

Time: 3 Hours

Max Marks: 70

Answer ONE Question from each Unit

All Questions Carry Equal Marks

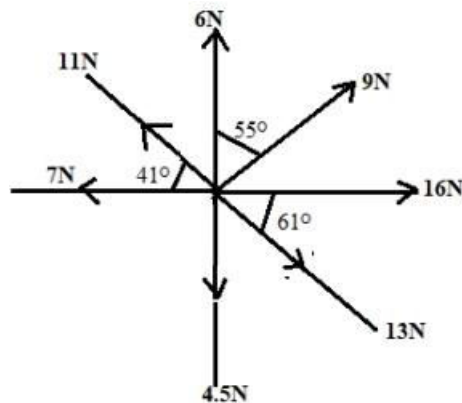
All parts of the Question must be answered at one place

UNIT-I

Marks CO BTL

1. Figure below shows concurrent coplanar forces, by the use of an accurate body force diagram. Resolve the forces and also calculate magnitude and direction of the resultant.

14 CO1 L2

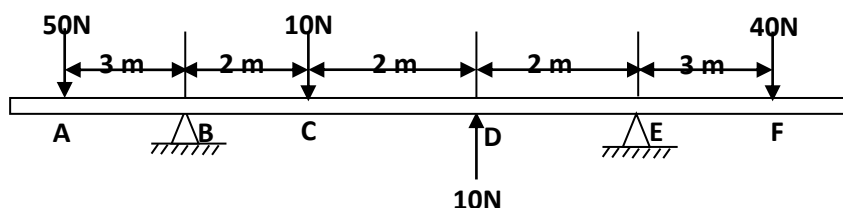


(OR)

2. a) Write the classification of force system. 06 CO1 L2
 b) Two forces of 80N and 60N are acting at an angle 60° . Determine the magnitude and direction of resultant of these two forces 08 CO1 L2

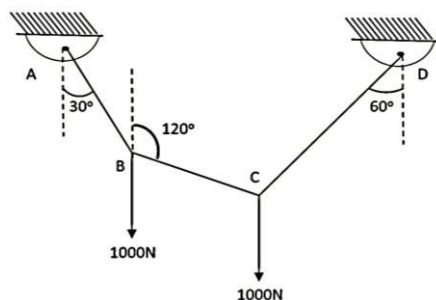
UNIT-II

3. Determine the reactions exerted at 'B' and 'E' for the problem shown below 14 CO2 L2



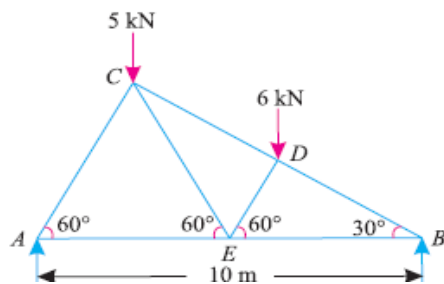
(OR)

4. A string ABCD, attached to fixed points A and D has two equal weights of 1000N attached to it at B and C the weights rest with the portions AB and CD inclined at angles as shown in figure. Find the tensions in the portions AB, BC and CD of the string if the inclination of the portion BC with the vertical 120°



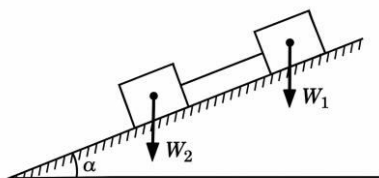
UNIT-III

5. A truss of span 10m is loaded as shown in figure. Find the forces in all the members of the truss



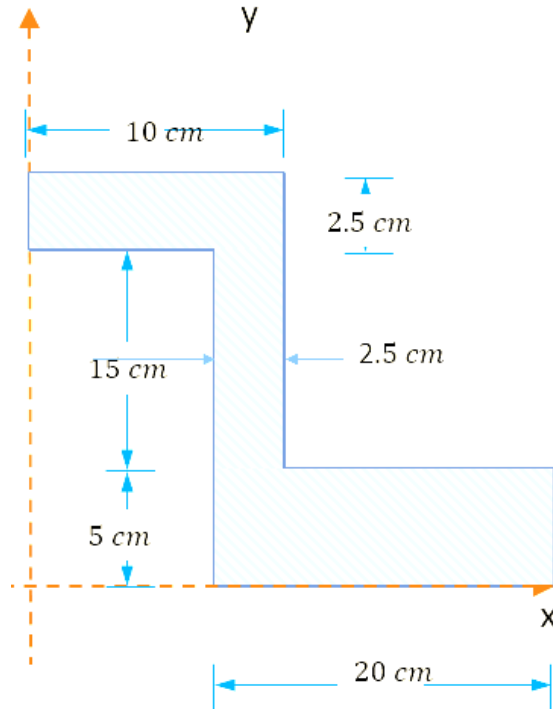
(OR)

6. a) Explain the following
 (a) Laws of dry friction (b) Concept of limiting friction
- b) Two blocks of weight $W_1 = 50 \text{ N}$ and $W_2 = 50 \text{ N}$ rest on a rough inclined plane and connected by a string as shown in Fig. The coefficients of friction between the inclined plane and W_1 and W_2 are $\mu_1 = 0.3$ and $\mu_2 = 0.2$ respectively. Find the inclination of the plane for which slipping will impend.



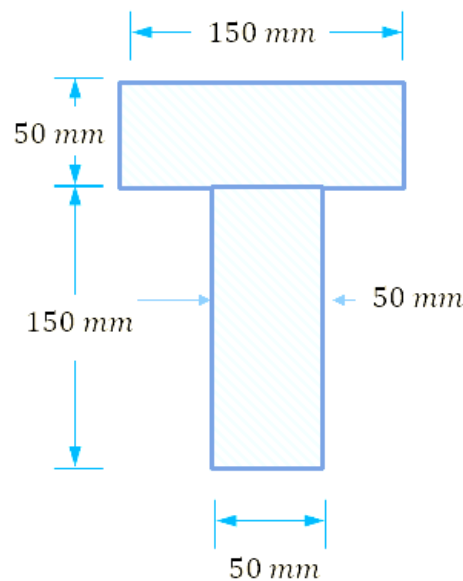
UNIT-IV

7. Determine the centroid of the cross-sectional area of a Z- section as shown in figure. 14 CO4 L4



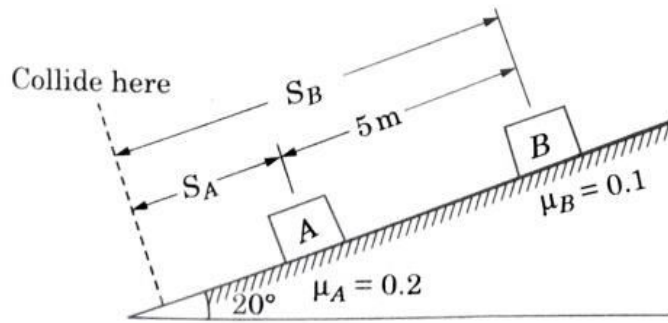
(OR)

8. Determine the moment of inertia of the section as shown in figure 7 about horizontal and vertical axes passing through the centroid of the section. 14 CO4 L4



UNIT-V

9. Two blocks A & B are held on a inclined plane 5 m apart as shown in fig. The coefficients of friction between the blocks A, B and the inclined plane are 0.2 & 0.1 respectively. If the blocks begin to slide down the plane simultaneously, calculate the time & distance travelled by each block before collision.

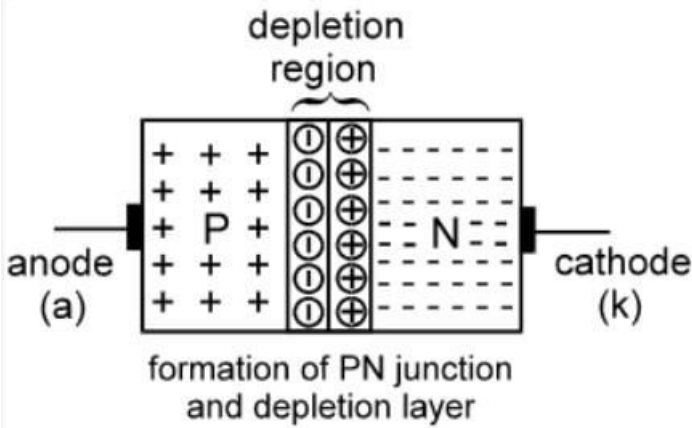
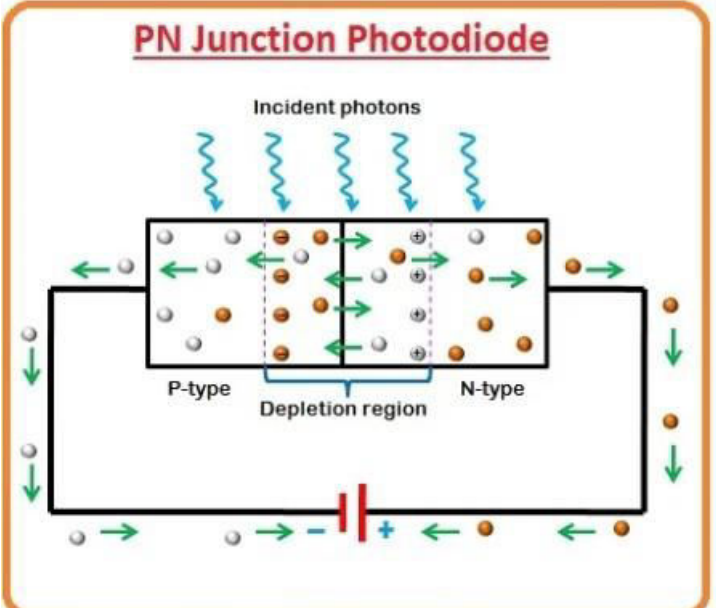
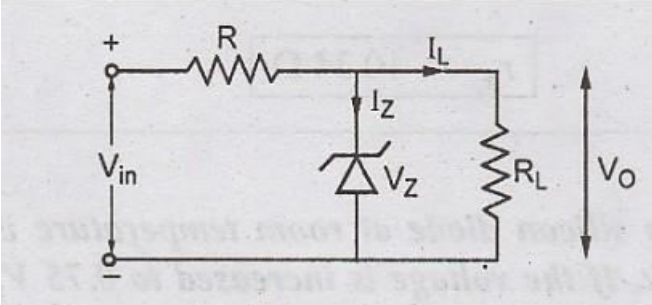


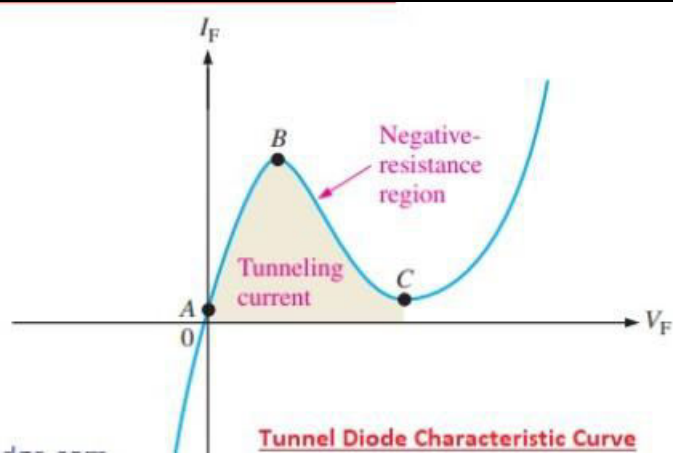
(OR)

10. a) Explain the concept of D'Alemberts principle? 6 CO5 L4
- b) The x and y components of the displacement in meters of a point are given by the equation $x = 4t^2 - 3t$ and $y = t^3 - 10$. Determine the velocity and acceleration of the point in x and y directions and its resultant when $t = 2$ sec 8 CO5 L4

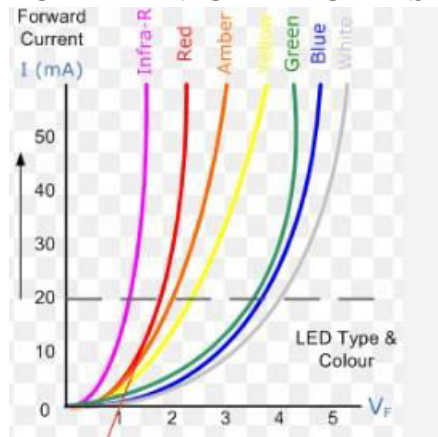
**ELECTRONIC DEVICES AND
CIRCUITS**

(Common to EEE & ECE Branches)

1.	a)	PN Junction Diagram -3M Explanation-Forward bias 2M, Reverse bias 2M 	M
	b)	Photodiode construction: 3 Marks Working Mechanism-2M Applications: 2 Marks 	
2.	a)	Zener diode Voltage regulator diagram: 3 Marks Voltage Regulator Explanation: 4 Marks 	
	b)	Tunnel diode I-V characteristics and its explanation: 4 Marks LED I-V characteristics and its explanation: 3 Marks	



FOR LED IV CHARACTERISTICS NO NEED TO DRAW FOR DIFFERENT COLORS:



3. a) Bridge wave circuit: 2 Marks
 Bridge wave explanation: 3
 Bridge wave output waveforms: 2

⇒ Bridge Rectifier:-

A Bridge rectifier is a type of full-wave Rectifier used to convert AC to DC using four diodes arranged in a bridge configuration. It allows both halves of the AC input wave form to be used for producing DC output.

*Bridge Rectifier doesn't require a center tap arrangement

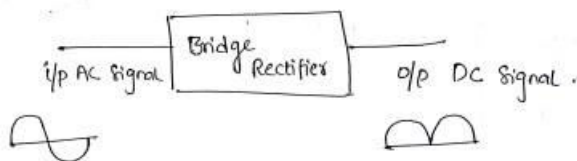


fig:- Basic block diagram of bridge Rectifier

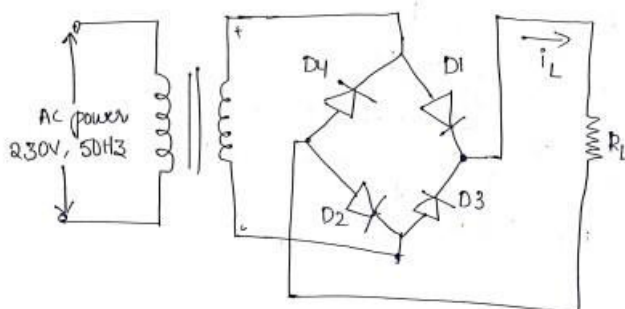


fig:- Circuit diagram of bridge Rectifier

Operation of Bridge Rectifier -

During the positive half cycle of AC input voltage, the diodes D1 and D2 will be forward biased. But the diodes D3 and D4 will be Reverse biased.

Current flowing through the D1 to R_L to D2 to source in one direction.

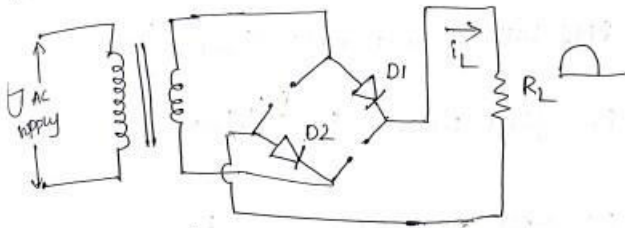


Fig:- During positive half cycle of bridge rectifier

During the negative half cycle of AC input voltage, the diodes D3 & D4 will be forward biased. But the diodes D1 & D2 will be Reverse biased.

Current flowing through the D4 to R_L to D3 to source in one direction.

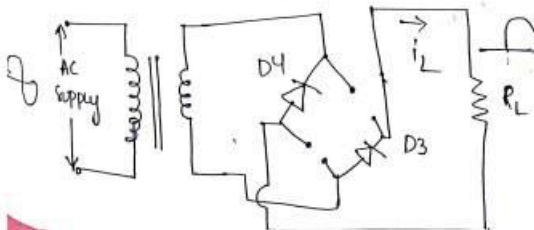
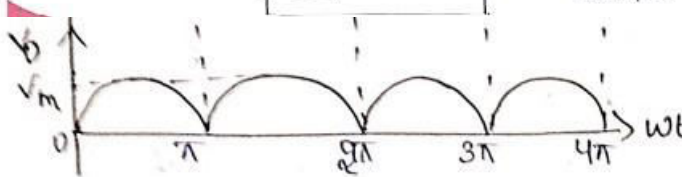


Fig: During negative half cycle of bridge Rectifier



- b) Ripple factor derivation: 4 Marks
Efficiency derivation: 3 Marks

1) Ripple Factor:-

Ripple factor is given by General Expression

$$r = \frac{V_{(RMS)ac}}{V_{dc}} \Rightarrow r = \frac{I_{(RMS)ac}}{I_{dc}}$$

$$\frac{V_{(RMS)ac}}{V_{dc}} = \frac{I_{(RMS)ac}}{I_{dc}}$$

$$I_{RMS} = \sqrt{I_{(RMS)ac}^2 + I_{dc}^2}$$

$$\frac{I_{RMS}}{I_{dc}} = \sqrt{\frac{I_{(RMS)ac}^2}{I_{dc}^2} + 1} = \sqrt{1 + \frac{I_{(RMS)ac}^2}{I_{dc}^2}}$$

$$\frac{I_{(RMS)ac}}{I_{dc}} = \sqrt{\left(\frac{I_{RMS}}{I_{dc}}\right)^2 - 1}$$

$$= \sqrt{\left(\frac{\frac{I_m}{\sqrt{2}}}{\frac{2I_m}{\pi}}\right)^2 - 1} \quad \left(\because I_{RMS} = \frac{I_m}{\sqrt{2}}\right)$$

$$\quad \left(\because I_{dc} = \frac{2I_m}{\pi}\right)$$

$$\frac{I_{(RMS)ac}}{I_{dc}} = \sqrt{\frac{\frac{I_m^2}{2}}{\frac{4I_m^2}{\pi^2}} - 1}$$

$$= \sqrt{\frac{I_m^2 \pi^2}{8I_m^2} - 1}$$

$$r = \sqrt{\frac{\pi^2}{8} - 1} = 0.48$$

$r = 0.48$ for full-wave Rectifier

Efficiency :- (η)

Efficiency of a rectifier can be defined as the ratio of DC power delivered to the load to the AC input power from the secondary winding of the transformer.

$$\eta = \frac{P_{dc}}{P_{ac}} = \frac{\text{DC power delivered to load}}{\text{AC input power from the secondary winding}}$$

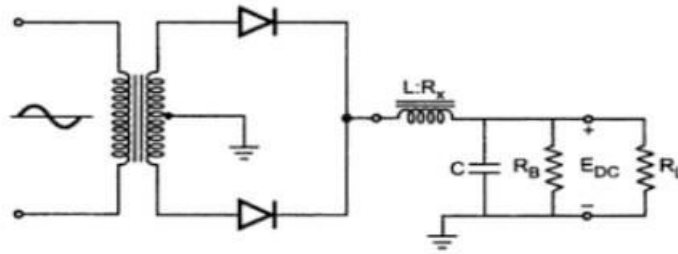
$$\eta = \frac{\frac{4I_m^2}{\pi^2} \times R_L}{\frac{I_m^2}{2} (R_L)} = \frac{8R_L}{\pi^2 (R_L)}$$

$$= \frac{8}{\pi^2} = 0.812$$

$$\eta = 0.812$$

$$\boxed{\eta\% = 81.2\%}$$

4. a) LC filter circuit: 2 Marks
Ripple factor derivation: 4 Marks



Hence the ripple factor is given by,

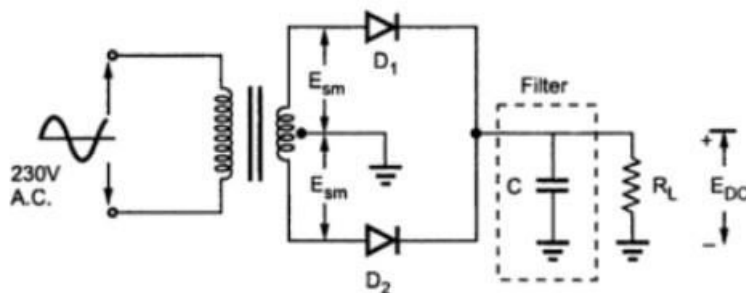
$$\begin{aligned} \text{Ripple factor} &= \frac{E_{2\text{rms}}}{E_{\text{DC}}} \\ &= \frac{E_{\text{sm}}}{3\sqrt{2}\pi\omega^2 LC} \times \frac{1}{\frac{2}{\pi} \frac{E_{\text{sm}}}{1 + \frac{R_x}{R}}} \\ &= \frac{1}{6\omega^2 LC\sqrt{2}} \left(1 + \frac{R_x}{R} \right) \end{aligned}$$

but $R_x \ll R$

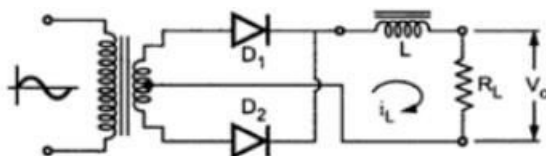
$$\therefore \text{Ripple factor} \approx \frac{1}{6\sqrt{2}\omega^2 LC}$$

b) C filter: 3 Marks
L filter: 2 Marks
 Π filter: 2 Marks

C filter:



L filter:



LC filter:

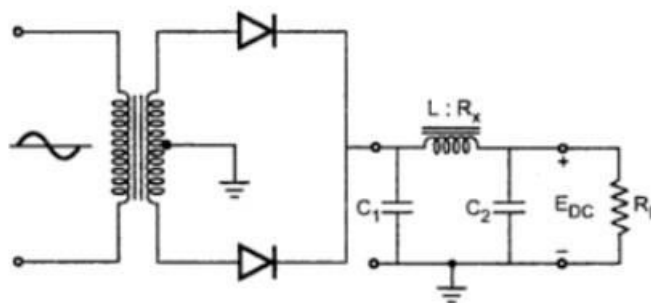


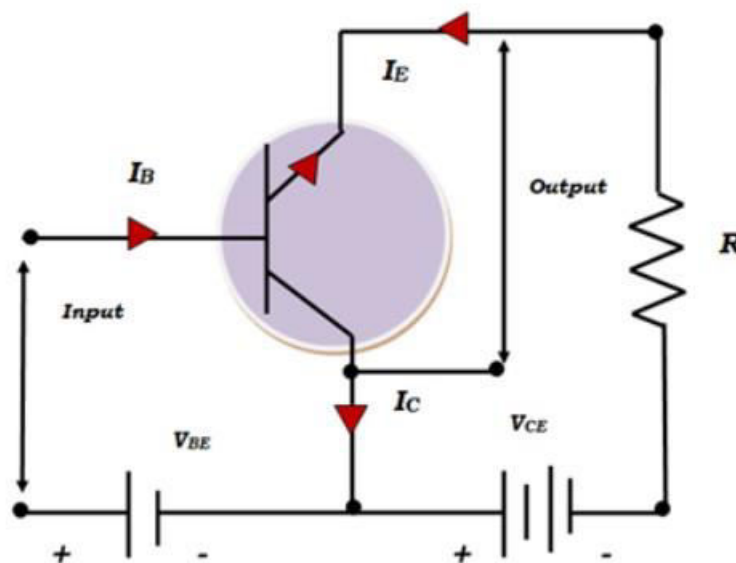
Fig. 1.26 π type filter

Comparison:

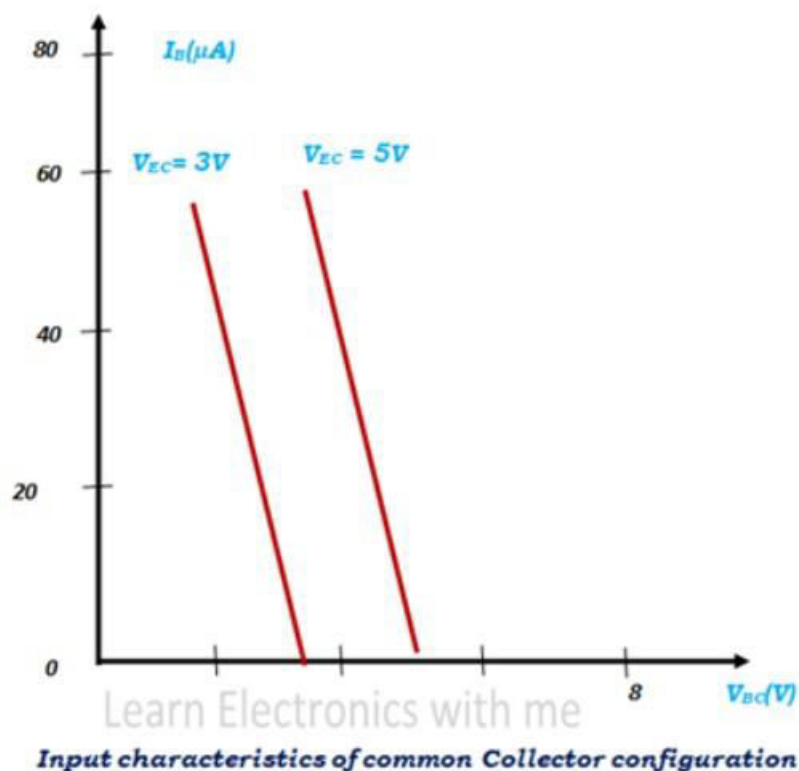
Parameter	Type of filter			
	L	C	LC	π
$E_{DC}(\text{no load})$	$0.636 E_{sm}$	E_{sm}	E_{sm}	E_{sm}
$E_{DC}(\text{load } I_{DC})$	$0.636 E_{sm}$	$E_{sm} - \frac{I_{DC}}{4fC}$	$0.636 E_{sm}$	$E_{sm} - \frac{I_{DC}}{4fC}$
Ripple factor (γ)	$\frac{R_L}{3\sqrt{2}\omega L}$	$\frac{1}{4\sqrt{3}fRC}$	$\frac{1}{6\sqrt{2}\omega^2 LC}$	$\frac{\sqrt{2}}{8\omega^3 LC_2 R_L}$
PIV	$2 E_{sm}$	$2 E_{sm}$	$2 E_{sm}$	$2 E_{sm}$

Key Point: Above comparison is for full wave rectifiers with filters and diode, transformer and filter element resistances are neglected.

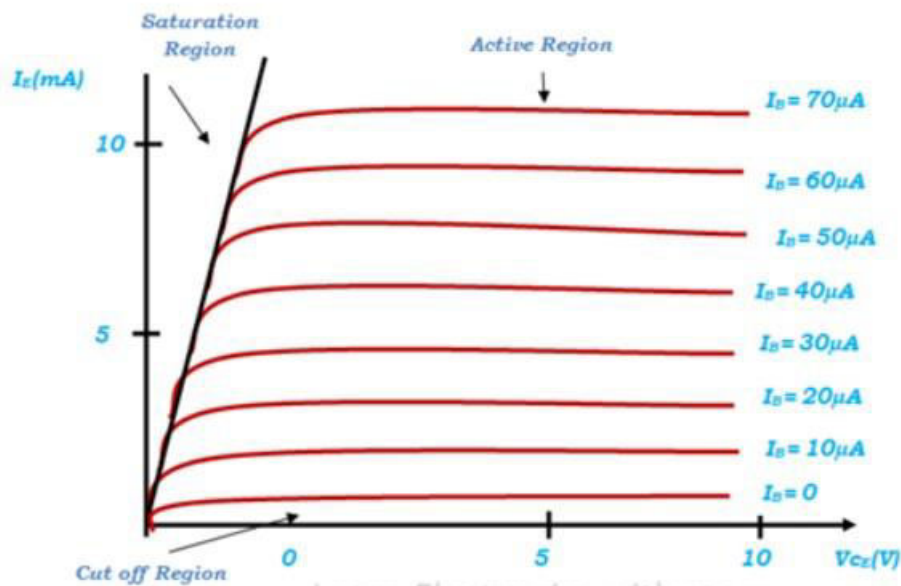
5. a) Common collector circuit: 2 Marks
Output characteristics: 2 Marks
Explanation: 3 Marks



INPUT Characteristics:



Output characteristics:



- b) α β γ Definitions: 3M
Derivation of relation among α β γ : 4 Marks

for an NPN common emitter

$$I_E = I_B + I_C \quad \text{--- (1)}$$

In Common Base Transistor

$$\text{Current gain} = \frac{\text{o/p current}}{\text{i/p current}} = \frac{I_C}{I_E}$$

$$\alpha = \frac{I_C}{I_E}$$

In Common Emitter transistor

$$\text{Current gain} = \frac{I_C}{I_B}$$

$$\beta = \frac{I_C}{I_B}$$

In Common collector transistor

$$\gamma = \frac{I_E}{I_B}$$

To find the relation b/w α , β , γ .

$$I_E = I_B + I_C$$

dividing I_C on both sides

$$\frac{I_E}{I_C} = \frac{I_B}{I_C} + \frac{I_C}{I_C}$$

$$\frac{1}{\alpha} = \frac{1}{\beta} + 1$$

$$\frac{1}{\alpha} = \frac{1+\beta}{\beta}$$

$$\boxed{\alpha = \frac{\beta}{1+\beta}}$$

$$\rightarrow \frac{1}{\alpha} - 1 = \frac{1}{\beta}$$

$$\boxed{\beta = \frac{\alpha}{1-\alpha}} \quad \frac{1-\alpha}{\alpha} = \frac{1}{\beta}$$

$$I_E = I_B + I_C$$

dividing I_B on both sides.

$$\frac{I_E}{I_B} = \frac{I_B}{I_B} + \frac{I_C}{I_B}$$

$$\beta = 1 + \beta$$

$$\beta = 1 + \frac{\alpha}{1 - \alpha}$$

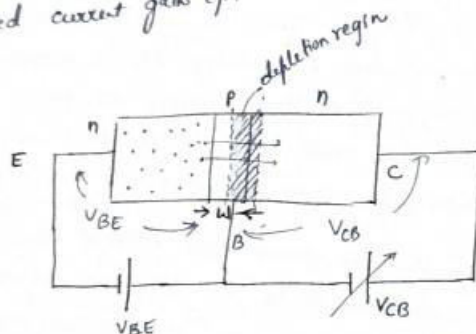
$$\beta = \frac{1 - \alpha + \alpha}{1 - \alpha}$$

$$\beta = \frac{1}{1 - \alpha}$$

6. a) Schematic: 3 Marks
Explanation: 4 Marks

Early effect (Base width modulation)

The early effect on base width modulation in a BJT occurs when increased reverse bias on the collector base junction, the depletion region increases towards the base region as base is lightly doped. This depletion region in base reduces effective base width. This causes higher carrier transport efficiency and lower base recombination, leading to an unwanted increase in collector current (I_C) [the emitter current carriers without recombination with base carriers, they directly pass through the collector side] and increased current gain (β) with higher V_{CE} .



$$W = W_e + W_d$$

$$W_e = W - W_d$$

In CB configuration, as reverse voltage increases (V_{CB}), the depletion region increases.

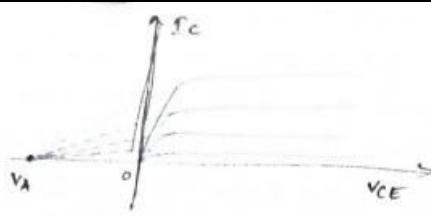
W is Base width.

W_d is the depletion region.

$W_e \rightarrow$ effective base width for recombination

$$W_e = W - W_d$$

As W_d increases, W_e decreases (recombination rate decreases). This results in emitter current directly pass through collector side. So, collector side current increases.



When o/p characteristic curves (I_c vs V_{ce}) are extrapolated backward, they intersect at a single point on negative V_{ce} axis called the Early voltage ($-V_A$).

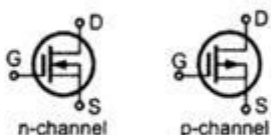
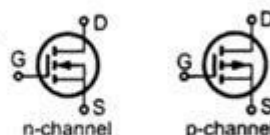
Punch through effect:

The punch through effect in a BJT occurs when a high collector to base reverse bias voltage (V_{CB}) causes the depletion region to expand entirely across the base, touching the emitter-base junction. This destroys the base region, leading to a direct, uncontrolled current flow b/w collector & emitter.

Therefore the excessive reverse bias voltage (V_{CB}) increases, the depletion region stretches across the thin base regions, then the effective base width becomes zero, causing a significant, rapid increase in collector current and permanent transistor failure. The punch through is a geometrical effect related to the depletion region stretching.

To prevent this, base doping concentration can be increased and thus base width increases can minimize this effect, which limits the expansion of the depletion region.

- b) Diagram for Enhancement mode and Depletion mode: 3 Marks
Comparison: 4 Marks

Sr. No	Parameter	Depletion type	Enhancement type
1	Symbols	 n-channel p-channel	 n-channel p-channel
2	Channel	Exists permanently.	Channel is physically absent. It is induced after application of positive gate voltage above the threshold value for n-channel enhancement type MOSFET and negative gate voltage above threshold value for p-channel enhancement type MOSFET.
3	Operation	Can be operated in depletion mode as well as enhance mode.	Can only be operated in enhance mode.
4	Current flow	Drain current flows on application of drain to source voltage, at $V_{GS} = 0$.	Practically no current flows on application of drain to source, at $V_{GS} = 0$. Current flows only when V_{GS} is above threshold level.

7. a) Collector to base bias circuit: 2M
Stability factor derivation: 5M

2) Collector to Base Bias:

Collector-feedback Bias (Or) Base bias with collector feedback.

The Base resistor R_B is connected to the collector

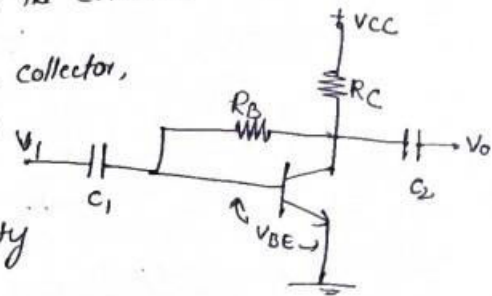
Since R_B is directly connected to the collector,

the voltage drop across R_B depends

on V_{CE}

this improves the Bias stability

$$\text{Current gain } \beta = \frac{I_C}{I_B}$$



Due to either temperature rise or parameter variation,

I_C current through R_C increases this will increase V_{RC} and decreases V_{CE} then voltage drop across R_B resistor decreases then Base current I_B decreases which reduce I_C .

Analysis of S:

$$S = \frac{\partial I_C}{\partial I_{C0}} \bigg|_{\text{at const } I_B, V_{BE}}$$

$$S = \frac{1+\beta}{1-\beta \left(\frac{\partial I_C}{\partial I_B} \right)}$$

applying KVL to Base-Emitter loop

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

dividing by I_B

$$V_{CC} = (I_B + I_C) R_C + I_B R_B + V_{BE}$$

$$\begin{aligned} V_{CC} &= I_B R_C + I_C R_C + I_B R_B + V_{BE} \\ &= I_B (R_C + R_B) + I_C R_C + V_{BE} \end{aligned}$$

$$I_B (R_B + R_C) = V_{CC} - I_C R_C - V_{BE}$$

$$\therefore I_B = \frac{V_{CC} - I_C R_C - V_{BE}}{(R_B + R_C)}$$

d.w.r. to I_C

$$\begin{aligned} \frac{\partial I_B}{\partial I_C} &= \frac{\partial}{\partial I_C} \left(\frac{V_{CC} - I_C R_C - V_{BE}}{R_B + R_C} \right) \\ &= \frac{1}{R_B + R_C} (-R_C) \end{aligned}$$

$$\begin{aligned} \therefore S &= \frac{1+\beta}{1-\beta \frac{\partial I_B}{\partial I_C}} \\ &= \frac{1+\beta}{1-\left(\frac{-R_C}{R_B + R_C} \right) \beta} \end{aligned}$$

$$S = \frac{1+\beta}{1+\beta \left(\frac{R_C}{R_B + R_C} \right)}$$

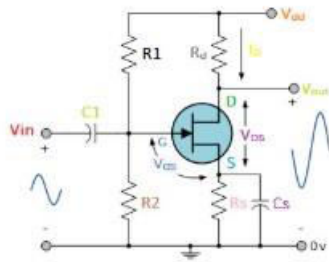
Stability

- b) Stability variation with V_{BE} : 3M
Stability variation with I_{C0} : 2M

Stability variation with β : 2M

8. a) FET in common source circuit: 3 Marks
DC analysis: 4 Marks

Common Source JFET Amplifier



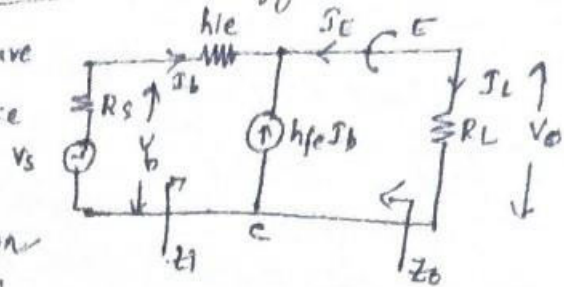
- b) Thermal runaway explanation: 4 Marks
Thermal stability explanation: 3 Marks

9. a) Common collector h parameter model: 4 Marks
Derivation for Z_{in} , Z_o , A_v and A_i : each 2.5 Marks

Approximate model for common collector configuration:

for simplified CC model, we have to make collector common & take the o/p from emitter.

$h_{fe} I_b$ current direction is opposite that of CE model.



$$\begin{aligned} \text{Current gain: } A_i &= \frac{I_L}{I_b} = \frac{-I_e}{I_b} = \frac{-(I_b + h_{fe} I_b)}{I_b} \\ &= -(1 + h_{fe}) \end{aligned} \quad \begin{cases} I_e + I_b + h_{fe} I_b = 0 \\ -I_e = (1 + h_{fe}) I_b \end{cases}$$

$$\therefore A_i = (1 + h_{fe})$$

Input impedance:

$$Z_i = \frac{V_b}{I_b}$$

applying KVL at input side $V_b - I_b h_{ie} - I_L R_L = 0$ (Super mesh analysis because of current source)

$$V_b = I_b h_{ie} + I_L R_L$$

$$\frac{V_b}{I_b} = h_{ie} + \frac{I_L R_L}{I_b}$$

$$Z_i = h_{ie} + A_i R_L$$

$$Z_i = h_{ie} + (1 + h_{fe}) R_L \quad (\text{C/p impedance of CC is higher than CE})$$

Voltage gain (A_v):

$$A_v = \frac{V_o}{V_b} = \frac{I_L R_L}{I_b Z_i} = \frac{A_i R_L}{Z_i} = \frac{(1+h_{fe}) R_L}{h_{ie} + (1+h_{fe}) R_L} \approx 1$$

The voltage gain of CC is always less than 1 in practice.

Output Impedance:

$$Z_o = \frac{V_o}{I_L} \bigg|_{V_s = 0}$$

$$\therefore Z_o = \frac{-I_b (R_s + h_{ie})}{1 + h_{fe} I_b} = \frac{R_s + h_{ie}}{1 + h_{fe}}$$

$$Z_o' = Z_o \parallel R_L$$

$$V_s - I_b R_s - I_b h_{ie} - V_o = 0$$

$$V_o = -I_b R_s - I_b h_{ie} = -I_b (R_s + h_{ie})$$

$$I_E = -(1+h_{fe}) I_b$$

10. a)

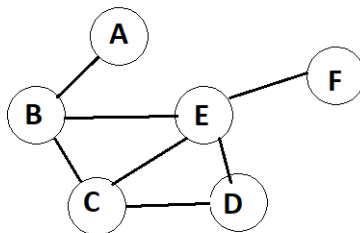
Comparison of Transistor Configurations		
Common Emitter	Common Base	Common Collector
i/p side (V_{be}, I_b) o/p side (V_{ce}, I_c) Current amplification factor $\beta = \frac{I_c}{I_b}$ i/p Impedance $Z_i = h_{ie}$ o/p Impedance $Z_o = \infty$ Voltage gain $A_v = \frac{A_i R_L}{h_{ie}}$ Current gain $A_i = -h_{fe}$ Typical values $Z_i = \text{low (1k}\Omega\text{)}$ $Z_o = \text{high (40k}\Omega\text{)}$ $A_v = \text{Medium}$ Current gain $A_i = \text{less than High}$ Applications: As Audio Signal Amplifier	i/p side (V_{cb}, I_c) o/p side (V_{cb}, I_c) $\alpha = \frac{I_c}{I_E}$ $Z_i = \frac{h_{ie}}{1+h_{fe}}$ $Z_o = \infty$ $A_v = \frac{A_i R_L}{Z_i}$ $A_i = \frac{h_{fe}}{1+h_{fe}}$ $Z_i = \text{Very low (20}\Omega\text{)}$ $Z_o = \text{Very high (1M}\Omega\text{)}$ $A_v = \text{medium}$ $A_i = \text{less than unity}$ As a i/p stage of multistage amplifiers	i/p side (V_{bc}, I_b) o/p side (V_{ec}, I_e) $\gamma = \frac{I_E}{I_B}$ $Z_i = h_{ie} + (1+h_{fe}) R_L$ $Z_o = \frac{R_s + h_{ie}}{1+h_{fe}}$ $A_v = \frac{(1+h_{fe}) R_L}{h_{ie} + (1+h_{fe}) R_L} \approx 1$ $A_i = 1+h_{fe}$ $Z_i = \text{High (500k}\Omega\text{)}$ $Z_o = \text{low (50}\Omega\text{)}$ $A_v = \text{low}$ $A_i \approx 1$ for impedance matching

Answer ONE Question from each Unit

All Questions Carry Equal Marks

All parts of the Question must be answered at one place

- | | | <u>UNIT-I</u> | Marks | CO | BTL |
|-----------------|----|---|-------|----|-----|
| 1. | a) | Explain the procedure for sorting elements of an array using selection sort and trace by taking a list of values. | 7M | 1 | K2 |
| | b) | Explain the necessary steps for analyzing the efficiency of recursive algorithms | 7M | 1 | K2 |
| (OR) | | | | | |
| 2. | a) | Write an algorithm for binary search. | 7M | 1 | K2 |
| | b) | Sort the following elements using Bubble sort.
11 23 7 5 21 35 56 65 22 28 17 15 | 7M | 1 | K3 |
| (OR) | | | | | |
| <u>UNIT-II</u> | | | | | |
| 3. | a) | Explain the traversing of a Single Linked list with example | 7M | 2 | K2 |
| | b) | Write a function to search an element in a double linked list | 7M | 2 | K2 |
| (OR) | | | | | |
| 4. | a) | Explain how to insert a node in the middle of the singly linked list. | 7M | 2 | K2 |
| | b) | What is a circular linked list? Explain its advantage. | 7M | 2 | K4 |
| (OR) | | | | | |
| <u>UNIT-III</u> | | | | | |
| 5. | a) | Explain the operations on Stack data structures | 7M | 3 | K2 |
| | b) | What is a Priority Queue? Explain its operations | 7M | 3 | K2 |
| (OR) | | | | | |
| 6. | a) | Explain the conversion of an Infix expression to a Postfix expression using a Stack with an example. | 7M | 3 | K2 |
| | b) | Describe about various types of Queue with suitable examples. | 7M | 3 | K3 |
| (OR) | | | | | |
| <u>UNIT-IV</u> | | | | | |
| 7. | a) | Write and explain Depth First Search algorithm with suitable example . | 7M | 4 | K2 |
| | b) | Explain (i) Complete Graph (ii) Connected Graph | 7M | 4 | K2 |
| (OR) | | | | | |
| 8. | a) | Trace the Breadth First Traversal taking "A" as source on the following graph. | 7M | 4 | K3 |



- | | | | | | |
|---------------|----|--|----|---|----|
| | b) | Explain the adjacency matrix representation of graph with an example. | 7M | 4 | K2 |
| (OR) | | | | | |
| <u>UNIT-V</u> | | | | | |
| 9. | a) | The Pre-order and In-order traversals of Binary tree is given below
Construct the Binary tree.
Pre-order: F, A, E, K, C, D, H, G, B.
In-order: E, A, C, K, F, H, D, B, G. | 7M | 5 | K3 |
| | b) | Explain step-by-step process in inserting elements into a Binary Search Tree using elements: 50,17,77,13,45,90,15,65,85 | 7M | 5 | K2 |
| (OR) | | | | | |
| 10. | a) | What is a collision in hashing? Explain why collisions occur and their impact on performance. | 7M | 5 | K3 |
| | b) | What is a Binary Tree? Explain its properties and applications with suitable examples. | 7M | 5 | K3 |

9.b) Explain step-by-step process in inserting elements into a Binary Search Tree using elements:
50,17,77,13,45,90,15,65,85

Time: 3 Hours

Max Marks: 70

Answer ONE Question from each Unit

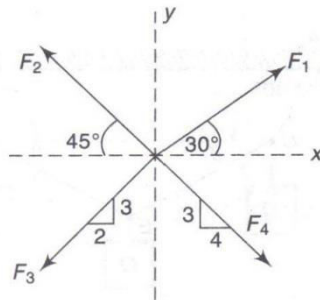
All Questions Carry Equal Marks

All parts of the Question must be answered at one place

UNIT-I

1. Find the magnitude and direction of resultant of concurrent forces shown in figure. $F_1=1500$ N $F_2= 2000$ N, $F_3= 3500$ N and $F_4=1000$ N

Marks	CO	BTL
14	1	K3



(OR)

2. Find force P required to pull block B (shown in Fig. 2). Coefficient of friction between A and B is 0.3 and between B and floor is 0.25 . Weights of $A = 20$ kg and $B = 30$ kg.

14	1	K3
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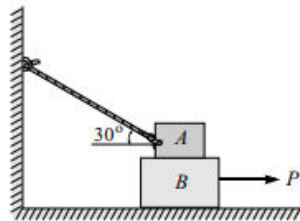


Fig.2

UNIT-II

3. Determine the force P applied at 30° to the horizontal just necessary to start a roller having radius 50 cm over an obstruction 12 cm high, if the roller is of mass 100 kg, shown in Fig. 3. Also find the magnitude and direction of P when it is minimum.

14	2	K3
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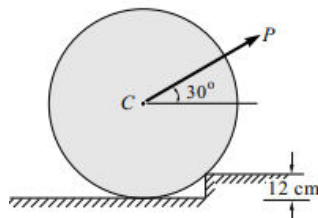


Fig.3

(OR)

4. Resolve the given force shown in Fig. 4 into components along x, y and z axes and also express in vectorial form. 14 2 K3

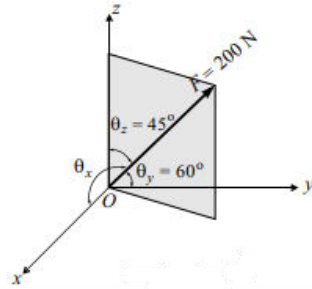


Fig.4

UNIT-III

5. Find the centroid of the following shaded plane area shown in Fig.3 14 3 K3

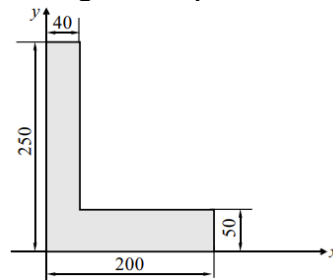


Fig.3

(OR)

6. Find the moment of inertia of the I-section w.r.t. the centroidal x and y axes as shown in Fig. 4 14 3 K3

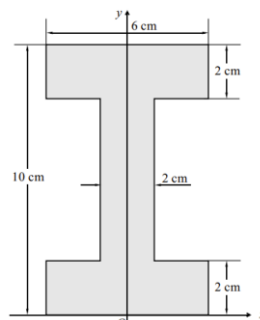


Fig.4

UNIT-IV

7. A motorist is travelling at 90 kmph, when he observes a traffic light 250 m ahead of him turns red. The traffic light is timed to stay red for 12 sec. If the motorist wishes to pass the light without stopping, just as it turns green. Determine (i) the required uniform deceleration of the motor and (ii) the speed of the motor as it passes the traffic light. 14 4 K3

(OR)

8. Two particles of masses 10 kg and 20 kg are moving along a straight line towards each other at velocities of 4 m/s and 1 m/s, respectively, as shown in Fig.5. If $e = 0.6$, determine the velocities of the particles immediately after their collision. Also find the loss of kinetic energy. 14 4 K3

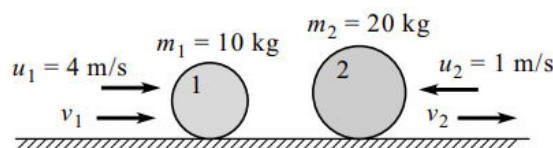
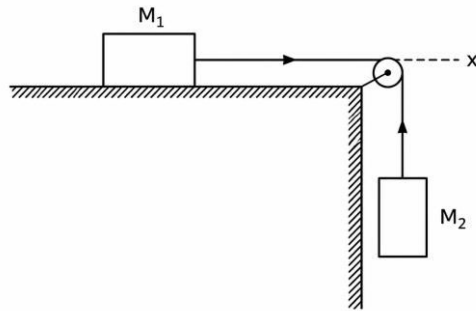


Fig.5

UNIT-V

9. Two blocks of masses M_1 and M_2 are connected by a flexible but inextensible string as shown in Figure. Assuming the coefficient of friction between the block M_1 and the horizontal surface to be μ find the acceleration of the masses and tension in the string. Assume $M_1 = 10\text{Kg}$ and $M_2 = 5\text{kg}$ and $\mu=0.25$ 14 5 K3



(OR)

10. Two bodies of 9 kg and 13.5 kg are suspended on two ends of a string passing over a pulley of radius 275 mm and $M.I. = 16.5 \text{ kgm}^2$ as shown in Fig. 6. Determine the tensions in the strings and the angular acceleration of the pulley. 14 5 K3



Fig.6

Time: 3 Hours

Max Marks: 70

Answer ONE Question from each Unit

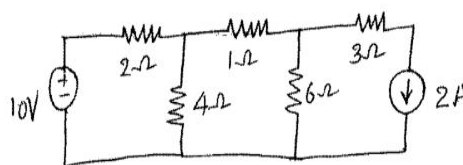
All Questions Carry Equal Marks

All parts of the Question must be answered at one place

UNIT-I

1. a) Explain about different types of sources.
b) Determine the number of nodes and branches for circuit shown in fig. and find the current in each branch.

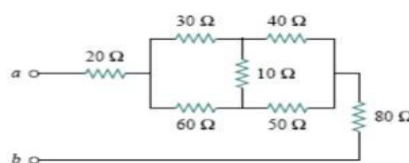
Marks	CO	BTL
6	1	K2
8	1	K3



(OR)

2. a) State and explain Kirchhoff laws with suitable examples.
b) Calculate the equivalent resistance R_{ab} in the given circuit.

6	1	K2
8	1	K3

UNIT-II

3. a) Derive the voltage and current phasor relationship in R-L Series circuits.
b) Draw and explain power triangle for (i) Real power (ii) Apparent power (iii) Power factor (iv) Reactive power.

6	2	K2
8	2	K2

(OR)

4. a) An alternating voltage is given by $V=230\sin 314t$. Calculate i) frequency ii) maximum value, iii) average value iv) RMS value
b) Derive RMS value and Average value and also form factor and peak factor from fundamentals of sin wave.

8	2	K2
6	2	K2

UNIT-III

5. a) Classify the Speed Control methods of DC motor.
b) A 6-pole generator has a lap-wound armature with 40 slots with 20 conductors per slot. The flux per pole is 25mWb. Calculate the speed at which the machine must be driven to generate an e.m.f. of 300 V.

6	3	K2
8	3	K3

(OR)

6. a) Explain the Construction of DC Machine with neat sketch.
b) Illustrate the working of 3 point starter in detail.

8	3	K2
6	3	K2

UNIT-IV

7. a) Demonstrate the V-I characteristics of Zener diode.
b) Explain the operation of diode as a switch.

7	4	K2
7	4	K2

(OR)

8. a) How is zener diode used as a voltage regulator?
b) Illustrate the working of a PN junction diode in forward bias with a neat diagram.

7	4	K2
7	4	K2

UNIT-V

9. a) Explain how the pinch off voltage can be modified without changing the physical structure of a JFET.
b) Illustrate the input and output characteristics of BJT in CB configuration.

7	5	K2
7	5	K2

(OR)

10. a) Explain about the transistor (BJT) operation
b) Derive the relationship between β and γ of a transistor.

7	5	K2
7	5	K2

AR23**CODE: 23ECT101****SET-1****ADITYA INSTITUTE OF TECHNOLOGY AND MANAGEMENT, TEKKALI
(AUTONOMOUS)****I B.Tech II Semester Supplementary Examinations, June , 2026****ELECTRONIC DEVICES AND CIRCUITS
(ELECTRICAL AND ELECTRONICS ENGINEERING)****Time: 3 Hours****Max Marks: 70**

Answer ONE Question from each Unit

All Questions Carry Equal Marks

All parts of the Question must be answered at one place

		Marks	CO	Blooms Level
<u>UNIT-I</u>				
1.	a) Explain the formation of PN junction and derive the expression for barrier potential.	7M	CO1	K2
	b) Compare Tunnel diode and Varactor diode with suitable characteristics and applications.	7M	CO1	K3
(OR)				
2.	a) Explain Zener breakdown and Avalanche breakdown mechanisms with neat diagrams.	7M	CO1	K2
	b) Describe the construction, working principle and applications of LED and Photodiode.	7M	CO1	K3
<u>UNIT-II</u>				
3.	a) Explain the operation of Bridge Rectifier and derive its efficiency.	7M	CO1	K3
	b) Compare Half-wave, Full-wave and Bridge Rectifiers based on performance parameters.	7M	CO1	K4
(OR)				
4.	a) Derive the ripple factor of a Capacitor filter.	7M	CO2	K4
	b) Explain the operation of LC and π filters with neat circuits.	7M	CO2	K2
<u>UNIT-III</u>				
5.	a) Draw and explain the input and output characteristics of a Common Collector transistor configuration.	7M	CO3	K3
	b) Derive the relationship among α , β and γ parameters of a transistor.	7M	CO3	K4
(OR)				
6.	a) Explain the construction and working of JFET with its drain characteristics.	7M	CO3	K2
	b) Distinguish between Enhancement MOSFET and Depletion MOSFET.	7M	CO3	K3
<u>UNIT-IV</u>				
7.	a) Explain fixed bias and collector-to-base bias circuits with neat diagrams.	7M	CO4	K2
	b) Derive the expression for stability factor (S) for fixed bias configuration.	7M	CO4	K4
(OR)				
8.	a) Explain thermal stability and methods used to avoid thermal runaway.	7M	CO4	K2
	b) A transistor has $\beta=120$ and $I_{CBO}=20 \mu A$. Determine collector current if $I_B=40 \mu A$.	7M	CO4	K4
<u>UNIT-V</u>				
9.	a) Explain the concept of two-port networks and h-parameters.	7M	CO5	K2
	b) Derive the expressions for Z_{in} , Z_{out} , A_v and A_i of a Common Collector amplifier using h-parameters.	7M	CO5	K4
(OR)				
10.	a) Compare CB, CE and CC amplifier configurations in terms of gain and impedance characteristics.	7M	CO5	K4K3
	b) Explain approximate h-parameter model of transistor amplifier and its significance.	7M	CO5	K4

Answer ONE Question from each Unit

All Questions Carry Equal Marks

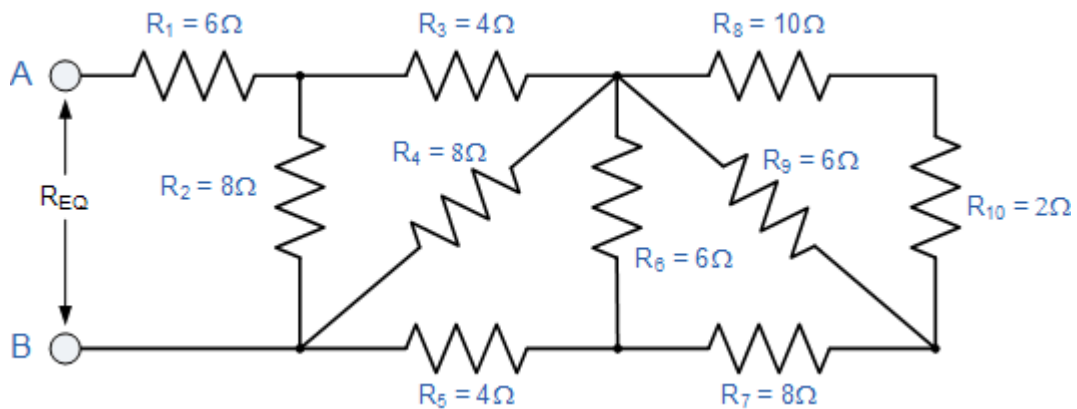
All parts of the Question must be answered at one place

UNIT-I

1. a) Define (i) Voltage (ii) Current (iii) Resistance
- b) Find R_{AB}

3M

7M



(OR)

2. a) State and Explain Kirchhoff's Laws with example
- b) Explain Source Transformation Technique with example.

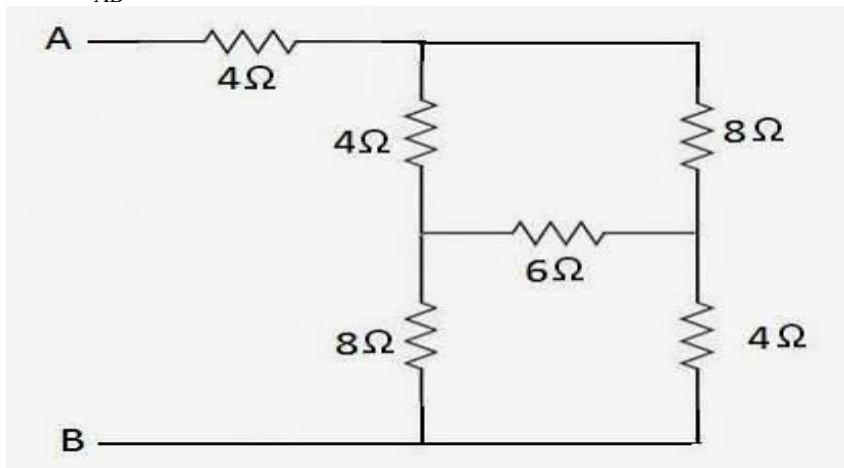
5M

5M

UNIT-II

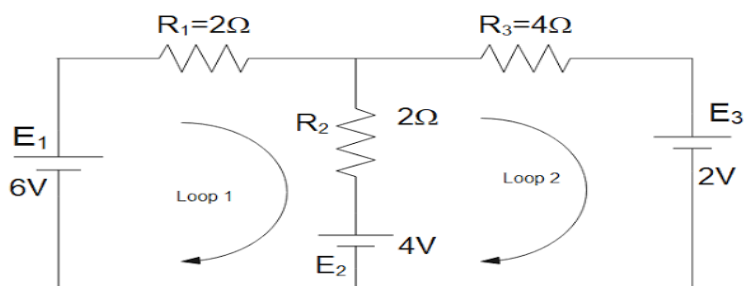
3. a) Find R_{AB}

5M



- b) Find Current passing R_2 Resistor using Mesh Analysis

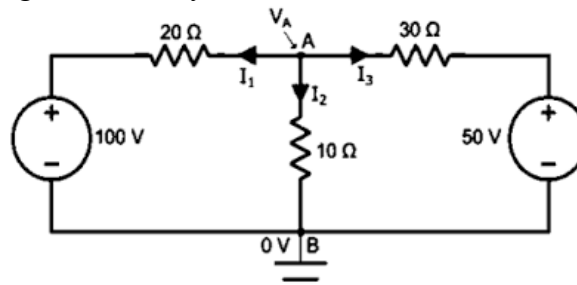
5M



(OR)

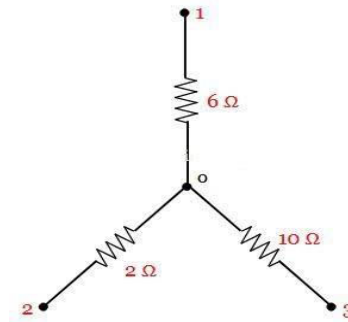
4. a) Find Current I_2 using Nodal Analysis

5M



- b) Convert given Star Network into Delta Network.

5M



UNIT-III

5. a) Define (i) Wave form (ii) Cycle (iii) Time Period (iv) Frequency (v) Phase Difference 5M
- b) A 240 V, 50 Hz AC supply is applied a coil of 0.08 H inductance and $4\ \Omega$ resistance connected in series with a capacitor of $8\ \mu\text{F}$. Calculate the following (i) Impedance (ii) Current (iii) Phase Angle between Voltage and Current (iv) Power Factor (v) Power Consumed 5M

(OR)

6. a) Define (i) Average Value (ii) rms value (iii) Form factor (iv) Peak factor (v) Power Factor 5M
- b) A sinusoidal wave form is given by $v=100\sin 314t$ is connected to the AC circuit. Calculate (i) frequency (ii) Time period (iii) maximum value (iv) average value (v) rms value 5M

UNIT-IV

7. a) Define (i) Magnetic Flux (ii) Magnetic Flux Density (iii) Magnetic Field (iv) Reluctance (v) Permeance 5M
- b) Derive an expression for coefficient of coupling. 5M
- (OR)
8. a) Write the Comparison between Electrical and Magnetic Circuits 5M
- b) Derive an expression for equivalent inductance for series aiding and series opposing. 5M

UNIT-V

9. a) Derive The EMF Equation of DC Generator. 5M
- b) Explain the principle operation of DC Generator. 5M

(OR)

10. a) Explain the construction of a DC machine with a neat sketch. 5M
- b) Explain the classification of DC Generator. 5M

UNIT-VI

11. a) Derive the Torque Equation of DC Motor. 5M
- b) Explain the principle operation of DC Motor? 5M

(OR)

12. a) Write the applications of DC Motors 5M
- b) Explain the working of 3-point starter with a neat sketch. 5M

CODE: 20ESI102 **SET-1**
ADITYA INSTITUTE OF TECHNOLOGY AND MANAGEMENT, TEKKALI
(AUTONOMOUS)
I B.Tech II Semester Supplementary Examinations, June,2026
Programming for Problem Solving
(Common to CIVIL, EEE & ECE Branches)

Time: 3 Hours**Max Marks: 60**

Answer ONE Question from each Unit
 All Questions Carry Equal Marks
 All parts of the Question must be answered at one place

UNIT-I

1. a) What are the differences between variable and identifier? 5M
- b) Explain Associativity and operator precedence in C 5M

(OR)

2. a) Explain the basic structure of C program and explain the significance of each section. 5M
- b) What is a flow chart? What are the different symbols are used to represent flowchart? Explain with an example. 5M

UNIT-II

3. a) Explain conditional statement 'switch' with example program? 5M
- b) Write a program to read student number, name and marks of three subjects and print the grade as per the following conditions: 5M

Average	Grade
≥ 90	O
≥ 80 and < 90	A
≥ 70 and < 80	B
≥ 60 and < 70	C
≥ 50 and < 60	D
< 50	F

(OR)

4. a) Compare while and do-while loops. Give an example for each. 5M
- b) Write a program to generate and print first N Fibonacci series. 5M

UNIT-III

5. a) What is an array? What are its advantages? Explain declaration, initialization and accessing elements in an array. 5M
- b) Define pointer? How pointer is useful to access array elements explain with example. 5M

(OR)

6. a) Develop a C program to find out product of given two matrices. 5M
- b) Explain any four string handling functions in C with appropriate examples. 5M

UNIT-IV

7. a) What is function? Explain the difference between user defined and library functions. 5M
- b) Give the scope and life time of the following 5M
 - (i) External variable
 - (ii) Static variable
 - (iii) Automatic variable
 - (iv) Register variable

(OR)

8. a) Define recursion. Explain the working of recursion with a suitable example. Discuss the advantages and limitations of recursive functions. 5M
- b) Explain in detail about pass by value and pass by reference. Explain with a Example Program? 5M

UNIT-V

9. a) Explain array of Structures with example program? 5M
- b) Differentiate between structures and unions with suitable examples. 5M

(OR)

10. a) What is a pointer to a structure? Explain how structure members are accessed using the arrow (->) operator with an example. 5M
- b) Write a C program to pass a structure as an argument to a function and display the details of a student. 5M

UNIT-VI

11. a) Explain various file opening modes in C with suitable example. 5M
- b) Write a C program to copy contents from one file to another file. 5M

(OR)

12. a) Differentiate between text files and binary files. Explain their advantages and disadvantages. 5M
- b) Explain the following File Input/Output functions in C with suitable example. 5M
 - fopen(), fclose(), getc(), putc(), fprintf(), and fscanf()

Answer ONE Question from each Unit

All Questions Carry Equal Marks

All parts of the Question must be answered at one place

UNIT-I

1. a) Draw flowchart for finding greatest among three given numbers. 6
- b) Write notes on the followings with example: 6
 - (i) Rules of an Identifier.
 - (ii) Data types in C .

(OR)

2. a) Explain with a neat diagram about the digital computer organization and each of its unit. 6
- b) Describe about basic structure of a C program. 6

UNIT-II

3. a) Write a program to check whether the given number is prime or not. 6
- b) What do you mean by looping? Describe any two looping statements in 'C' programming with examples. 6

(OR)

4. a) Classify the different types of decision making statements. 6
- b) Write a Program to perform all arithmetic operations using switch case. 6

UNIT-III

5. a) Write about different types of arrays. 6
- b) Differentiate between Actual parameter and Formal parameter. Write a program in C to find out GCD of two numbers using function. 6

(OR)

6. a) Write a C program to multiply two matrices of different order. 6
- b) State the types of functions depending upon the categories of arguments and return statements with an example. 6

UNIT-IV

7. Describe the concept of "Function returning pointers" and "Pointers to functions" with examples. 12

(OR)

8. a) What is pointer arithmetic and illustrate with suitable example. 6
- b) What is dynamic memory allocation.& differentiate Malloc(), Calloc() with syntax. 6

UNIT-V

9. What is a file? Discuss about the various modes in which a file can be opened in C language. What are the functions associated with opening and closing a file in C language? 12

(OR)

10. Define structure and also describe different ways to initialize the Structure. Write a program in C to read Name, Age and Roll of n number of students and print them by using structure. 12