B - Volume of FAS used for Blank titration.
- A - Volume of FAS used for waste water sample.
- V - Volume of Test Sample.
- N - Normality of FAS

**Sludge**

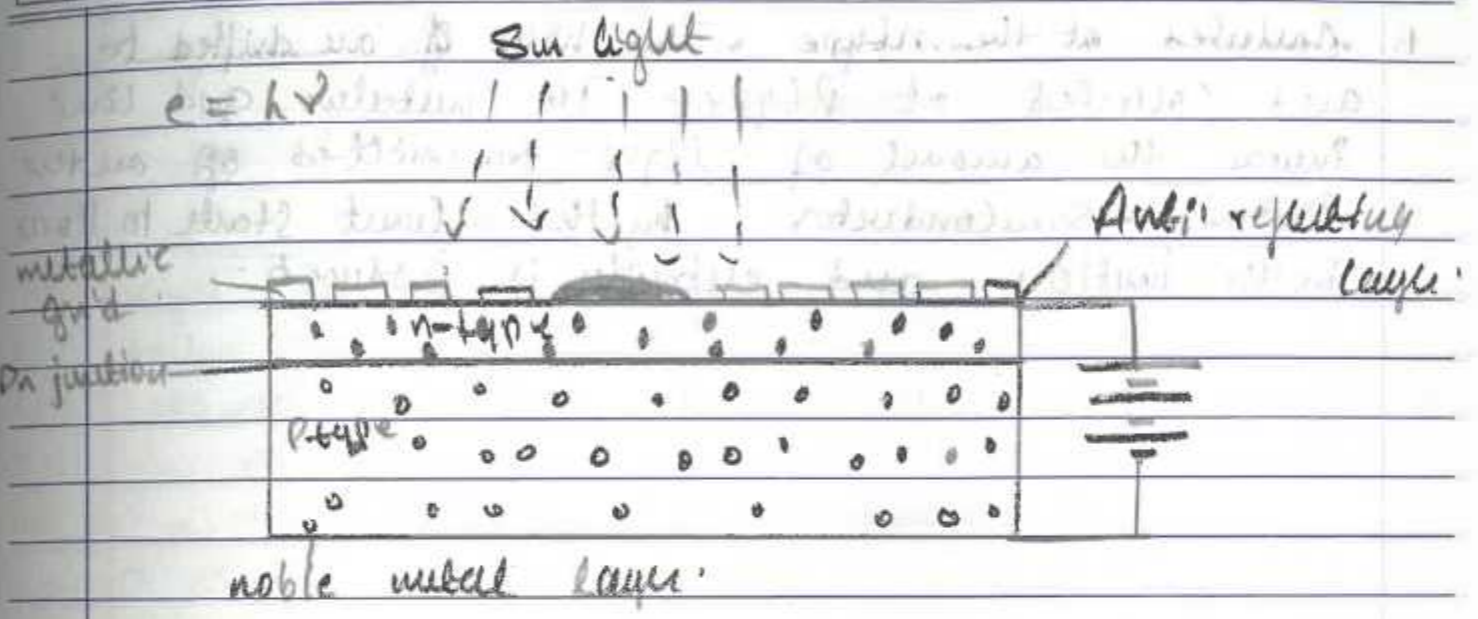
- It is a loose, flaky and non-adherent precipitate.
- The main components of sludge formation are  $MgSO_4$ ,  $MgCl_2$ ,  $CaCl_2$  etc.
- Disadvantage!** Sludge is a poor conductor of heat. Hence even if sludge formation reduces the efficiency of the boiler.
- Prevention!** formation of sludge can be prevented by blow down operation. blow down operation is the process of removing a portion of concentrated water frequently during steam formation.

**Scale**

- It is hard and adherent coating.
- The main components of scale formation are  $MgCO_3$ ,  $CaCl_2$ ,  $CaHCO_3$  etc.
- Disadvantage!** Scales are insulators of heat, hence formation of scales decrease boiler efficiency. Any cracks developed on the scales lead to explosion of boiler.
- Prevention!** It can be prevented by adding water like HCl solution. It can be prevented by using 1) internal method 2) external method.



Construction and working of PV cell.



The device which converts solar energy into electrical energy is known as PV cell.

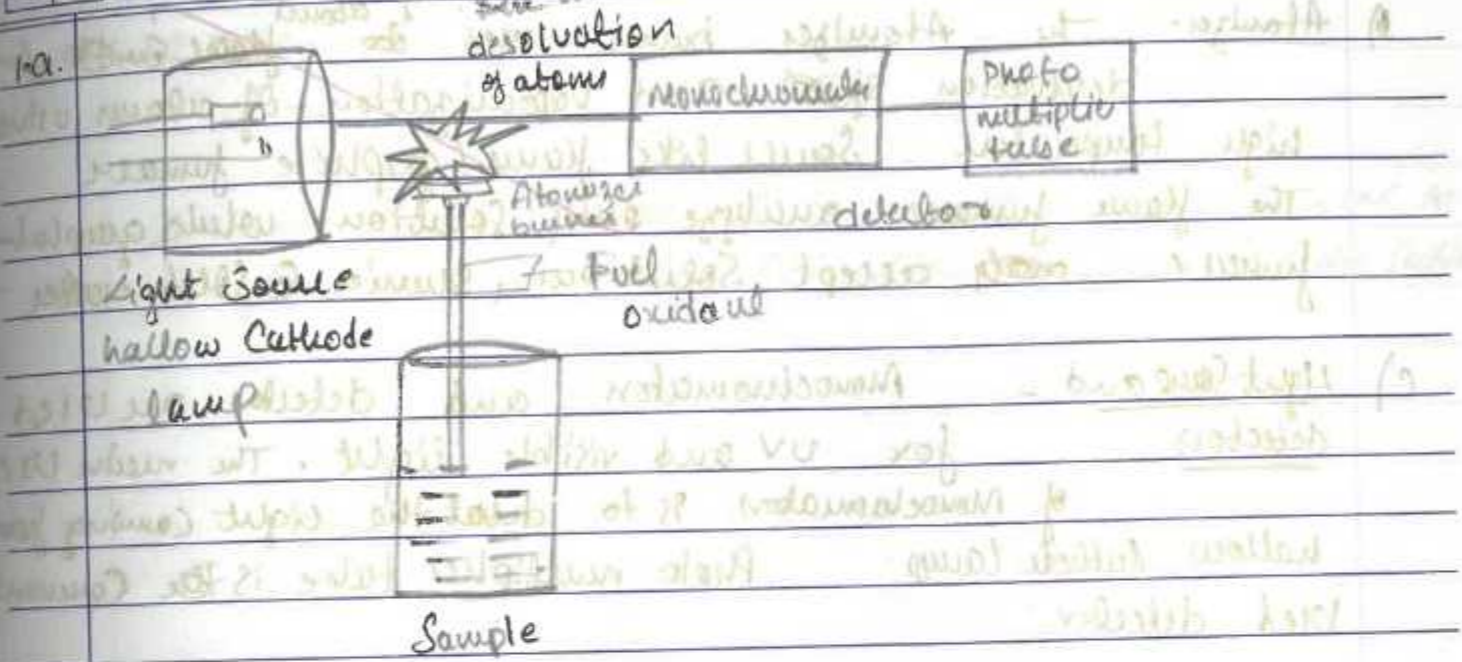
**Principle!** PV cells generally work on the principle of photo-voltaic effect. It is the generation of electricity due to absorption of sunlight which falls on the semiconductor.

Construction and working - +

PV cell consists of a ultra thin layer of phosphorus doped (n-type) silicon on top of boron doped (p-type) silicon. This creates a p-n junction between the two. The metallic grid lines increase the amount of light transmitted on the semiconductor between the grid line. When the sunlight falls on the p-n junction,  $e^-$  hole pair are formed to absorption of sunlight. The  $e^-$  holes are drifted to and

collected at the n-type. The holes of are drifted to and collected at p-type. The net electric field line increase the amount of light transmitted on the surface semiconductor. by this current starts to flow in the junction and electricity is produced.

### III INTERNALS



Theory - Monochromator having frequency of radiation ( $\nu$ ) incident on a molecule, with the molecule in ground state, it undergoes transition from lower energy level to higher energy level, which indicates that intensity is reduced:

$$ie, \Delta E = h\nu$$

The Energy level difference is given by:

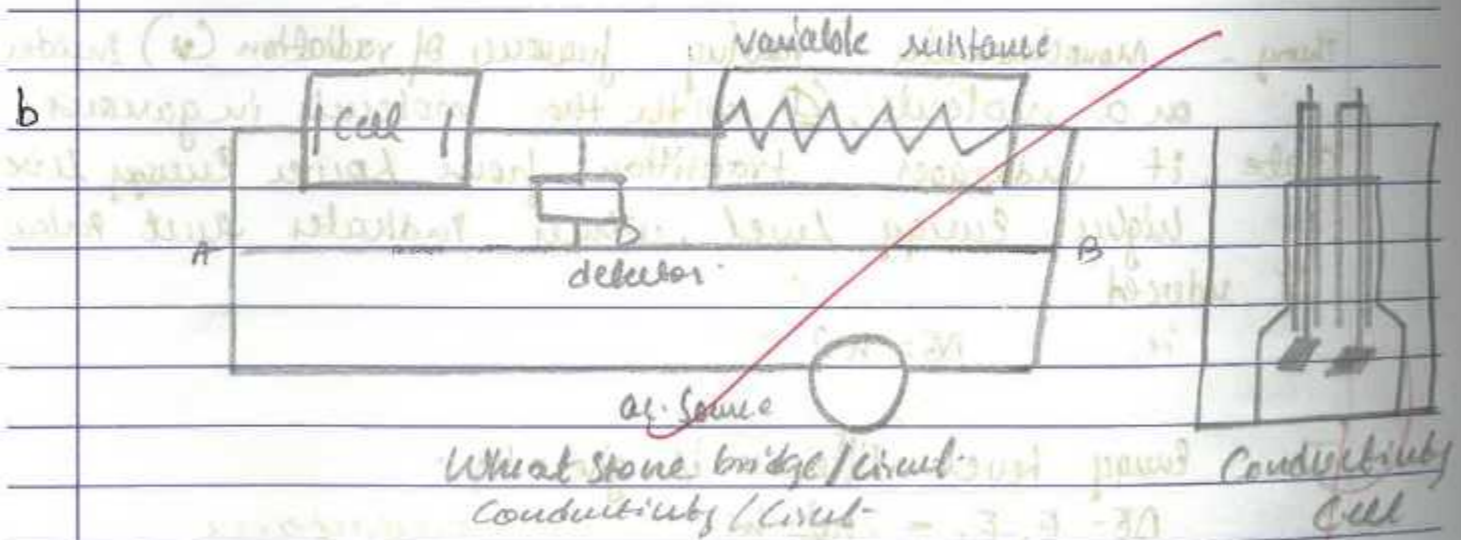
$$\Delta E = E_2 - E_1 = h\nu = hc/\lambda$$

#### Instrumentation:

a) Light source :- Light source is basically the hollow cathode lamp being measured. Since lasers have the intensity to excite the atoms from higher energy level, it uses AA spectrometer and Absorption fluorescent materials.

b) Atomizer - The Atomizer burner used <sup>analyze about</sup> ~~is~~ ~~used~~ for desolvation ~~of~~ and vaporization of ~~about~~ using high temperature. Some like flame / graphite furnace. The flame furnace analyze ~~only~~ solution while graphite furnace ~~only~~ accept solution, slurry & solid matter.

c) Light Source and detectors - Monochromator and detector are used for UV and visible light. The main use of Monochromator is to direct the light coming from hollow cathode lamp. Photo multiplier tube is ~~the~~ commonly used detector.



Conductometry is the measure of ability of a solution to carry electron. Conductivity solution conduct current due to migration of ions under the influence of electric field. Like all metals it obeys Ohm's law  $E = IR$ .

$E =$  Applied potential ;  $I =$  Current ;  $R =$  Resistance

The reciprocal of resistance is conductance.

S.I Unit:  $\text{ohm}^{-1} \text{cm}^{-1}$ .

$$C = \frac{l}{R \cdot a}$$

Resistance of any material is directly proportional to length and inversely proportional to area of cross section.

$$R \propto \frac{l}{a}$$

$$\rightarrow E = IR$$

$$C = \frac{l}{R \cdot a}$$

$$R \propto \frac{l}{a}$$

$C =$  Specific resistance

$$\rightarrow C = \frac{l}{R \cdot a}$$

$$C = \frac{l \cdot a}{l \cdot l}$$

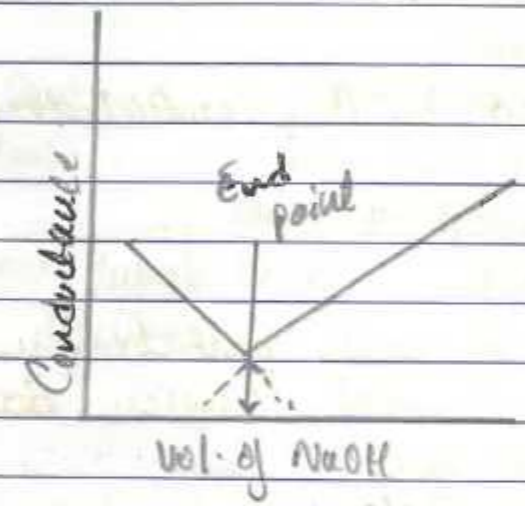
$\frac{1}{C} = k$ , Specific conductance

$$C = \frac{k \cdot a}{l}$$

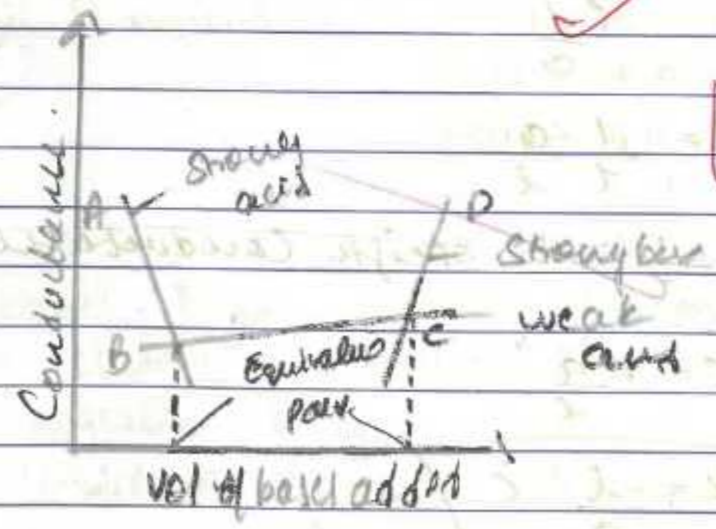
$$k = \frac{l \cdot C}{a}$$

Applications

1) Strong acid with Strong base.  
 $HCl + NaOH \rightarrow NaCl + H_2O$



2) Mixture of Strong acid, weak acid with Strong base.



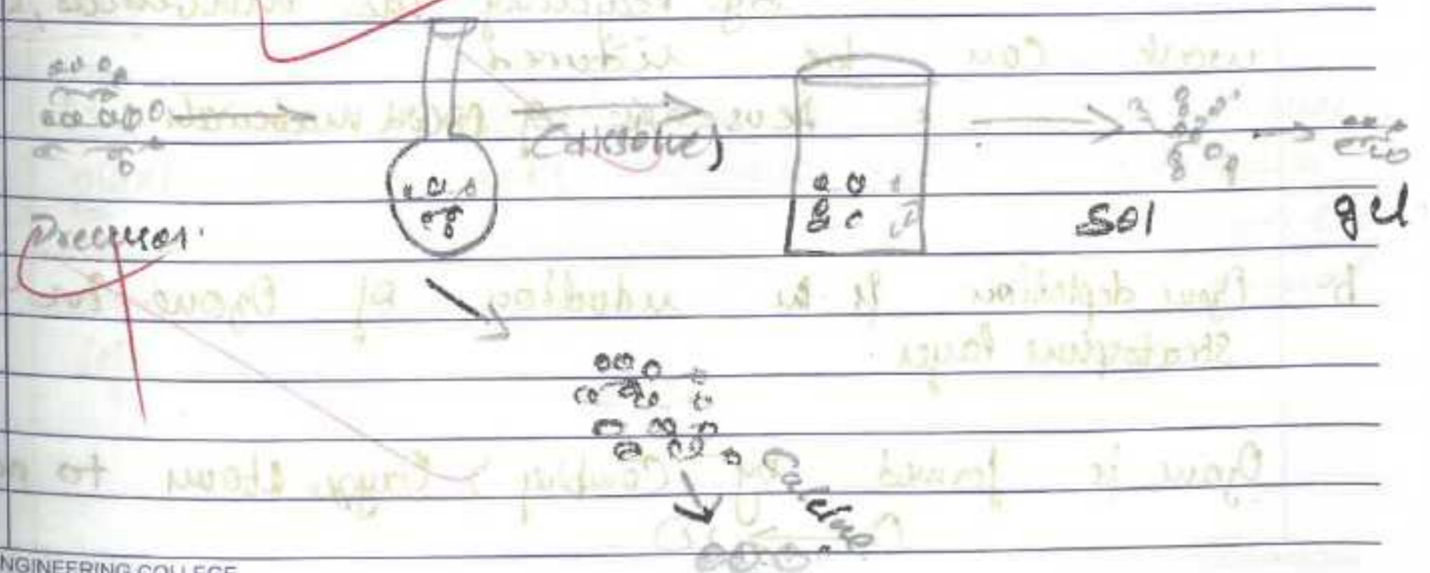
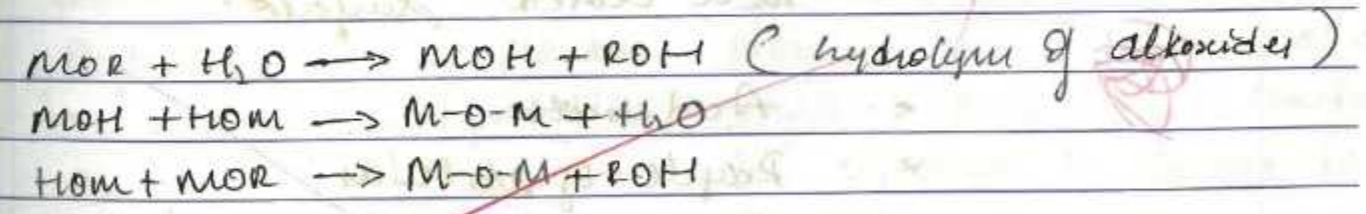
c. Sol-gel method.

It mainly consists of two phases. Dispersed phase in micro niter and disperse medium.  
 Main steps involved are:

- $\rightarrow$  hydrolysis of Precursor.
- $\rightarrow$  Condensation followed by Poly Condensation.
- $\rightarrow$  Drying to get Solid.

The starting materials of nano particle are called as Precursor. Precursor must chosen ~~the~~ as they have to be in gel.

Oxide Ceramics include the ~~pro~~ steps below:





3a. Solid waste.

Source: Solid waste is mainly generated from human beings. Other remedial source are from factories, Industries, paper mills etc.

Effects: It widely affects the ecosystem and the surrounding by dumping solid garbage all around in an open space. It causes large area, thereby cutting down / deforestation of trees, plants taken place.

Disposal methods:   
 \* Incineration: - By collecting all the garbage dump and burning them by doing incineration in a closed surface.

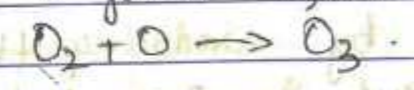
- \* Acid bath
- \* Recycle of materials: - By recycling the materials, solid waste can be reduced.
- \* Reuse of solid materials.

b. Ozone depletion is the reduction of Ozone in the stratosphere layer.

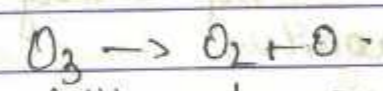
Ozone is formed by combining 2 Oxygen atoms to molecule.  $O_2 \rightarrow 2O$



\* The formed oxygen molecules are then further with oxygen to form Ozone.



\* The Ozone formed then breaks down into oxygen molecules due to depletion.



CFC's from refrigerant, aerosols & foam also are other sources for ozone depletion.

Effects:

- \* UV-B rays on human beings adversely affects by causing skin disorder, Cataracts which leads to mutation and paralysis.
- \* UV-B rays on marine life is very dangerous because, Phytoplankton, Zooplankton play a very important role in marine life by providing light. Marine life is dependent on the base of food chain, so affecting it is very dangerous.

UV-B rays on plants is also very dangerous because, plants play a very important role in food chain. It causes low quality crop, shorter leaves etc. which is also a problem to human & animal life as well.





Remedial measures:

- Some measures are by reducing the usage of automobiles which play a huge part in ozone depletion and use Eco friendly vehicles
- \* It can also be reduced by using high Centane/octane rate petrol in automobile.
- Regular cleaning of chimneys of industries reduces the damage to ozone depletion.

2) Photo-chemical smog is the mixture of fog + smoke and first found in Los Angeles. It is caused due to reaction of Nitrogenous compound & hydrocarbon in the atmosphere.

Mechanism:

