



## Summer 2015 Examination

Subject Code: 17215

Model Answer

### Important Instructions to examiners:

- 1) The answers should be examined by key words and not as word-to-word as given in the model answer scheme.
- 2) The model answer and the answer written by candidate may vary but the examiner may try to assess the understanding level of the candidate.
- 3) The language errors such as grammatical, spelling errors should not be given more Importance (Not applicable for subject English and Communication Skills).
- 4) While assessing figures, examiner may give credit for principal components indicated in the figure. The figures drawn by candidate and model answer may vary. The examiner may give credit for any equivalent figure drawn.
- 5) Credits may be given step wise for numerical problems. In some cases, the assumed constant values may vary and there may be some difference in the candidate's answers and model answer.
- 6) In case of some questions credit may be given by judgement on part of examiner of relevant answer based on candidate's understanding.
- 7) For programming language papers, credit may be given to any other program based on equivalent concept.

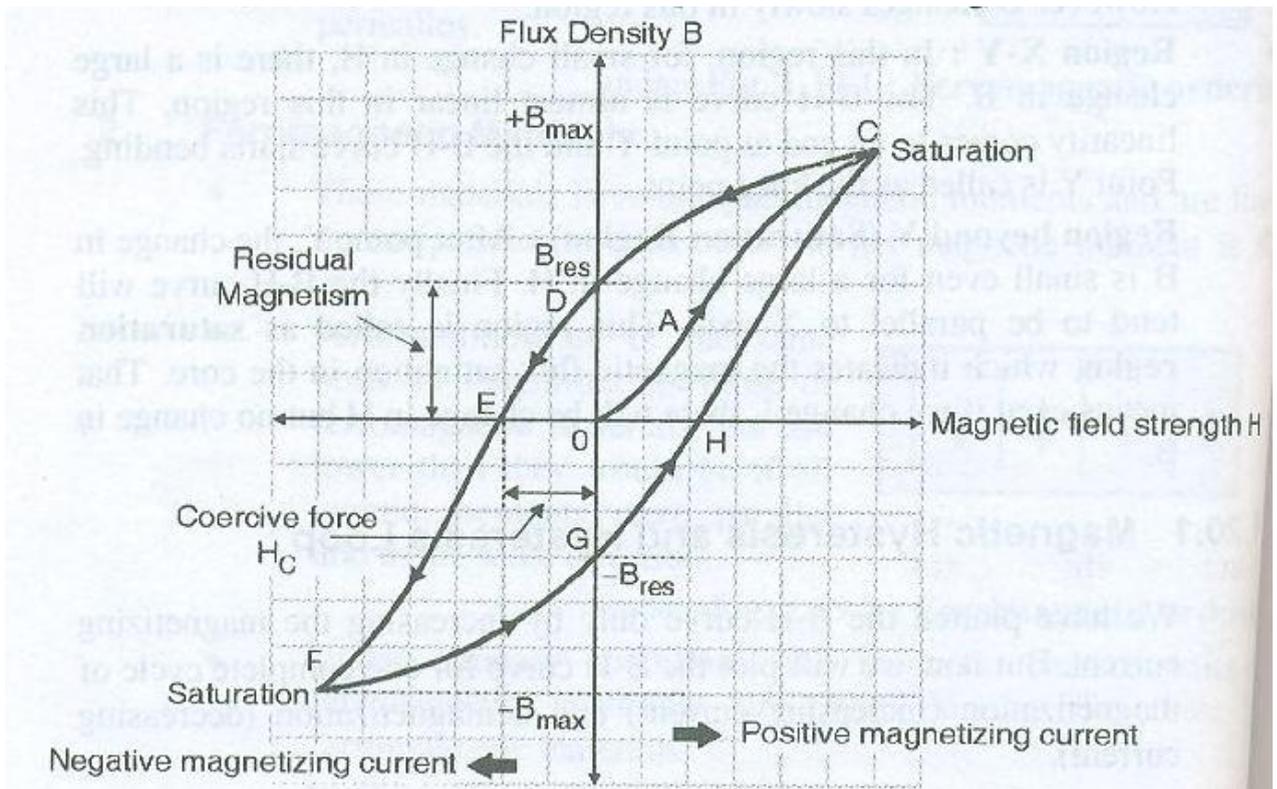
**1. Attempt any TEN:**

**20 marks**

a. Define Ferromagnetic materials. Draw B- H Curve.

Ans a. **Define:1 Mark , B-H Curve:1 Mark**

Ferromagnetic materials: The materials which possess magnetism in the absence of applied magnetic field is known as ferromagnetic materials.



b. State two functions of slug- tuned inductor and write the expression of self-inductance.

Ans b. **Two function:1 Mark; Expression:1 Mark**

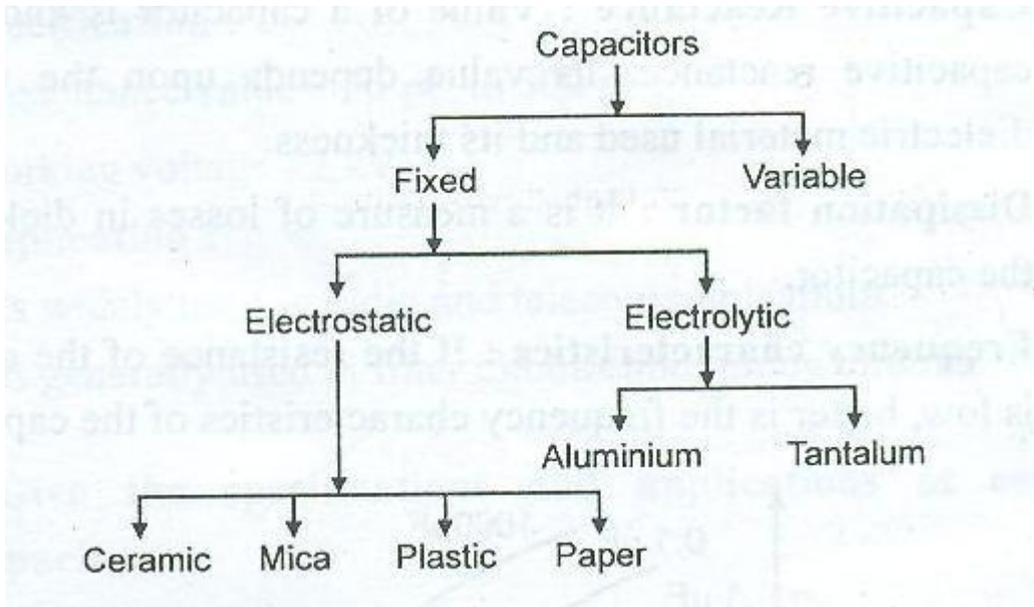
- It is kind of variable inductor.
- The value of inductance increases, when the slug is moved into the coil winding and decreases the resonant frequency.
- When the slug is moved out of the coil winding, the inductance decreases and resonant frequency of the tuned circuit increases.

Self-inductance (L)=  $N \times \phi / I$

c. State the classification of capacitors.

Ans c. **Classification of capacitors- 2 Mark**

Classification of capacitor is as follows:



d. State the need of rectifiers and filter.

Ans d.

**Need of Rectifiers: 1 Mark**

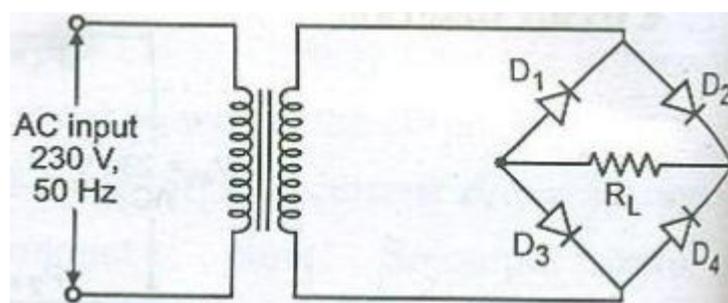
- Many electronic devices such as diodes, transistors and IC's works on D.C. but not on A.C.
- It is then needed to convert A.C. into D.C.
- Rectifier is the best and cheapest way to provide D.C. current for electronic devices.

**Need of Filters: 1 Mark**

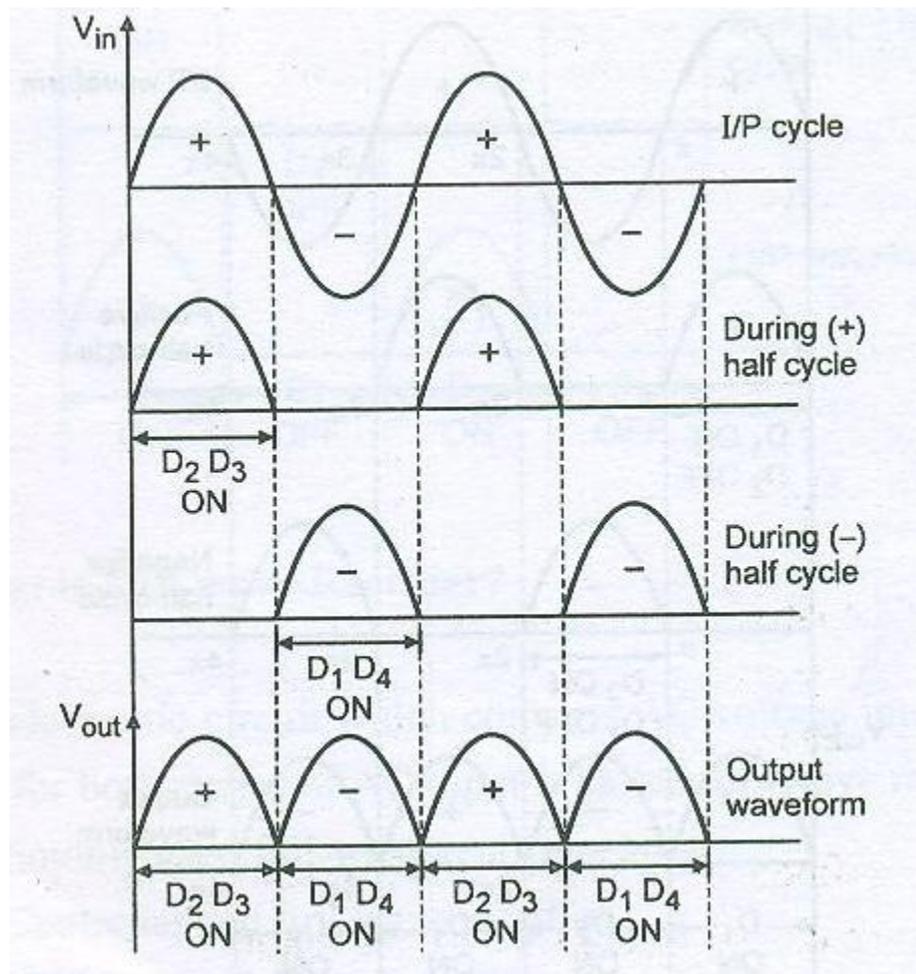
- The output of a rectifier is pulsating D.C. [i.e. it contain A.C and D.C]. The A.C. components are undesirable and must be moved from the pulsating D.C> to obtain pure D.C. signal.
- To remove this filter circuit is used.

e. Draw the circuit diagram of bridge rectifier and draw its output waveform.

Ans e. **Circuit Diagram: 1 Mark; Output waveform:1 Mark**



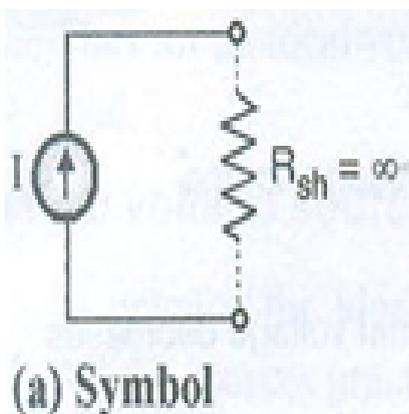
**Circuit Diagram Bridge rectifier**



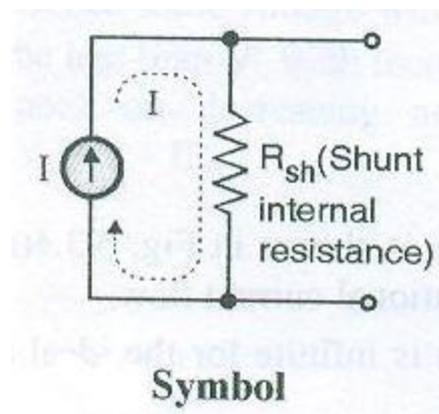
**Fig: Output waveform**

f. Draw the ideal current source and practical current source.

**Ans f. Ideal current source: 1 Mark; Practical current source: 1 Mark**



**Ideal current source**



**Practical current source**

g. State Kirchoff's law (KCL, KVL)

Ans g.

**Kirchoff's law KCL: 1 Mark**

The algebraic sum of all currents entering or leaving a node must be equal to zero

Therefore,

$$\Sigma I = 0$$

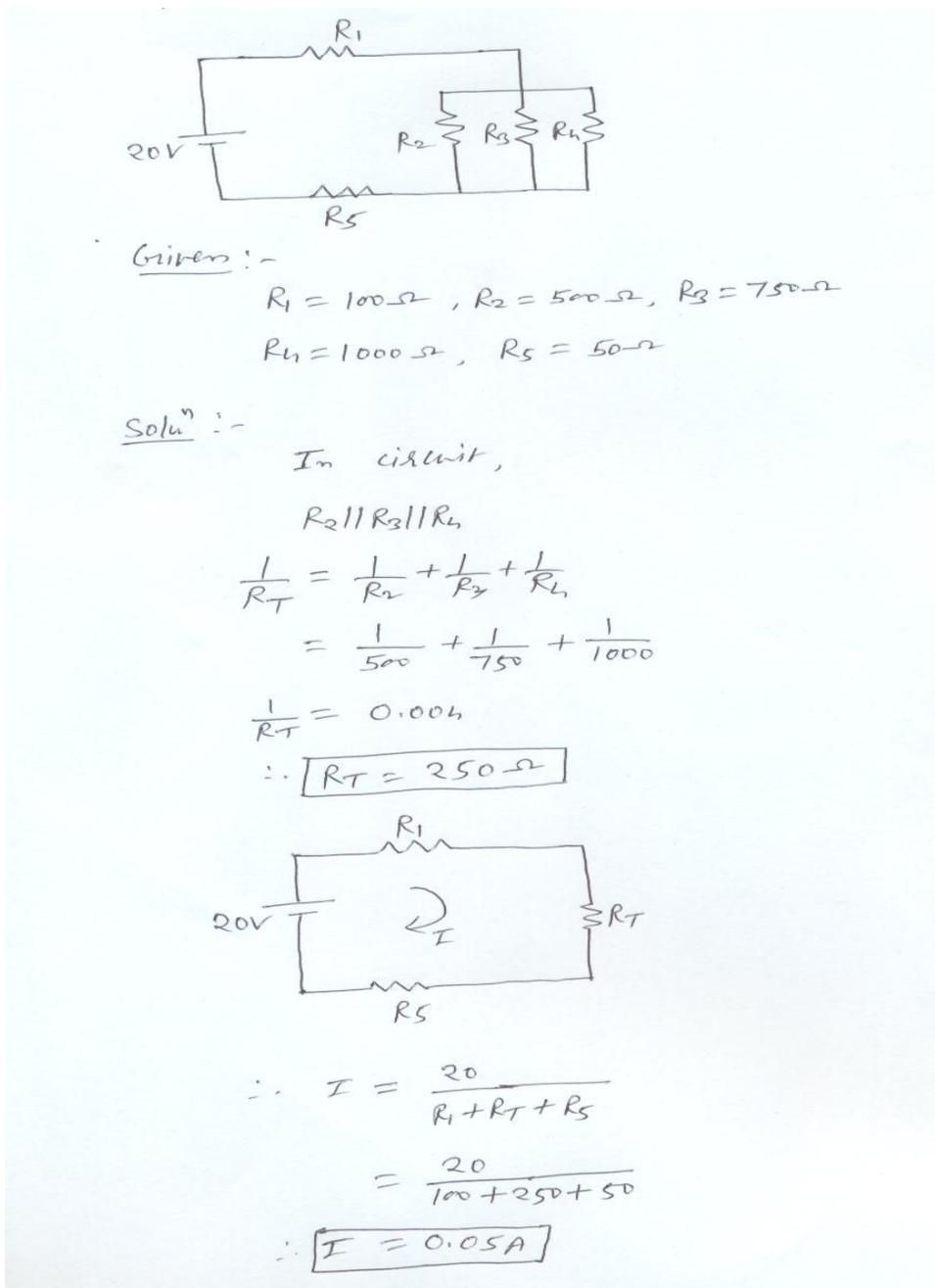
**Kirchoff's law KVL: 1 Mark**

It states that "Algebraic sum of voltages in a loop or mesh is equal to zero"

$$\Sigma \text{ voltage} = 0$$

h. State the current flowing through  $R_1$  in the following circuit:

Ans h. **Correct Solution: 2Marks**



Given :-

$$R_1 = 100\Omega, R_2 = 500\Omega, R_3 = 750\Omega$$

$$R_4 = 1000\Omega, R_5 = 50\Omega$$

Solu<sup>n</sup> :-

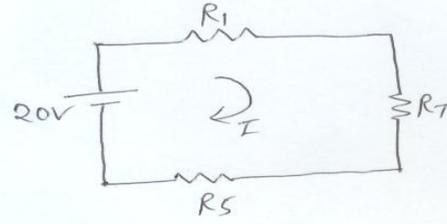
In circuit,

$$R_2 || R_3 || R_4$$

$$\frac{1}{R_T} = \frac{1}{R_2} + \frac{1}{R_3} + \frac{1}{R_4}$$

$$= \frac{1}{500} + \frac{1}{750} + \frac{1}{1000}$$

$$\frac{1}{R_T} = 0.004$$

$$\therefore R_T = 250\Omega$$


$$\therefore I = \frac{20}{R_1 + R_T + R_5}$$

$$= \frac{20}{100 + 250 + 50}$$

$$\therefore I = 0.05A$$

i. Write two applications of P-N junction diode and zener diode.

Ans i.

**Application of P-N junction diode: 1 Mark (any two)**

- Used in rectifier circuit
- Used in clipping and clamping circuit.
- Used for A.M detection
- Used for voltage multiplier.

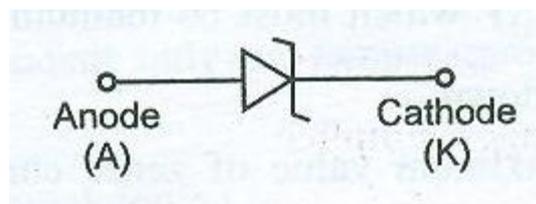
**Application of Zener diode: 1 Mark (any two)**

- It is used as voltage regulator.
- Used in protection circuits for MOSFET.
- Used in pulse amplifier.
- Used in clipping circuits.

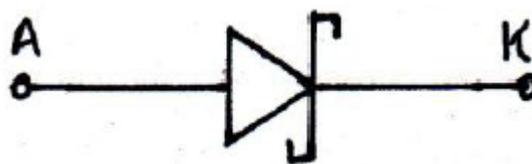
j. Draw the symbol of

1. Zener diode
2. Schottky diode
3. LED
4. Tunnel diode

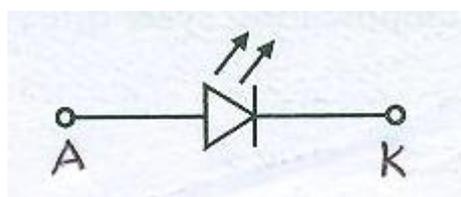
Ans j. **Each correct symbol: ½ Mark**



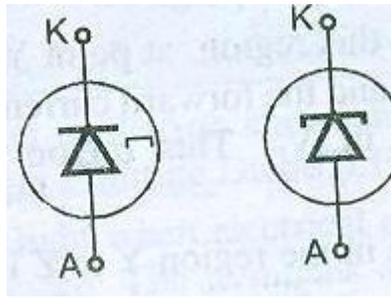
**Zener diode**



**Schottky diode**



### LED



### Tunnel diode

k. What is the meaning of linear and non-linear wave shaping circuit?

Ans k.

#### Linear wave shaping circuit. 1 Mark

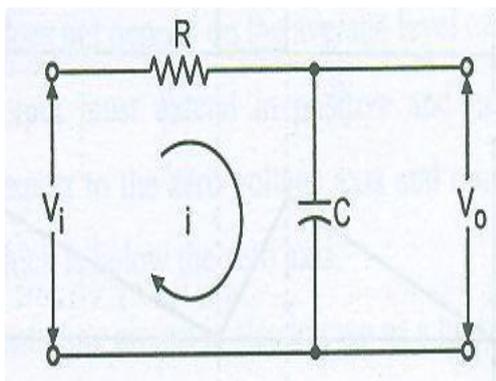
The circuits which make use of only linear circuit element such as the inductors, capacitors and resistors are known as Linear wave shaping circuit.

#### Non Linear wave shaping circuit: 1 Mark

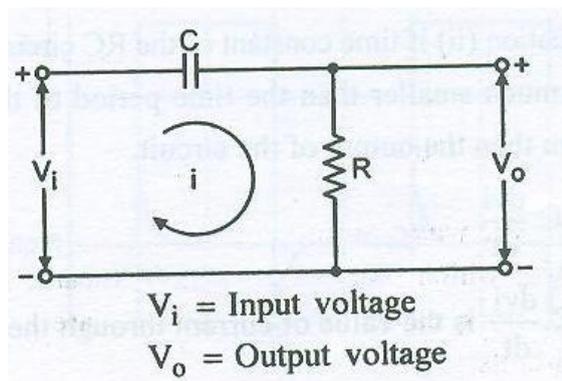
The circuits which make use of non-linear circuit element such as diodes and transistors are as Non Linear wave shaping circuit.

l. Draw RC integrator and differentiator.

Ans l. **RC integrator: 1 Mark; Differentiator: 1Mark**



**RC Integrator**



**RC Differentiator**

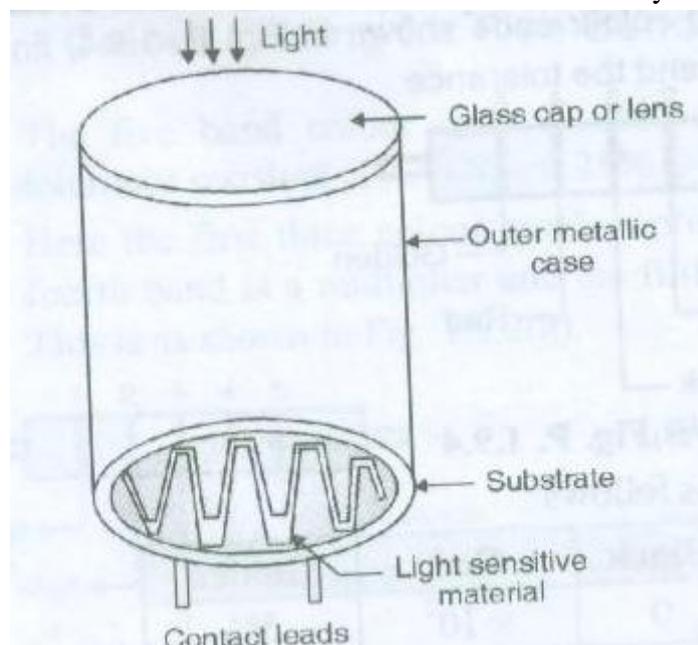
2. Attempt any FOUR:

16 marks

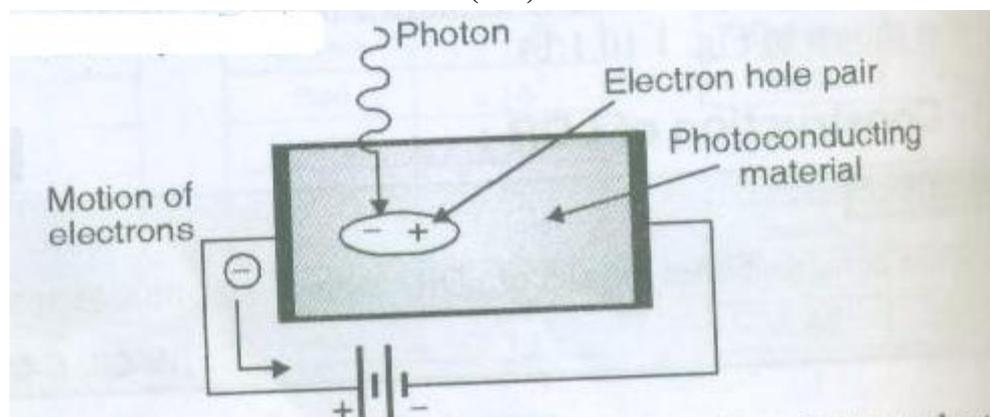
a. Describe the working of LDR with neat sketch and list applications of it.

Ans a. (Diagram – 2 marks, working – 1 mark, applications (any two) – 1 mark)

- Due to the radiant energy supplied to the semiconductor, the covalent bonds are broken and the electron hole pairs are generated.
- These increased current increase the conductivity of the material and hence decrease the resistivity. Such a device is called as a photoresistor or photoconductor.
- The photoconductive cell or a light dependent resistor (LDR) makes use of the principle of photoconductivity.
- It is semiconductor device in which resistance is dependent on the intensity of incident light.
- The resistance of the LDR will decrease with increase in the intensity of incident light.



(OR)

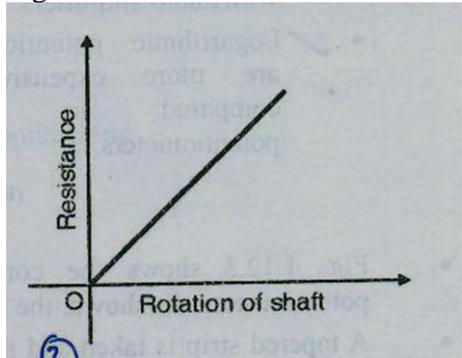
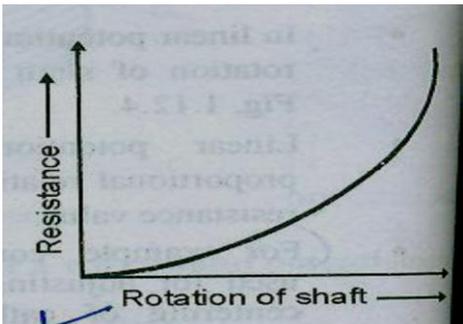


**Applications:**

1. It is used for automatic contrast of brightness control in television receivers.
2. It is used as a proximity switch.
3. It is used in the street light control circuits.
4. It is used in the optical coding.
5. It is used in the light (flux meter).
6. It is used in the photosensitive relay.
7. It is used in camera light meters.
8. It is used in the security alarms.
9. It is used in the smoke detectors.
10. It is used in the infrared astronomy.

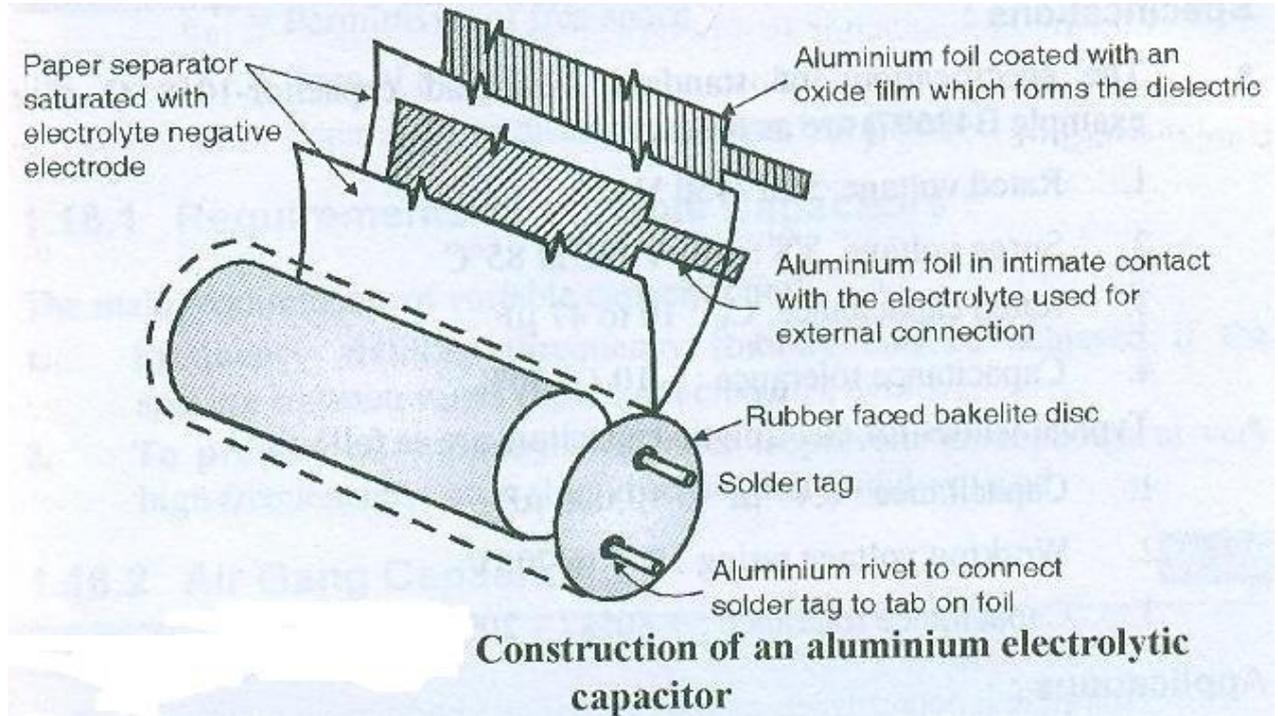
b. Compare linear and logarithmic potentiometers(any four points)

Ans b. **Any four points: 4Marks**

Sr. No	Linear Potentiometer	Logarithmic Potentiometer
1.	It has a linear variation of resistance with each degree of rotation of its shaft	It has a logarithmic variation of resistance with each degree of rotation of its shaft.
2.	It is produced by taking resistive segments of uniform thickness over the entire length of the segment.	It is produced by combining segments of resistance mixers having different resistivity to make up the total length of the film
3.	Fig: Characteristics of Linear Potentiometer 	Fig: Characteristics of Logarithmic Potentiometer 
4.	Linear potentiometers are less expensive as compared to logarithmic potentiometers	Logarithmic potentiometers are more expensive as compared to linear potentiometers
5.	In consumer electronics, user control uses linear potentiometers.	Logarithmic potentiometers are often used in connection with audio amplifiers.

- c. Draw the construction diagram of electrolytic capacitor and write the materials used for different parts.

Ans c. **Diagram: 2Marks; Materials used: 2Marks**



- A plain foil dry electrolytic capacitor is made by forming a coating of aluminium oxide on both sides of an aluminium foil.
- Two strips of aluminium foil used are then separated by two layers of porous paper soaked with electrolyte. This assembly is rolled up the ends closed with wax and then sealed into an aluminium container.

- d. Write four specifications of capacitor. Write the range of values for any one type of capacitor.

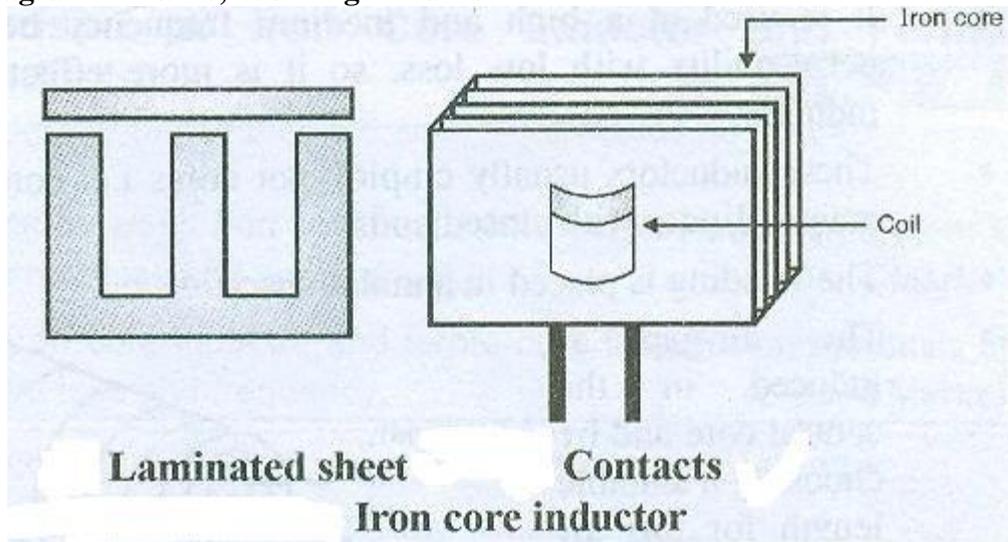
Ans d. **Any four specifications: 2 Marks; Range of value of any one capacitor: 2 Marks**

**Four specifications of capacitor are:**

- Working voltage
- Capacitive reactance
- Dissipation factor
- Frequency characteristics
- Equivalent series resistance
- Quality Factor
- Tolerance

Electrolytic capacitor =  $0.47\mu\text{F}$  to  $10,000\mu\text{F}$

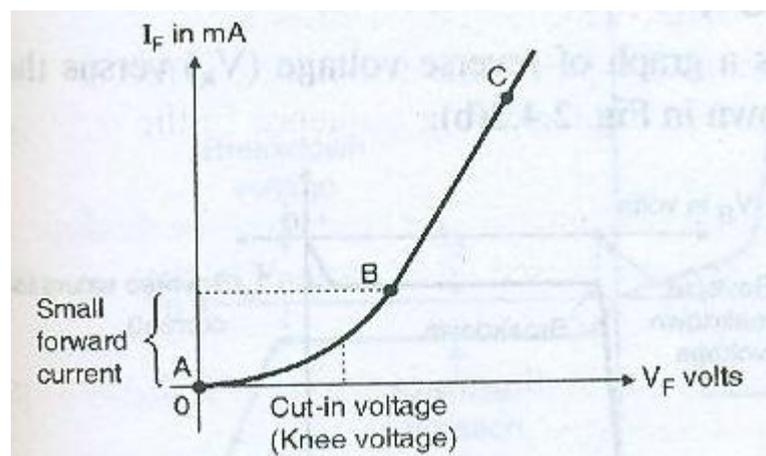
- e. Draw the constructional diagram of iron core inductor and write the working of it.  
Ans e. **Diagram:2 Marks; Working: 2Marks**



- Iron core inductors allow high inductance value but are limited in high frequency capacity due to hysteresis and eddy current losses.
- Iron core increases the magnetic induction of a coil of wire. Because iron has high permeability, it allows more magnetic lines of flux to concentrate, therefore increasing induction.
- Upto a certain point this result in a useful increase in inductance. Beyond that point, inductance decreases.

- f. Draw and describe the P- N junction diode characteristics.

Ans f: **Diagram:2 Marks; Explanation:2Marks**



- The forward characteristics is the graph of the anode to cathode forward voltage  $V_F$  versus the forward current through the diode ( $I_F$ ).
- The forward characteristics is divided into two portions, AB and BC
- Region A to B of the forward characteristics.

The forward voltage is small and less than the cut in voltage. Therefore the forward current flowing through the diode is small. With further increase in the forward voltage, it reaches the level of the cut in voltage and the width the depletion region goes on decreasing.

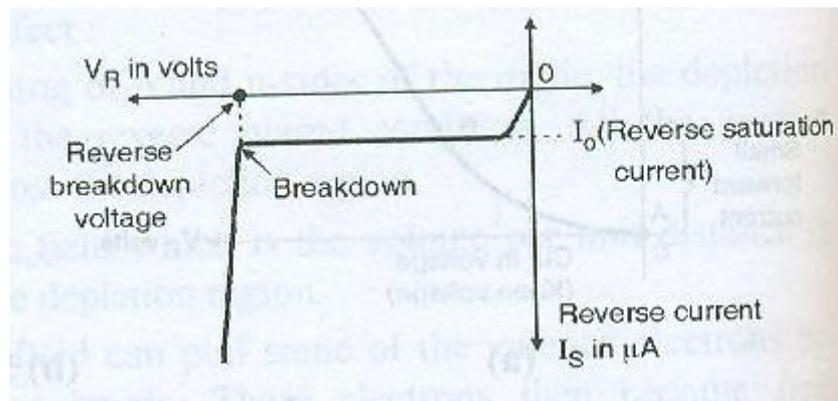
### Region B to C:

- As soon as the forward voltage equals the cut in voltage, current through the diode increase suddenly. The nature of this current is exponential. The large forward current in the region B-C of the forward characteristics is limited by connecting a resistor R in series with the diode. Forward current is of the order of a few mA.
- The forward current is a conventional current that flows from anode to cathode. Therefore it is considered to be a positive current, and the forward characteristics appears in the first quadrant.

### Cut in voltage (Knee voltage):

- The voltage at which the forward diode current starts increasing rapidly is known as the cut in voltage of a diode. The cut in voltage is very close to the barrier potential. Cut in voltage is also called as knee voltage.
- Generally a diode is forward biased above the cut in voltage. The cut in voltage for a silicon diode is 0.7 V and that for a germanium diode is 0.3V.

### Reverse characteristics of a Diode.



- Current flowing through a diode in the reverse biased state is the reverse saturation current which flows due to the minority carriers.
- Therefore it is treated as a negative current. Hence the reverse characteristics appears equal to  $I_0$  if the temperature is constant.
- As the reverse voltage is increased, the reverse saturation current remains constant equal to  $I_0$  if the temperature is constant. This is because, reverse saturation current does not depend on reverse voltage but it depends only on temperature.
- But as the reverse voltage reaches the breakdown voltage value. a large current flows through the diode, due to the reasons discussed earlier.
- Thus we define the reverse breakdown voltage of a pn junction diode as the reverse voltage at which breakdown takes place and a large reverse current starts flowing through the diode.
- Operation in the breakdown region should be avoided because the diode may be damaged due to excessive power dissipation.
- Typically the reverse breakdown voltage for p-n junction diode is in range of 50 to 100 volts

**3. Attempt any FOUR:**

**16 marks**

a. List four specifications of zener diode or P- N junction diode.

Ans a. (Any four specifications – 1 mark each)

**Specifications of zener diode:**

1. Zener voltage
2. Power dissipation
3. Maximum power dissipation  $P_{D(max)}$
4. Breakdown current
5. Dynamic resistance
6. Maximum reverse current.

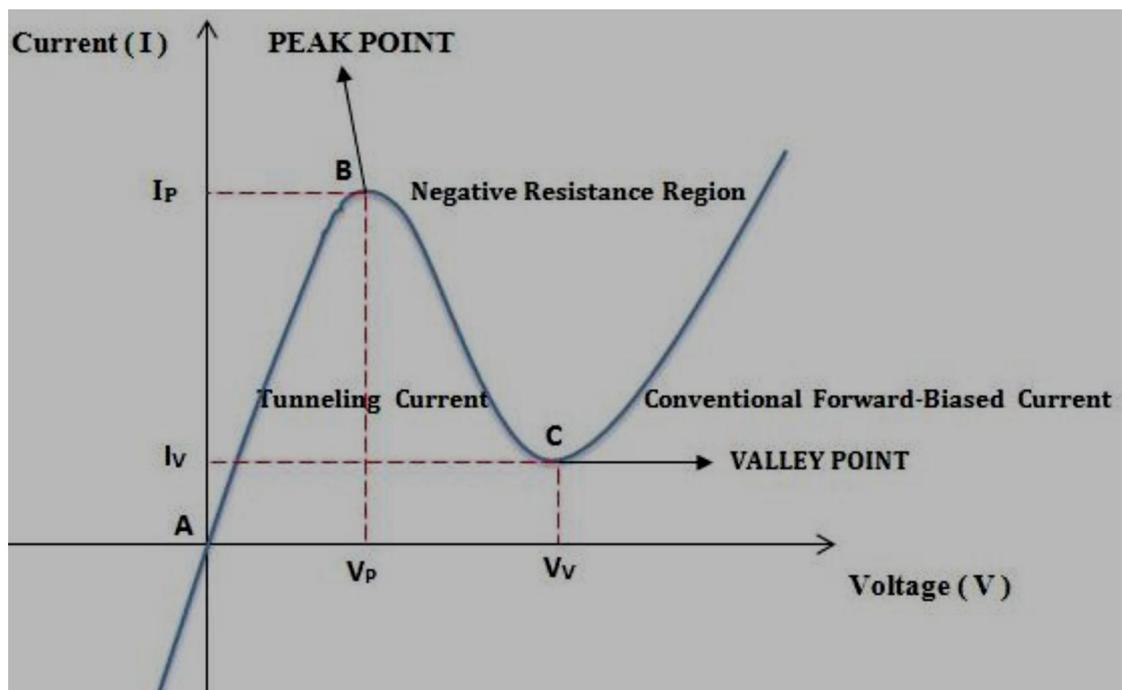
(OR)

**Specifications of P- N junction diode:**

1. Forward voltage drop ( $V_F$ )
2. Maximum forward current
3. Average forward current
4. Reverse saturation current
5. Power dissipation
6. Junction temperature
7. Peak inverse voltage (PIV)

b. Draw the characteristics of tunnel diode and write two applications of it.

Ans b. **Characteristics: 2Marks, Any two applications: 2Marks**

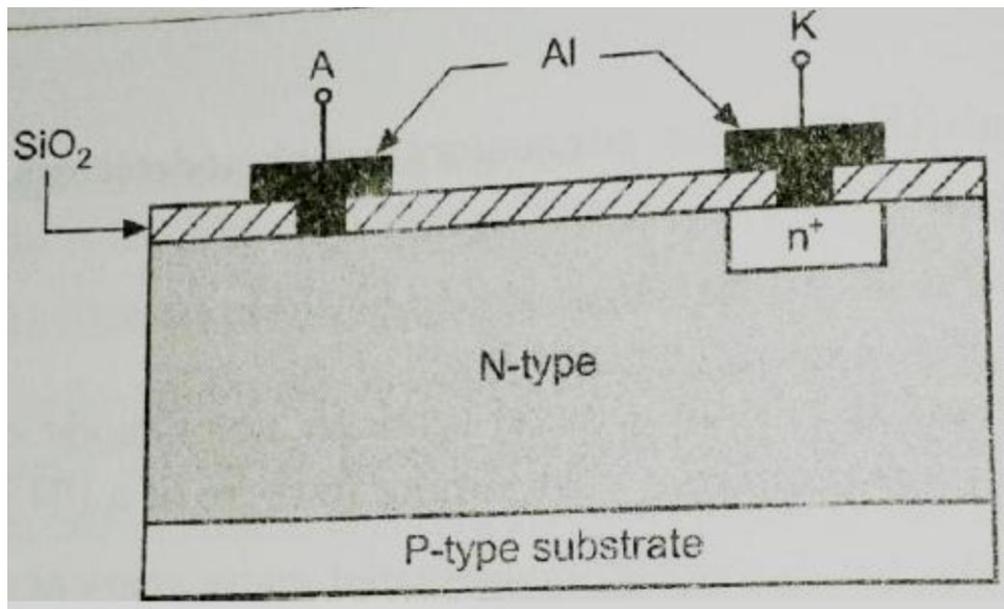


### Applications:

1. In the digital networks
2. As a high speed switch
3. As a high frequency oscillator
4. High speed computers

c. Explain the working principle of Schottky diode with neat sketch.

Ans c. **Sketch: 2Marks; Working: 2Marks**



### Working

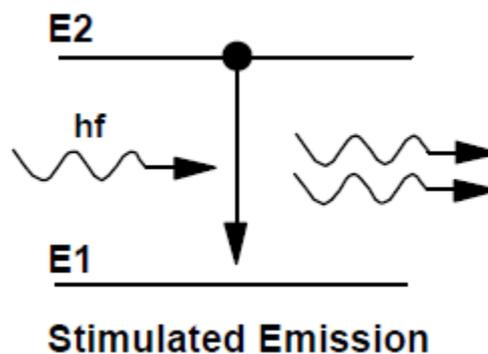
- The metal region of a Schottky diode is heavily occupied with the conduction band electrons and the N-type region is lightly doped.
- There are no minority carriers as in other types of diodes, but there are only majority carriers as electrons. It operates only with majority carriers.
- When it is forward biased, higher energy electrons in the N regions are injected into the metal region where that gives up their excess energy very rapidly.
- Since there are no minority carriers as in conventional diodes, there is no charge storage and hence there is no reverse recovery diode when it is switched from the forward-biased condition (i.e. ON state) to the reverse biased condition (i.e. OFF state).
- It has negligible storage time and hence there is a very rapid response to a change in bias. Because of this property, it acts as a very fast switching diode.

d. Describe the operating principle of LASER diode with diagram.

Ans d. **Operating Principle: 2Marks; Diagram: 2Marks**

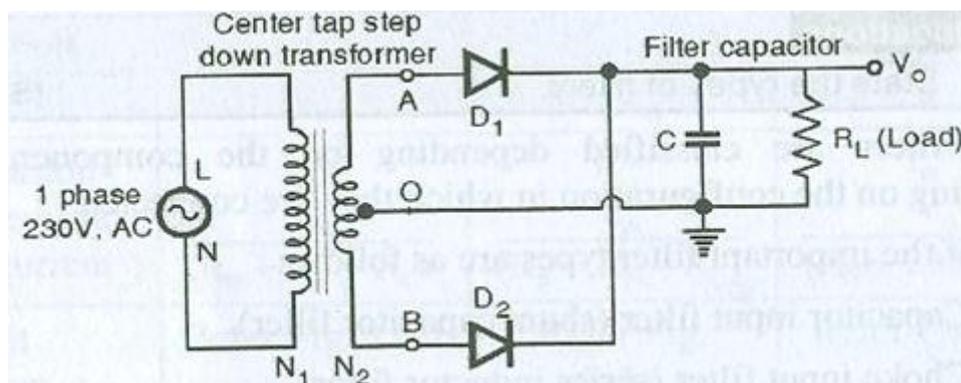
There are three main processes in semiconductors that are associated with light:

- Light absorption
  - Spontaneous emission
  - Stimulated emission
- Stimulated emission is different. A light photon entering the semiconductor lattice will strike an electron and release energy in the form of another light photon.
- The way in which this occurs releases this new photon of identical wavelength and phase. In this way the light that is generated is said to be coherent.
- This type of process is the basic principle on which LASER Diode operates.
- Photon, with energy equal to  $E_2 - E_1$  interacts with an atom in upper energy state, causing it to return to lower energy state with the emission of a second photon.
- Second photon has the same phase, frequency and polarization as the first.
- It is stimulated emission which gives LASER special properties such as narrow spectral width and coherent output radiation.



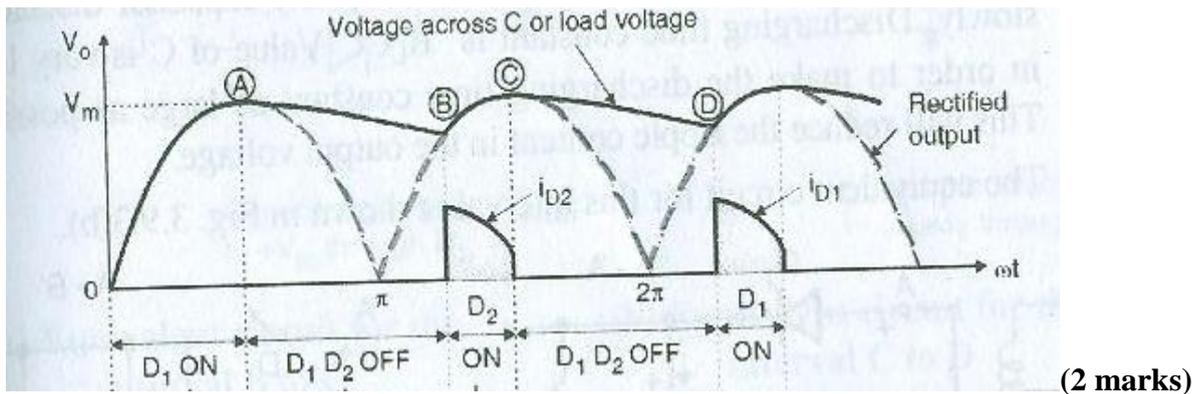
e. Draw the circuit diagram of shunt capacitor filter along with full wave rectifier. Draw the waveform of full wave rectifier output and shunt capacitor filter output.

Ans e. **(Bridge Rectifier circuit and waveform also should be considered)**



(2 marks)

**Fig: Shunt capacitor filter along with full wave rectifier**



**Fig: Waveform of full wave rectifier output and shunt capacitor filter output.**

f. Write the function of C and L in  $\pi$  filter and write two advantages of  $\pi$  filter over other filters.

Ans f. **Function: 2Marks ; Advantages:2Marks**

- The capacitors  $C_1$  and  $C_2$  provide a low reactance path for the ripple whereas the series inductor L provides a high reactance to the ac ripple. The combined effect of this is the reduction in ripple, and improvement in the output waveform.

**Advantages: (Any two)**

1. Easy to design
2. Reduction in the ripple content of the output voltage waveform
3. In addition to that the ripple factor is very low.
4. High dc voltage (approximately  $V_m$ )
5. Increase in the average load voltage.

**4.Attempt any FOUR:**

**16 marks**

- a. Define:
- (1) PIV
  - (2) TUF
  - (3) Ripple factor
  - (4) Efficiency of rectifier

Ans a. **Each Definition: 1Mark**

**PIV:**

Peak Inverse Voltage (PIV) is defined as the maximum negative voltage which appears across non-conducting reverse biased diode.

**TUF :**

Transformer Utilization Factor (TUF) is defined as the ratio of DC output power to the AC power ratings of the transformer.  
Mathematically it is expressed as,

$$\text{TUF} = \frac{\text{DC output power}}{\text{AC power ratings of the transformer}}$$

**Ripple Factor:**

Ripple Factor is defined as the ratio of RMS value of the AC component of output to the DC or average value of the output.

Mathematically it is expressed as,

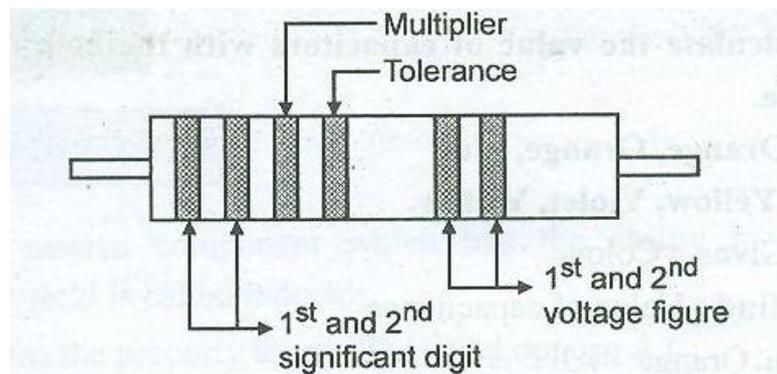
$$\text{Ripple Factor} = \frac{\text{RMS value of the AC component of output}}{\text{DC or average value of the output}}$$

**Efficiency of rectifier:**

$$\eta = \text{DC output power} / \text{AC input power} = P_{Ldc} / P_{ac}$$

b. Explain the colour coding using colour band system in capacitor with an example.

Ans b. **Explanation: 2Marks; Example: 2Marks**



1. First and second band gives the significant digit reading from left to right.
2. Third colour band gives the multiplier.
3. Fourth colour band gives the tolerance value.
4. Fifth and sixth bands gives the voltage figure.

**Example (any example should be considered)**

Given: Yellow, Violet, Yellow

To find : Value of capacitor

Solution: Yellow: 4

Violet: 7

Yellow:  $10^4$

$$: (47 \times 10^4) \times 10^{-12} = 47 \times 10^{-8}$$

$$: 0.47\mu\text{F}$$

- c. The input AC power to HW rectifier is 140W and DC power output is 60W. Calculate the efficiency of rectification.

**Ans c. Correct Solution: 4Marks**

$$P_{ac} = 140W, P_{dc} = 60W.$$

$$\begin{aligned} \text{Efficiency of rectification} &= P_{dc} / P_{ac} \\ &= 60 / 140 \\ &= 0.428 \end{aligned}$$

- d. Compare HW and FW (CT type ) rectifier on the basis of:

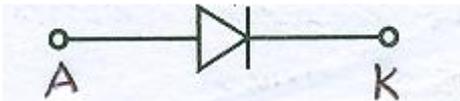
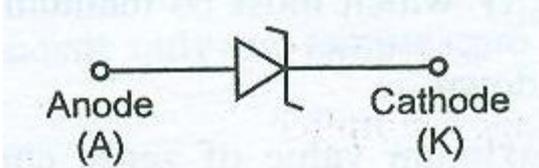
1. PIV
2. Efficiency
3. Ripple Frequency
4. Necessity of transformer

**Ans d. 4 Points: 4 Marks**

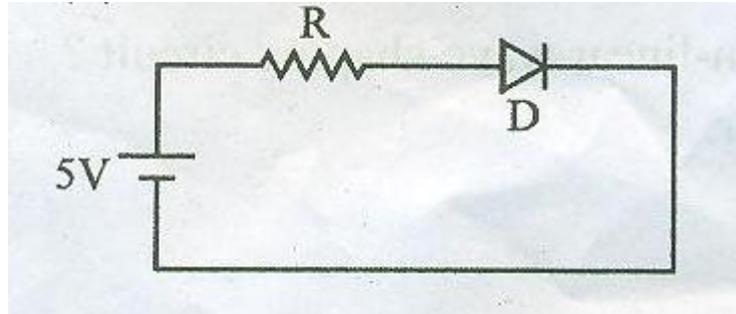
Sr.No	Parameters	HW	FW
1	PIV	$V_m$	$2V_m$
2	Efficiency	40.6%	81.2%
3	Ripple frequency	$F_{in}$ (or) 50Hz	$2 F_{in}$ (or) 100Hz
4	Necessity of transformer	Not always	Yes

- e. Compare P- N junction diode with zener diode.

**Ans e. 4 Points: 4 Marks**

Sr. No	PN Junction Diode	Zener Diode
1	It is operated in forward biased condition	It is operated in forward as well as reverse biased condition also.
2	It is not properly doped	Doping in Zener diode is controlled during manufacturing.
3	Applications: Rectifier, Clippers, Clampers	Applications: Voltage Regulators, Voltage Limiters etc.
4	Symbol: 	Symbol: 

- f. Calculate the value R in the following circuit to get maximum forward current of 100mA
1. when diode is Si- diode
  2. when diode is Ge- diode- **2Marks**



Ans f.

1.  $V_f = 0.7V$

$I_f = \frac{5 - 0.7}{100 \times 10^{-3}} = 43\Omega$  - **2Marks**

2.  $V_f = 0.3V$

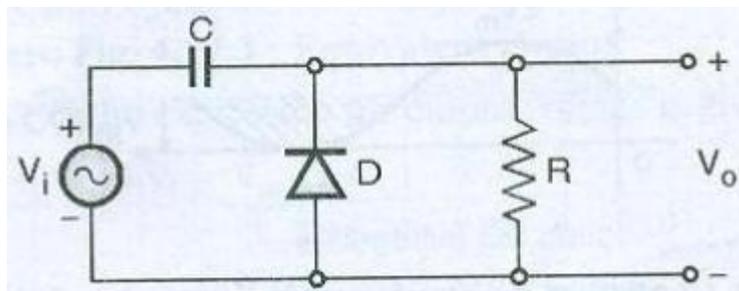
$I_f = \frac{5 - 0.3}{100 \times 10^{-3}} = 47\Omega$  - **2Marks**

**5. Attempt any FOUR:**

**16 marks**

- a. Draw the positive clamper circuit and explain its working.

Ans a. **Diagram- 2Marks; Working: 2Marks**



**Operation (2 Mark)**

In the first negative half cycle after turning on the circuit, the diode acts as a closed switch and charges the capacitor to peak input voltage  $V_m$  with the polarities.

In all the subsequent positive and negative half cycles, due to large RC time constant, the capacitor does not loose much charge. So  $V_o$  almost remains constant.

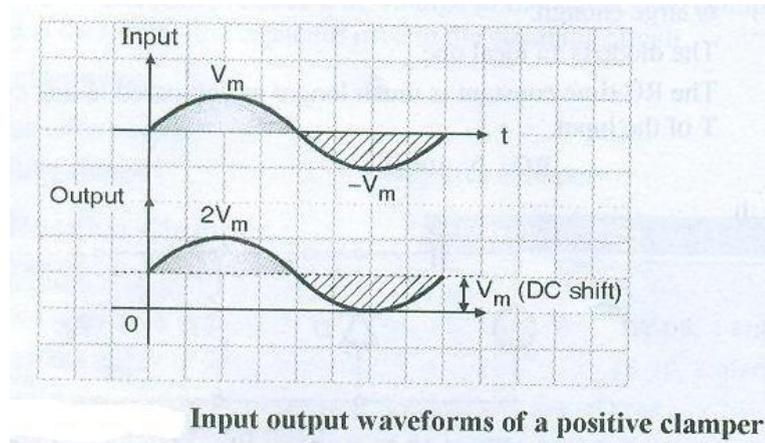
So for the rest of operation, the equivalent circuit is as shown in figure. The diode is reverse biased in both half cycles, so it remains off.

From figure we can write the expression for  $V_o$  as,

$$V_o = V_i + \underbrace{V_m}_{\text{Positive DC shift}}$$

This shows that the clamper adds a positive DC shift.

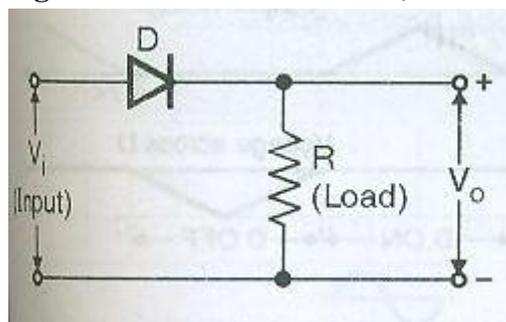
### Waveform



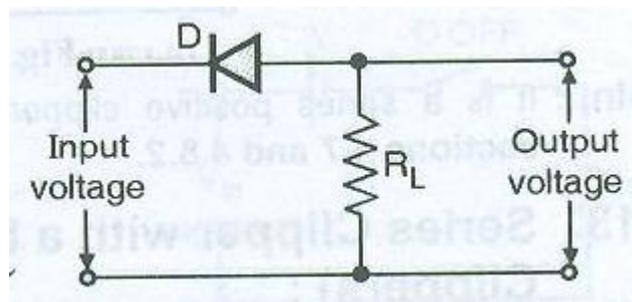
b. Draw the clipper circuit using series and shunt diode.

Ans b. **Clipper circuit using series-2 Marks Clipper circuit using shunt diode-2Marks**

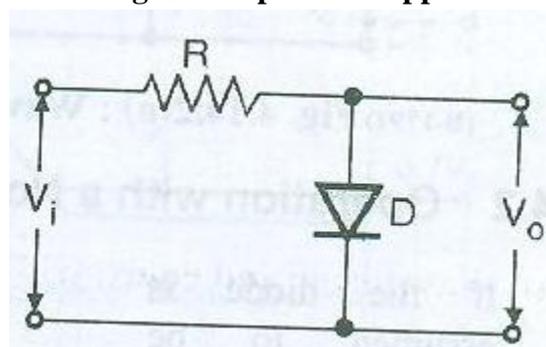
(Note: Any other relevant diagram should be considered)



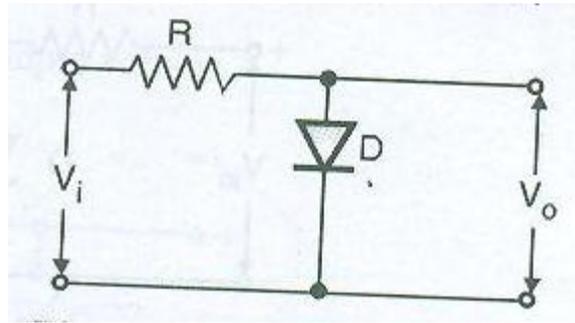
**Fig: A series negative clipper  
(OR)**



**Fig: Series positive clipper**

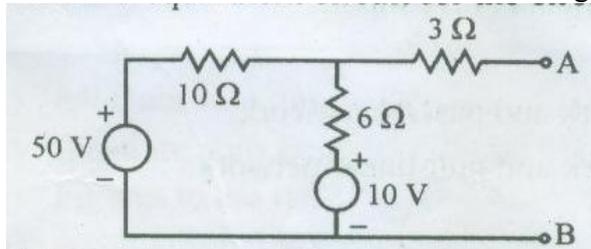


**Fig: Parallel positive clipper  
(OR)**



**Fig: Parallel negative clipper**

c. Find the Thevenin's equivalent circuit for the circuit shown in the figure.



Ans c. **Correct Solution: 4Marks**

c) Thevenin's

$$\therefore 50 - 10I_1 - 6I_1 - 10 = 0$$

$$40 - 16I_1 = 0$$

$$40 - 16I_1$$

$$\frac{40}{16} = I_1$$

$$\therefore \boxed{I_1 = 2.5 \text{ A}} \quad \text{--- (1)}$$

Now,

$$R_{TH} = (10 \parallel 6) + 3$$

$$= 3.75 + 3$$

$$= 6.75 \Omega$$

$\therefore$  Now,

$$V_{OC} = 10 + (6 \times I_1)$$

$$= 10 + (6 \times 2.5)$$

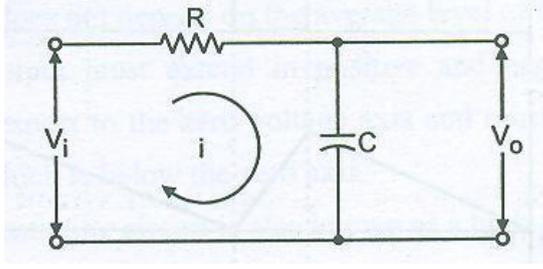
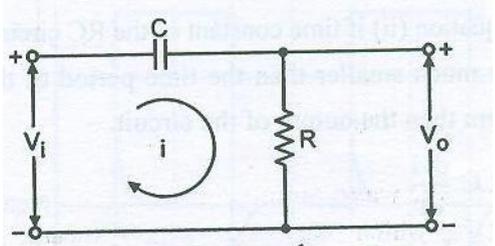
$$= 10 + 15$$

$$= 25 \text{ V}$$

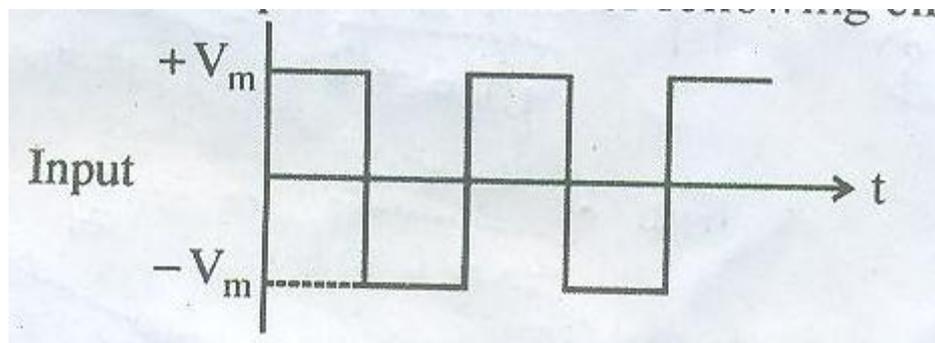
Equivalent circuit

d. Compare RC integrator and differentiator.

Ans d. Any **4 points: 4 Marks**

Sr.No	RC Integrator	Differentiator
1	Output is integration of input	Output is differentiation of input
2	For proper operation $T \ll RC$	For proper operation $T \gg RC$
3	Output decreases as frequency is increased	Output increases as frequency is increased
4	It is basically a low pass filter	It is high pass filter
5	Configuration 	Configuration  $V_i = \text{Input voltage}$ $V_o = \text{Output voltage}$

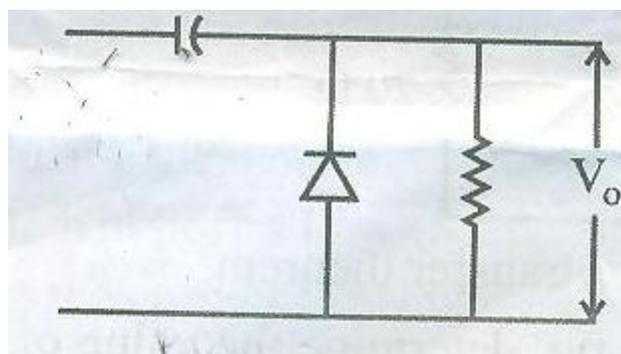
e. Draw the output waveform for the following circuits when input is



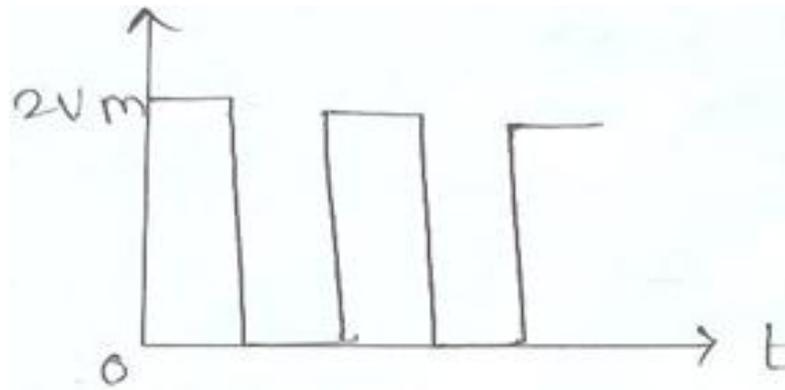
Ans e.

Circuits:

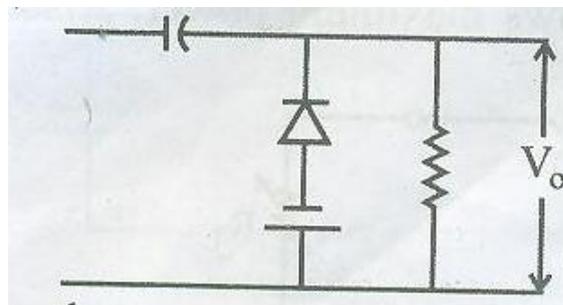
**2Marks**



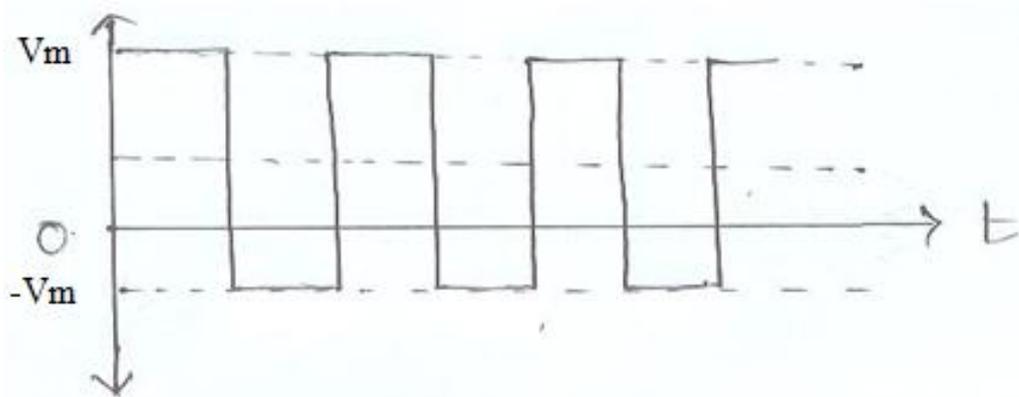
**Positive Clamper**



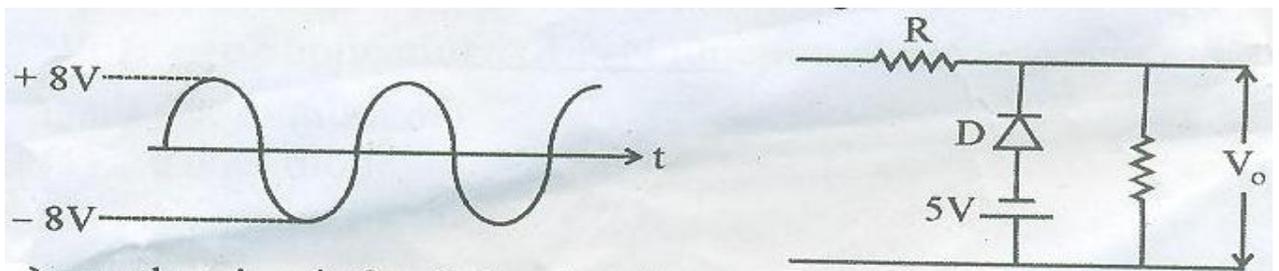
2Marks



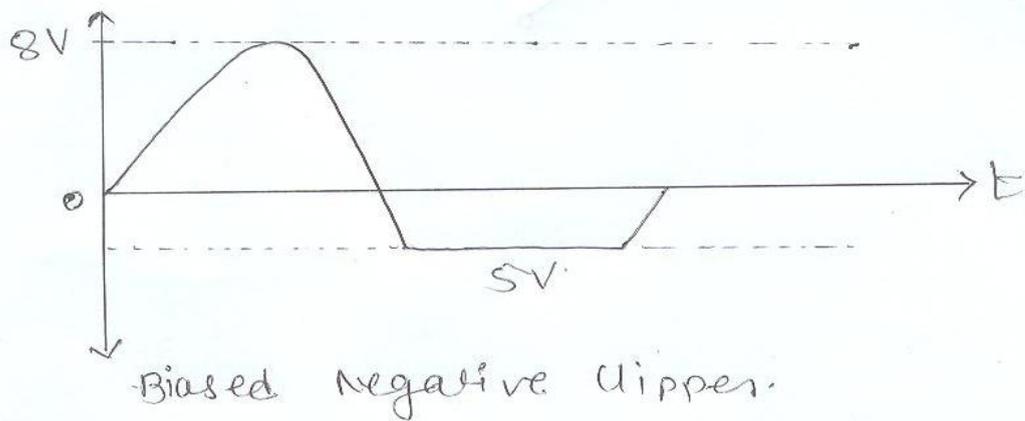
**Positive Biased Clamper**



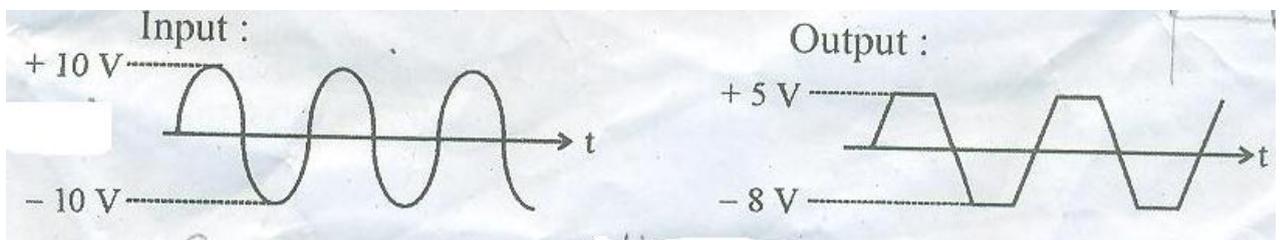
f. (i) Draw the output waveform for the following circuit



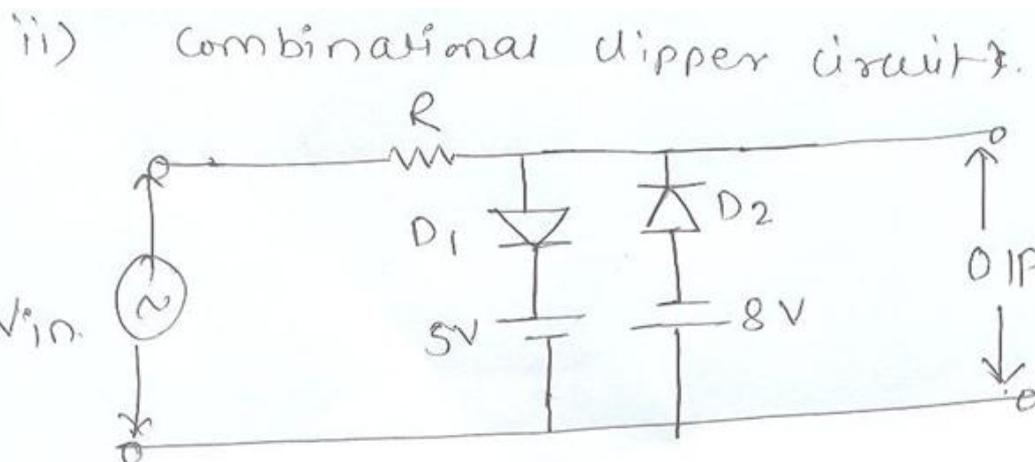
Ans f. (i) 2Marks



(ii) Draw the circuit for following input and output: **2Marks**



Ans f(ii)



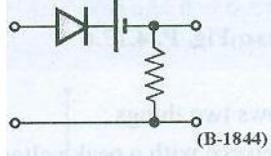
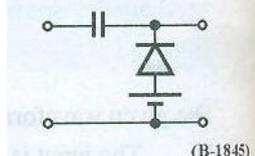
**6. Attempt any FOUR:**

**16 marks**

(a) Compare clipper and clamper

Ans a. Any four points- 4Marks

Sr. No	Parameter	Clipper	Clamper
1	Components used	Diode, Resistors	Diode, Capacitors, Resistors
2	Function	To remove a part of input waveform	To add a DC shift to the input waveform
3	Frequency of input	Not important as capacitor is not used	The value of C needs to be chosen on the basis of input frequency
4	Application	Diode clamp, wave	Voltage Multipliers

		shaping circuits	
5.	Configuration	 (B-1844)	 (B-1845)

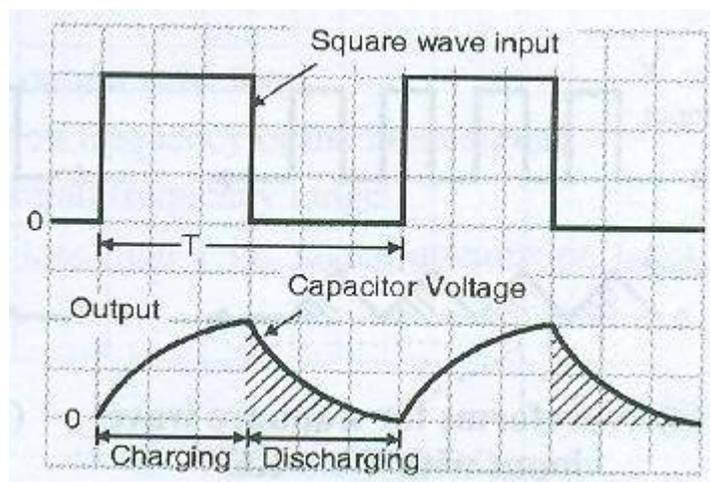
b. State the condition for RC differentiator. Draw the output waveform of RC integrator for square wave input.

Ans b. **Condition: 2Marks; Waveform: 2Marks**

**Condition for RC differentiator:**

- If the time duration  $T$  of the input waveform is comparable with the  $RC$  time constant (product of  $R$  and  $C$ ) then the output waveform of the differentiator gets distorted. Hence for proper differentiator the condition is as follows:

$T \gg RC$



**Waveform for square wave input**

c. Compare:

1. Active and passive network
2. Linear and non-linear network

Ans c.

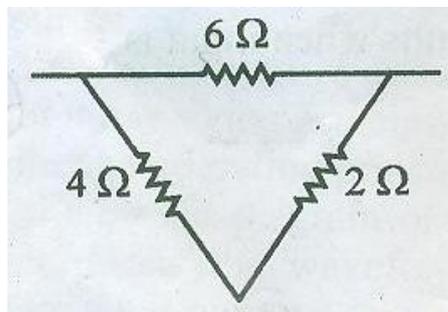
**1. Active network and passive network. 2 Marks**

Sr.No	Active network	Passive network
1	If a network consists of an energy source, then it is called as an active network.	If a network does not contain any energy source then it is called as the passive network.
2	The type of energy source can be voltage source or a current source.	No energy source is used.

**2. Linear Network and non- linear network. 2Marks**

Sr.No	Linear Network	Non- Linear Network
1	If the characteristics, parameter such as resistances, capacitances, inductances etc. remain constant irrespective of changes in temperature, time, voltage etc. then the circuit or network is called Linear network.	If the parameters of a network change their values with change in voltage, temperature, time etc. then the network is called as Non-Linear Network.
2	We can apply the ohm's law only to the linear networks.	The ohm's law is not applicable to the nonlinear network.
3	The superposition theorem also is applicable only to the linear networks.	The superposition theorem also is not applicable to the nonlinear networks.

d. Convert the delta network into equivalent star network.



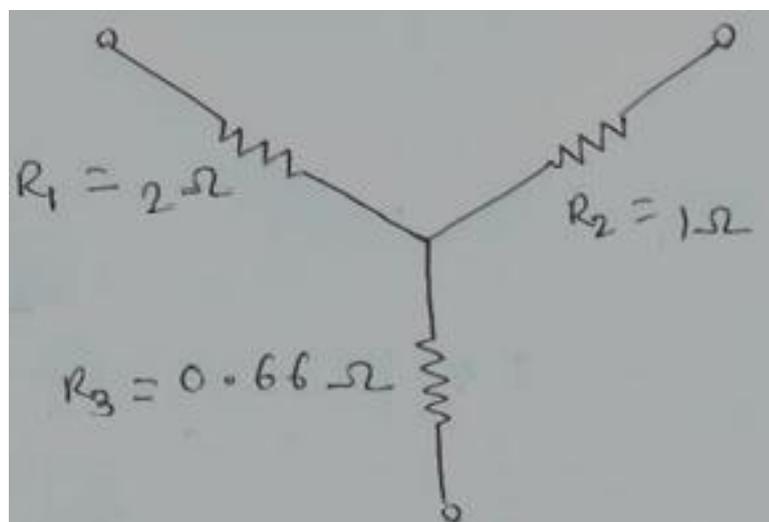
Ans d. **Correct Conversion- 4Marks**

Delta to start network

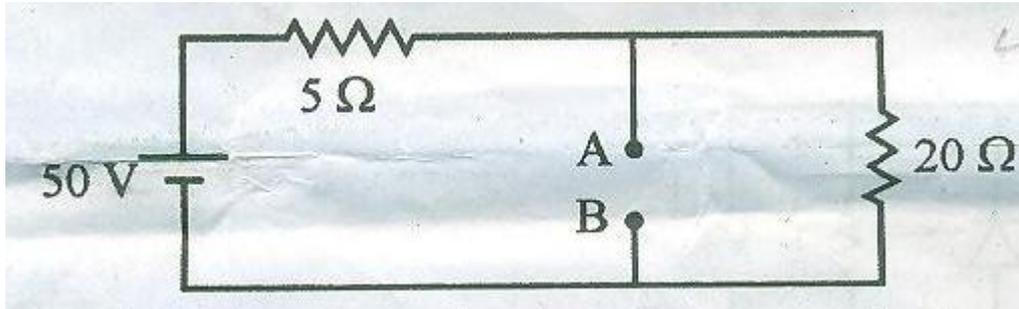
$$R_1 = \frac{4 \times 6}{4+6+2} = \frac{24}{12} = 2/1 = 2\Omega$$

$$R_2 = \frac{2 \times 6}{4+6+2} = \frac{12}{12} = 1 = 1\Omega$$

$$R_3 = \frac{4 \times 2}{4+6+2} = \frac{8}{12} = \frac{2}{3} = 0.66\Omega$$



e. Find the Norton's current through AB



Ans e.

e)  
Ans Norton's.

step-1 - for calculate  $I_{sc}$ .

$\therefore I_{sc} = \frac{50}{5} = 10 \text{ A}$

$I_{sc} = 10 \text{ A}$

step-2 - calculate  $R_{TH}$ .

$\therefore R_{TH} = 5 \parallel 20$

$$= \frac{5 \times 20}{5 + 20}$$

$R_{TH} = 4 \Omega$

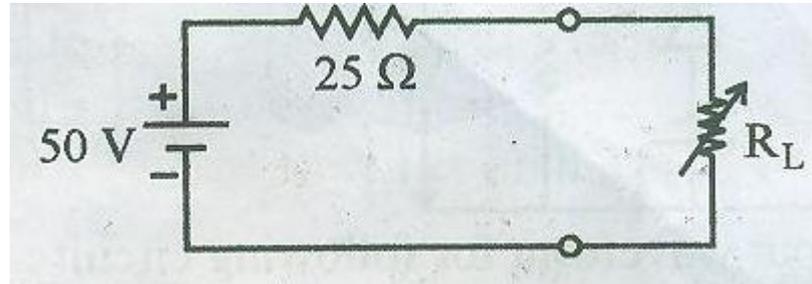
step-3 equivalent ckt

Therefore, the current flowing through AB will depend on resistance between Points AB.

f.

(1) State the maximum power transfer theorem.

(2) For the circuit shown in fig, determine the value of load resistance when load resistance draws maximum power. Also find the value of the maximum power.



Ans f.

(i) **Theorem – 2 marks**

The maximum power transfer theorem states that the maximum amount of power will be delivered to the load resistance when the load resistance is equal to the Thevenin/ Norton resistance of the network supplying the power. If the load resistance is lower or higher than the Thevenin/ Norton resistance of the source network, then the power delivered to load is less than maximum. That means the condition for maximum power transfer according to maximum power transfer theorem is,

$$R_L = R_{TH}$$

(ii) From circuit above,  
 $R_L = R_{TH} = 25\Omega$

$$P_{L \max} = (V_{oc})^2 / 4R_L$$
$$= (50)^2 / 4 \times 25$$

$P_{L \max} = 25 \text{Watt}$
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