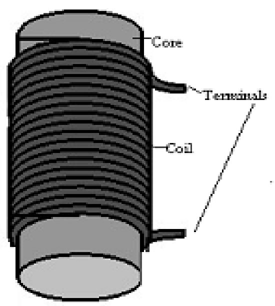
WINTER– 17 EXAMINATION

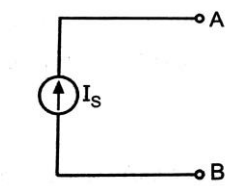
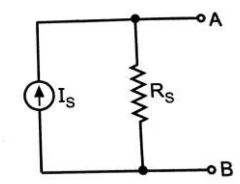
Subject Name: Elements of Electronics **Model Answer** **Sub Code: 17215**

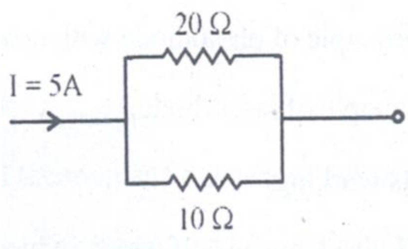
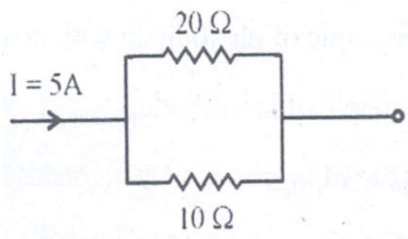
Important Instructions to examiners:

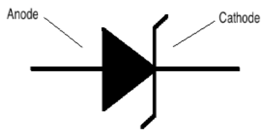
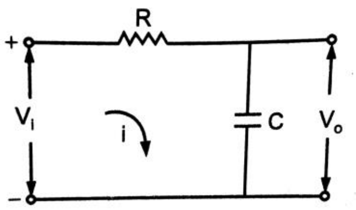
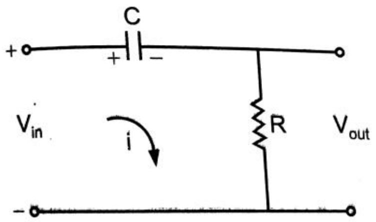
1) The answers should be examined by key words and not as word-to-word as given in the model answer scheme.
2) The model answer and the answer written by candidate may vary but the examiner may try to assess the understanding level of the candidate.
3) The language errors such as grammatical, spelling 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 anyequivalent 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.

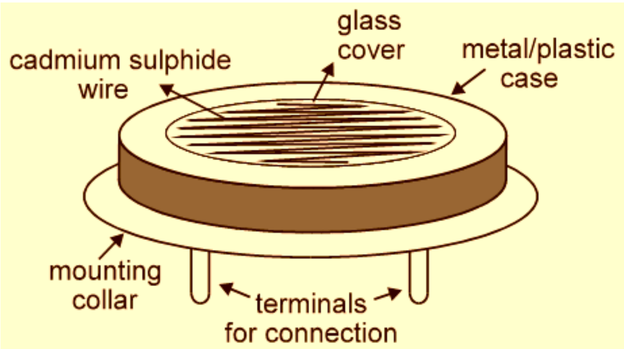
Q. No.	Sub. Q. No.	Answer	Marking Scheme
1		**Attempt any TEN**	**20 M**
	a.	**State Faraday's law of electromagnetic induction.**	**2 M**
	Ans:	**First law:** Whenever magnetic flux linked with a conductor or coil changes, it induces e.m.f (Electromotive force) in it. **(OR)** **Second law:** The magnitude of induced e.m.f is directly proportional to the rate of change of magnetic flux linked with a conductor or coil. $E = - N (d\Phi/dt)$ (volts)	**2marks for statement of any one law**
	b.	**Draw labeled diagram of air core inductor.**	**2 M**
	Ans:	**Diagram of air-cored inductor :**  	**2M**

	c	**State the specifications of capacitor.**	**2 M**
	Ans:	**(Any 4 specifications for 2 marks)** **The important specifications of capacitor are**: 1. Capacitance (C) Value 2. Dielectric material 3. Working Voltage (WV) 4. Power factor 5. Physical Size 6. Insulation resistance 7. C/V ratio 8. Tolerance (±%) 9 Leakage Current 10 Temperature Coefficient (TC) 11 Equivalent Series Resistance (ESR)	**2 marks (½ mark for each specification)**
	d)	**Define rectifier. State its types.**	**2 M**
	Ans:	A rectifier is defined as an electronic device which converts alternating (AC) voltage or current into unidirectional/ pulsating (D.C) voltage or current. **Types of Rectifier**: 1. Half wave rectifier 2. Full wave rectifier a. Centre tapped full wave rectifier	**1 mark for definition** **1 mark for types**

		b. Full wave bridge rectifier	
	e)	**State different types of filters.**	**2 M**
	Ans:	**Types of filters**: 1. Series inductor (or choke) filter 2. Shunt capacitor filter 3. Choke input (LC or L type) filter 4. Capacitor input (CLC or π type) filter	**(1/2 mark for each type)**
	f)	**Draw the ideal and practical current source.**	**2 M**
	Ans:	 **Ideal current source**  **Practical current source** Where, Is = Current Source R_S = internal resistance of source.	**(1 mark for each)**
	g)	**State KVL and KCL**	**2 M**
	Ans:	**Statement of Kirchhoff's Current Law** or **KCL:** In any electrical network, the algebraic sum of the currents meeting at a point or junction is zero. (**OR**) Total current entering a junction or node is exactly equal to the total current leaving the node. $\sum I = 0$	**(1 mark for each definition)**

		Statement of Kirchhoff's Voltage Law or KVL : The algebraic sum of the products of current and resistances in each of the conductors in any closed path or mesh in a network plus the algebraic sum of the e.m.fs in that path is zero (**OR**) The algebraic sum of all voltages within the loop must be equal to zero. $\sum IR + \sum emf = 0$ round a mesh.	
	h)	**Calculate the current through 20 resistor shown in Fig 1**  **Fig.1**	**2 M**
	Ans:	 By using current division rule $I_{R1=}$ I $[(R_2/(R_1+R_2)]$ $I_{20}=(5*10)/(10+20)$ I_{20}=1.66Amp	**2M**
	i)	**Draw the symbol of 1. Zener diode 2. Shottky diode**	**2M**
	Ans:		

		Zener diode  **Schottky diode** 	**1M for each symbol**
	j)	**State four applications of p-n junction diode.**	**2M**
	Ans:	**Applications of p-n junction diode:** 1. It is used as a rectifier in DC power supply. 2. It is used as a signal diode in communication circuits. 3. It is used as a switch in logic circuits used in computers and digital electronics. 4. It is used as a detector in demodulation circuits. 5. It is used for wave shaping in demodulation circuits. 6. It is used for wave shaping in clipping and clamping circuits.	**(2 M for 4 applications)**
	k)	**Draw RC integrator and RC differentiator circuit.**	**2 M**
	Ans:	 RC Integrator  RC Differentiator	**2 marks (1 mark for each)**
	l)	**Define clipper and clamper.**	**2 M**
	Ans:	**Clipper:** A clipper is a type of diode network that has the ability to “clip off” a portion of the input signal without distorting the remaining part of the alternating	**(1 mark for**

<table>
<tr><td></td><td></td><td>waveform.
Clamper: The circuit with which the waveform can be shifted in such a way that a particular part of it(say positive or negative peak) is maintained at a specified voltage level is called a clamper.
(OR)
It is a circuit which introduces a D.C level to a A.C signal.</td><td>each definition)</td></tr>
<tr><td>2</td><td></td><td>Attempt any FOUR</td><td>16</td></tr>
<tr><td></td><td>a)</td><td>Draw and describe construction of LDR. List its applications.</td><td>4M</td></tr>
<tr><td></td><td>Ans:</td><td>Constructional diagram of light dependent resistor (LDR):


Constructional diagram of LDR

Description:
1. Photo resistors (or LDR) are manufactured from photo-conductive semiconductor materials such as cadmium sulphide (CdS), cadmium selenide (CdSe) and lead sulphide (PbS).
2. These resistors have a ceramic substrate, over which a layer of cadmium sulphide (CdS) is deposited in zig-zag form to increase the length. This increases the resistance value.
3. Depending upon the thickness, surface area and length of the layer, the resistance value changes. The electrodes are formed by evaporating metal in vacuum.</td><td>1 mark for diagram

2 marks</td></tr>
</table>

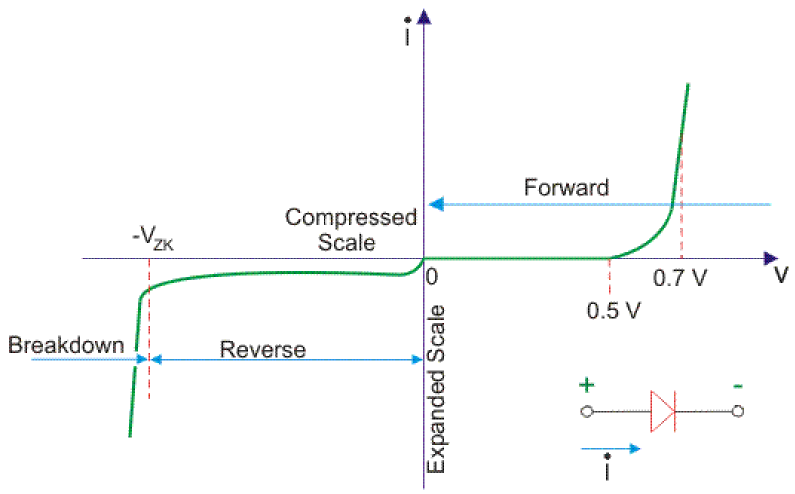
		4. The leads are connected and put in plastic case. These are available in the form of discs with wire lead ends on one side. 5. The resistance of photo resistors may be several mega ohms in total darkness and less than100Ω, when well illuminated. **Applications:** 1. It is used as a proximity switch. 2. It is used in street light control system. 3. It is used in optical coding. 4. It is used in light (flux) meter. 5. It is used in photosensitive relay. 6. It is used in camera light meters. 7. It is used in security alarms. 8. It is used in smoke detectors.	**1 mark for any 2 applications**

	b)	**Compare linear and logarithmic potentiometer.**	**4M**
	Ans:	<table><tr><th>Linear Potentiometer</th><th>Logarithmic Potentiometer</th></tr><tr><td>It has linear variation of current with the applied voltage.</td><td>It has non-linear variation of current with the applied voltage.</td></tr><tr><td>Its resistance value does not change with change in applied voltage and light intensity.</td><td>Its resistance value changes with change in temperature, light intensity and applied voltage.</td></tr><tr><td>It includes carbon composition, wire wound, metal film and carbon film resistance.</td><td>It includes LDR, VDR, thermistor etc</td></tr><tr><td>It has linear variation of resistance with each degree of rotation of its shaft</td><td>It has a logarithmic variation of resistance with each degree of rotation of its shaft</td></tr></table> **(Marks may be given to any relevant points other than given above).**	**4M**
	c)	**State the functions of following essential parts of electrolytic capacitor.** 1. Aluminium foil 2. Oxide film 3. Spacers 4. Aluminium container	**4M**
	Ans:	1. Aluminium Foil – It serves as a positive electrode called anode 2. Oxide film – It acts as a dielectric medium. 3. Spacer- It is used to provide separation and hold the electrolyte. 4. Aluminium container- It serves as a negative electrode called cathode.	**1 mark for each**

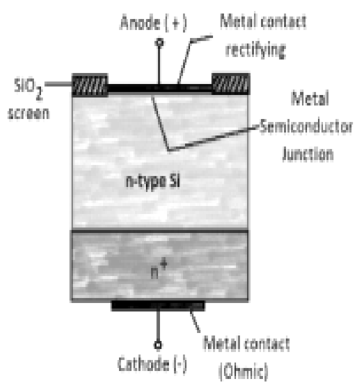
	d)	**Compare hard and soft magnetic materials.**	**4M**
	Ans:	(see table below)	**1mark for each for any four**

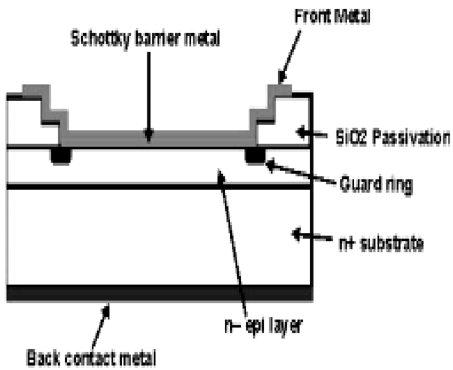
Hard magnetic materials	Soft magnetic materials
They have low resistivity	They have high resistivity
They have high coercivity.	They have low coercivity
They have high residual magnetism	They have low residual magnetism.
They have high (B*H) energy	They have low (B*H) energy
They have high retentivity.	They have low retentivity
They cannot be easily magnetized.	They are easily magnetized.
They have wide hysteresis loop.	They have narrow hysteresis loop.

	e)	**List different types of capacitors? State the dielectric materials used for it.**	4M
	Ans:	**Types of capacitors:** 1. Electrolytic capacitor 2. Variable capacitor 3. Air ganged capacitor 4. PVC ganged capacitor 5. Trimmer capacitor	**2 Marks for types**
		Dielectric materials used in capacitors: 1. Air 2. Mica 3. Glass 4. Ceramic 5. Porcelain 6. Polystyrene. 7. Fibre 8. Bakelite 9. Waxed paper 10.Plastic	**2Marks for any four dielectric materials**

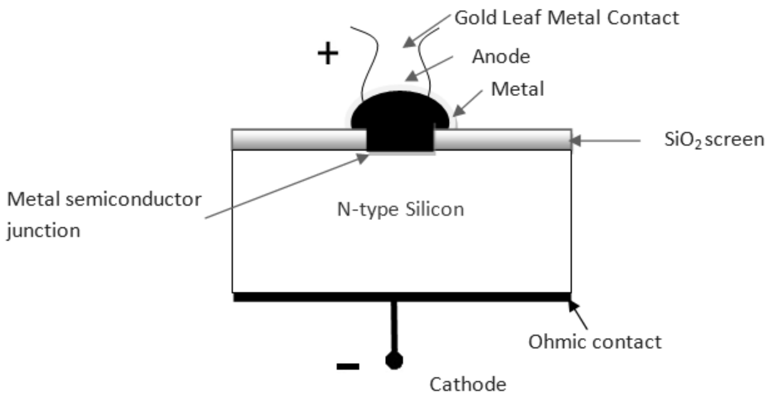
	f)	**Draw V-I characteristics of p-n junction diode? Define static and dynamic resistance of diode.**	**4M**
	Ans:	 **V-I characteristics of PN junction diode** **Static Resistance**: The resistance offered by a p-n junction diode when it is connected to a DC circuit is called static resistance. **(OR)** It is the ratio of DC voltage applied across diode to the DC current or direct current flowing through the diode. **Dynamic Resistance**:The dynamic resistance is the resistance offered by the p-n junction diode to an A.C. signal. **(OR)** The dynamic resistance of a diode is the ratio of change in voltage to the change in current.	**2 M for characteristics** **1M for each definition**

3		**Attempt any FOUR**	**16**
	a.	**Draw the construction of Schottky diode, State its applications.**	**4M**
	Ans:		**Any relevant dig-2M**





OR

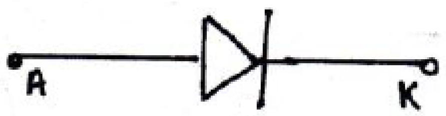
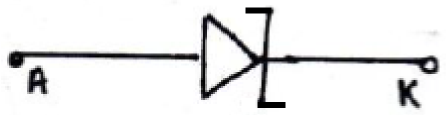


Applications:

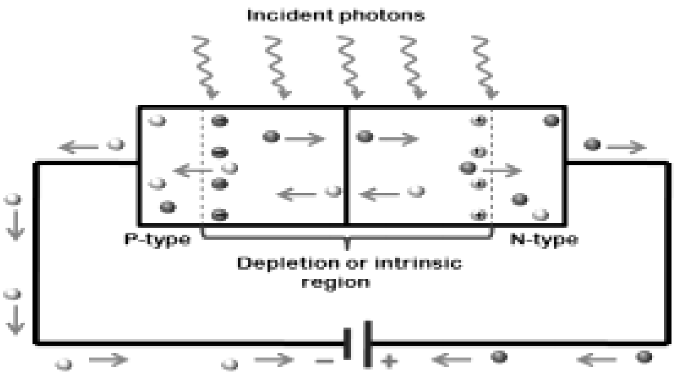
1) RF mixer and Detector Diode.
2) Power Rectifier
3) Voltage Clamping
4) Stand-alone photovoltaic system in order to prevent batteries from discharging purpose for the solar panels at night.
5) Rectifiers in power supplies.
6) Clipping and Clamping circuits.
7) Low Voltage Power Supply Circuits.
8) To rectify very high frequency signals.

Any four Application- 1/2M each

	b.	**Compare P-N junction and Zener Diode.**	**4M**
	Ans:	(see table below)	**Any 4 points-1Marks each**

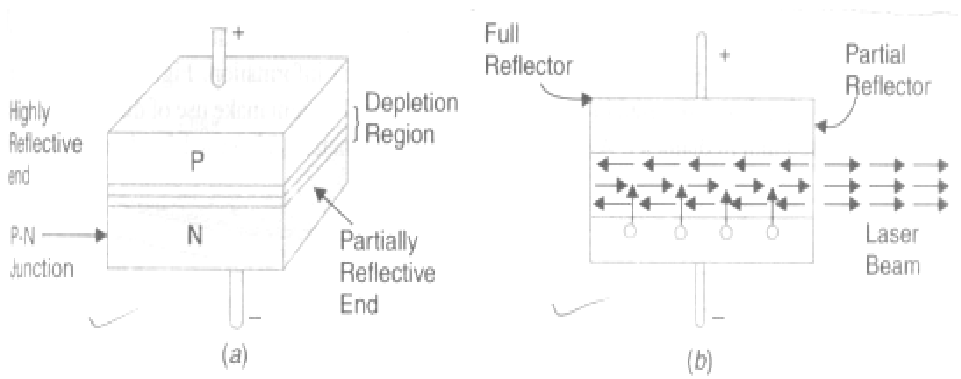
P-N junction	**Zener Diode**
It conducts in only in one direction.	It conducts in both the directions.
It is always operated in forward bias condition.	It is always operated in reverse bias condition.
It has no sharp reverse breakdown	It has quite sharp reverse breakdown
It burns immediately, if applied voltage exceeds the breakdown voltage.	It does not burn, but functions properly in breakdown region.
It is commonly used for rectification purpose.	It cannot be used for rectification, but commonly used for voltage regulation
	

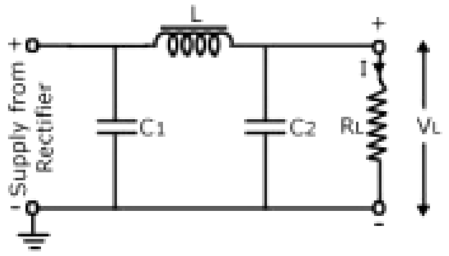
	c	**Describe the operating principle of photodiode with sketch**	**4M**
	Ans:	(see below)	**Relevant diagram-2M** **Working Principle-2M**



Working principle:

A photodiode is a PN- junction diode which uses light energy to produce electric current. It is also called photo-detector, light detector, or photo-sensor. Photodiode works in reverse bias condition, it means that the P-side of the photodiode is connected to the negative terminal of the battery and n-side is connected to the

		positive terminal of the battery. When a photon of ample energy strikes the diode, it makes a pair of electron-hole. This mechanism is called inner photoelectric effect. If the absorption arises in the depletion region junction, then the carriers are removed from the junction by the inbuilt electric field of the depletion region. Therefore, holes in the region move toward the anode, and electrons move toward the cathode, and a photocurrent will be generated.	
	d	**Describe the working principle of Laser Diode.**	**4M**
	Ans:	 When the P-N junction of a laser diode is forward-biased by an external voltage source, electrons move across the junction and recombination occurs in the depletion region which results in the production of photons. As forward current is increased, more photons are produced which drift at random in the depletion region. Some of these photons strike the reflective surface perpendicularly. These reflected photons move back and forth between the two reflective surfaces. The photon activity becomes so intense that at some point, a strong beam of laser light comes out of the partially reflective surface of the diode.	**Relevant Diagram-2M** **Working principle 2M**

	e	**Draw π-filter and state its working.**	**4M**
	Ans:	**Circuit Diagram:**  Circuit Digram **Working :** It consists of a filter capacitor C_1 connected across the rectifier output, a choke L is series and another filter capacitor C_2 connected across the load R_L. The pulsating o/p from the rectifier is applied across the input terminals 1 & 2 of the filter. The filtering action of the three components C_1,C_2 and L is described below: The filter capacitor C_1 offers low reactance to a.c component of rectifier output while it offers infinite reactance to the d.c. component. Therefore, capacitor C_1 bypasses an appreciable amount of a.c component to the ground, while the d.c component moves towards L. The choke L offers high reactance to the a.c component but it offers almost zero reactance to the d.c component. Therefore, it allows the d.c component to flow through it, and blocks a.c component. The filter capacitor C_2 bypasses the a.c component which the choke has failed to block. Therefore, only d.c component appears across the load.	**Diagram-2M** **Working-2M**
	f	**State the advantages and disadvantages of series inductor and shunt capacitor filter.**	**4M**
	Ans:	**Advantages of series inductor filter** 1. It has low ripple factor at heavy load currents (i.e. low load resistance) 2. It has no surge current through the diode. 3. It reduces the ripple in the DC output of rectifier circuit. 4. The L filter is suitable for heavy loads.	**Any one advantage of each filter-2M**

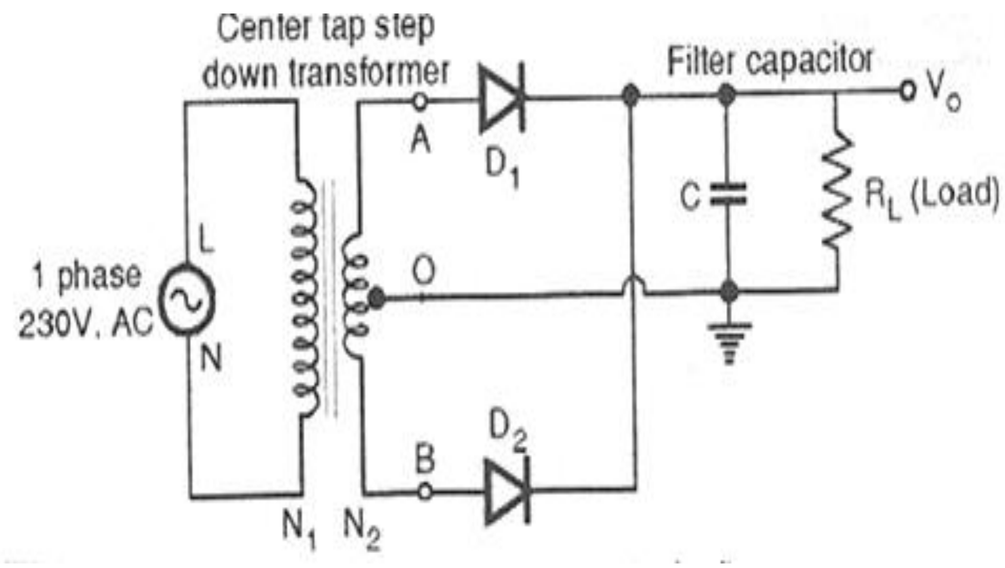
		Advantages of Shunt Capacitor filter 1. It is easy to design. 2. It is small in size and cheap. 3. It has low ripple factor for heavy loads. 4. It has high output DC voltage for light loads. 5. It is suitable for light loads. 6. It has no load voltage equal to maximum transformer voltage. **Disadvantages of series inductor:** 1. It is bulky and more costly. 2. It has poor voltage regulation. 3. It produces audible noise. 4. It is not suitable for light loads. **Disadvantages of Shunt Capacitor:** 1. It has relatively poor voltage regulation. 2. It has high ripple factor for heavy loads. 3. It has low output voltages for heavy loads. 4. Ripple factor is dependent on the load.	**Any one disadvantage of each filter -2M**
4		**Attempt any FOUR**	**16**
	a	**Compare Half wave and Full wave rectifier on the basis of** **(1) number of diode used** **(2) Ripple factor** **(3) Rectification Efficiency** **(4) PIV Rating**	**4M**
	Ans:	**Note: Comparison between Half wave rectifier and Full wave rectifier either Center tapped (OR)Bridge type any one can be considered.**	

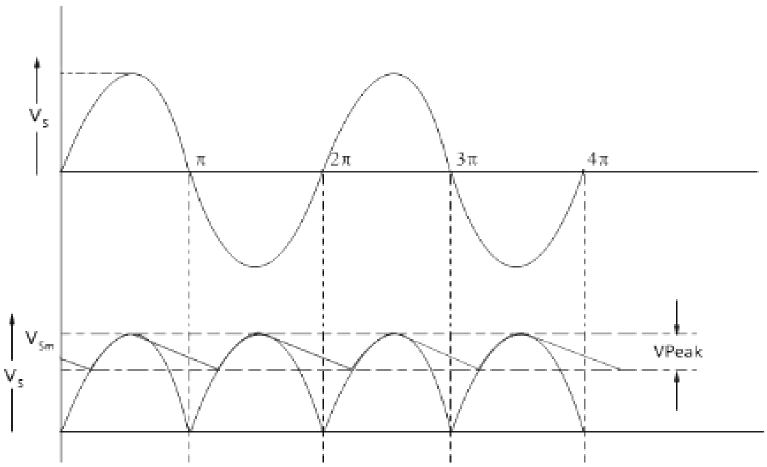
S. N	Parameter	Half Wave Rectifier	Full Wave Rectifier(center tap)	Bridge Rectifier
1	number of diode used	1	2	4
2	Ripple factor	1.21	0.48	0.48
3	Rectification Efficiency	40.6%	81.2%	81.2%
4	PIV Rating	Vm	2Vm	Vm

1M for each Point

b **Draw shunt capacitor filter with center-tap rectifier. Draw its input and output waveforms.** **4M**

Ans: **Diagram-2M**



		Waveforms: 	**Waveform- 2M**
	c	**Using colour code, write colour code for the following.** **(1) 10kΩ, ±10%** **(2) 4kΩ, ±5%**	**4M**
	Ans:	1) **10kΩ, ±10%** $=10*10^3$, ±10% The colour code is : **Brown, Black, Orange, Silver** 2) **4kΩ, ±5%** Considering Five bands the answer will be: $=400*10^1$, ±5% The colour code is: **Yellow, Black, Black, Brown, Gold** Considering Four bands the answer will be: $=40*10^2$, ±5% The colour code is: **Yellow, Black, Red, Gold**	**Colour code- 2M each**

	d	**An AC supply of 230V is applied to half wave rectifier circuit. A transformer with turns ratio 10: 1. Find (1)DC output voltage (2) PIV of diode**	**4M**
	Ans:	Given V_1 = 230 Volts, $N_2/N_1=1/10$ $\frac{N_2}{N_1} = \frac{V_2}{V_1}$ (1) We know that the secondary voltage $V_2 = \frac{N_2}{N_1} \times V_1 = 230 \times \frac{1}{10} = 23$ volts. Maximum value of secondary voltage $Vm = \sqrt{2} \times V_2$ $= \sqrt{2} \times 23 = 32.5v$ Therefore DC voltage $V_{dc} = \frac{V_m}{\pi} = \frac{32.5}{3.14} = 10.3$ volts (2) PIV of a diode = Vm = 32.5 volts.	**2M** **2M**
	e	**Compare zener breakdown and avalanche breakdown.**	**4M**
	Ans:	(see table below)	1M each

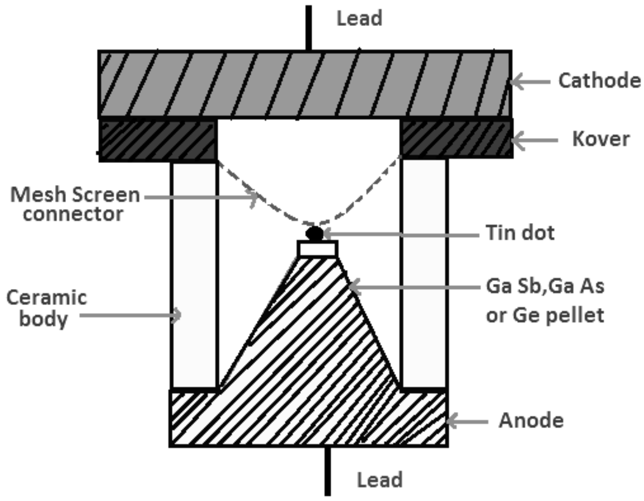
	Avalanche breakdown		Zener breakdown
1	PN junction are lightly doped in avalanche breakdown	1	PN junction are heavily doped in zener breakdown
2	The avalanche breakdown occurs when carriers in the transition region are accelerated by the electric field to energies sufficient to create mobile or free electron-hole pairs via collisions with bound electrons	2	In the Zener effect or Zener breakdown , the electric field enables tunneling of electrons from the valence to the conduction band of a semiconductor in a reverse biased p-n diode
3	Charge carriers acquire energy from the applied potential	3	Zener current is independent of applied voltage
4	Electron hole pairs are generated	4	Large number of holes and electrons are produced

WINTER– 17 EXAMINATION

Subject Name: Elements of Electronics **<u>Model Answer</u>** **Sub Code:** 17215

<table>
<tr><td></td><td>f</td><td>Draw the construction of Tunnel Diode. State its application.</td><td>4M</td></tr>
<tr><td></td><td>Ans:</td><td>

Construction:



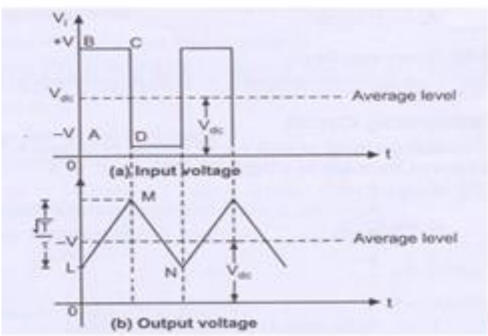
Applications:

- In digital networks.
- As a high speed switch.
- As a high frequency oscillator.
- As a logic memory storage device.
- In relaxation oscillator circuits.

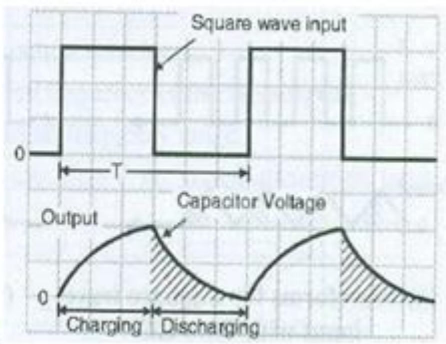
</td><td>Diagram-2M

Applications -2M any two applications</td></tr>
<tr><td>5</td><td></td><td>Attempt any FOUR</td><td>16M</td></tr>
<tr><td></td><td>a</td><td>Draw output waveforms of RC integrator for Square and Triangular wave as Input</td><td>4M</td></tr>
<tr><td></td><td>Ans:</td><td>

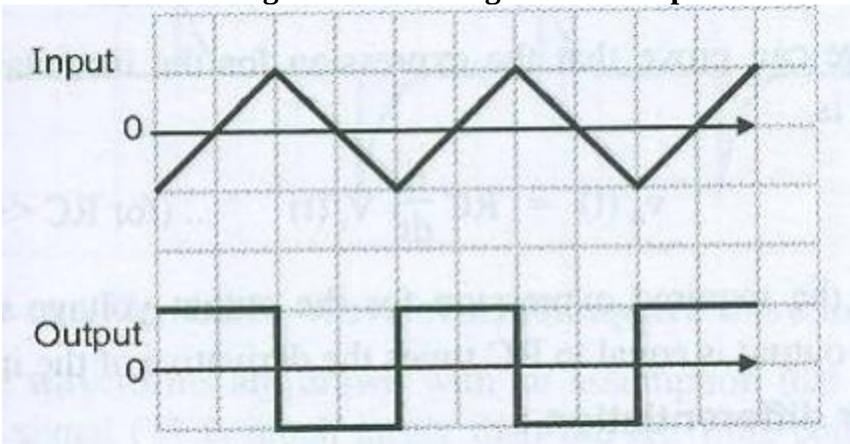
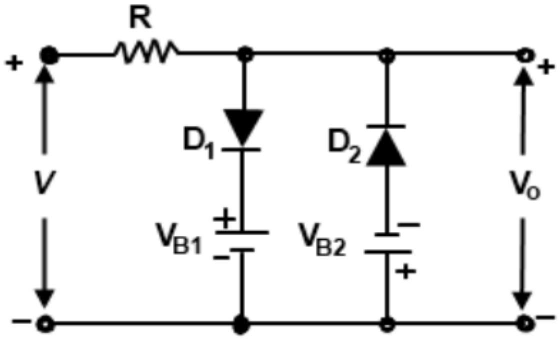
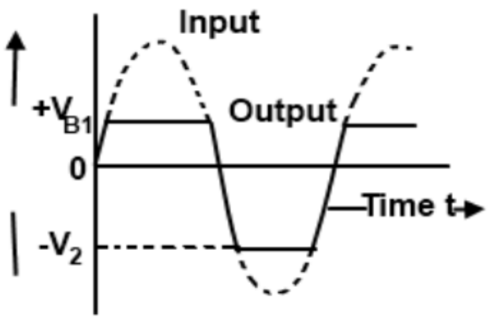
Output waveform of RC integrator for Square wave input:-



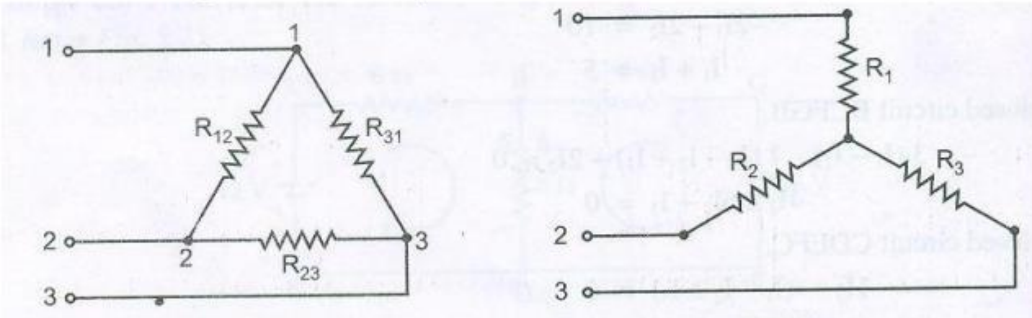
OR



</td><td>2M each</td></tr>
</table>

		output waveform of RC integrator for Triangular wave input:- 	
	b	**Draw and explain the working of combinational Clipper with waveforms.**	**4M**
	Ans:	  **Explanation:-** • As shown in figure the combinational clipper is the combination of positive biased and negative biased clipper. The combinational clipper can be used to clip both two independent levels depending upon the bias voltages. • During the positive half cycle of input the diode D_1 is forward biased while diode D_2 is reverse biased. Therefore diode D_1 conducts and will act as a short circuit ,while D_2 acts as open circuit. Hence the value of output voltage cannot exceed the voltage level of V_{B1}. • Similarly during the negative half cycle of input the diode D_2 is forward biased while D_1 is reverse biased. Therefore D_2 conducts and act as a short circuit while D_1 acts as open circuit. Hence the value of output voltage cannot exceed the voltage level of V_{B2}.	**2M diagram , 1M waveform, 1M explanation**

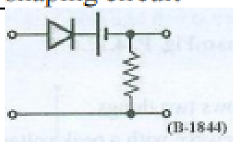
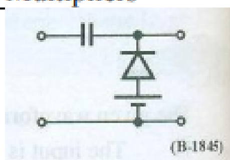
	c	**Explain the following terms:** **(1) Unilateral network** **(2) Bilateral network**	**4M**
	Ans:	**Unilateral network:** It is a network whose properties or characteristics change with the direction of its operation. Eg: Network consisting of Diode. Current flows in only one direction. **Bilateral network:** It is a network whose properties or characteristics are same in both directions. In this network impedance is same in both directions. Eg: All resistive networks.	**2M each for each definition**
	d	**State Superposition theorem and maximum power transfer theorem.**	**4M**
	Ans:	**Superposition theorem:** Superposition theorem states that in any linear network containing two or more sources, the response (current) in any element is equal to the algebraic sum of the response (current) caused by individual sources acting alone, while the other sources are replaced by their internal resistances. **Maximum power transfer theorem:** 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's resistance of the network supplying the power. This means the condition for maximum power transfer according to theorem is $R_L = R_{TH}$ Where, R_L= load resistance, R_{TH} = Thevenin's resistance.	**2M each**

	e	**Draw the star and delta connection. State any one conversion formula.**	**4M**
	Ans:	**Ans. (Correct Diagram- 2 Marks, Any one Conversion formula – 2 Marks)**  **(a) Delta** **(b) Star** $R_{12} = R_1 + R_2 + \frac{R_1R_2}{R_3}$ $R_{23} = R_2 + R_3 + \frac{R_2R_3}{R_1}$ $R_{31} = R_3 + R_1 + \frac{R_3R_1}{R_2}$ **Delta to star conversion** **(OR)** $R_{12} = \frac{R_1 \cdot R_2 + R_2 \cdot R_3 + R_3 \cdot R_1}{R_3}$ $R_{23} = \frac{R_1 \cdot R_2 + R_2 \cdot R_3 + R_3 \cdot R_1}{R_1}$ $R_{31} = \frac{R_1 \cdot R_2 + R_2 \cdot R_3 + R_3 \cdot R_1}{R_2}$ **Star to Delta conversion**	**2M for diagram, 2M for any one conversion formula**
	f.	**State necessity of wave-shaping circuits. Classify wave-shaping circuit.**	**4M**
	Ans:	**Necessity of Wave-shaping circuits:** 1. To hold the waveform to a particular d.c level. 2. To generate one waveform from another. 3. To limit the voltage level of the waveform to some preset value and suppress all other voltage levels in excess of the preset level. 4. To cut off the positive and negative portions of the input waveform. **Classification of wave shaping circuit:** There are two main types of wave shaping. They are − • Linear wave shaping (e.g. RC integrator and Differentiator) • Non-linear wave shaping (e.g. Clipper and Clamper)	**Necessity: 2M** **Classification :2M**

6 **Attempt any FOUR** **16 M**

a **Compare clipper and Clamper** **4M**

Ans: **Any 4 points 1M each**

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 shaping circuit	Voltage Multipliers
5.	Configuration		

b **Define:** **4M**

(1) Mesh

(2) Sign conversion

(3) Potential rise

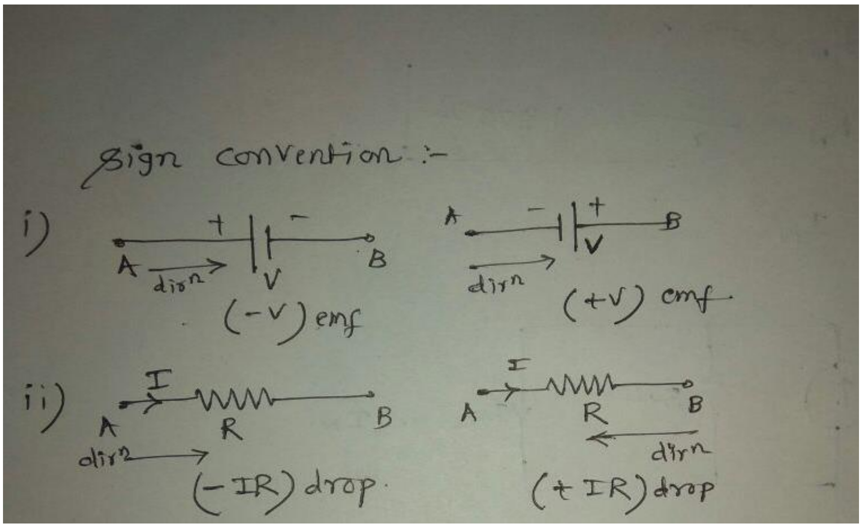
(4) Potential Drop

Ans: **1M for each definition**

Mesh:
A mesh is a closed path in a circuit with no other paths inside it.

Sign convention:

In an electrical circuit, the notation given to the voltage drop across resistance and the emf present is called sign convention.



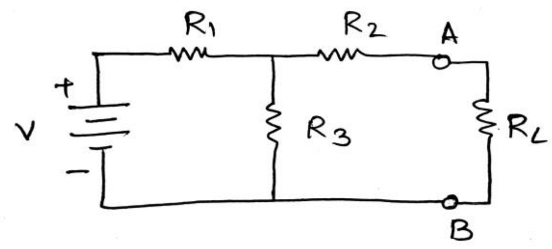
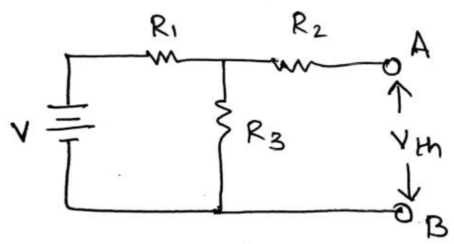
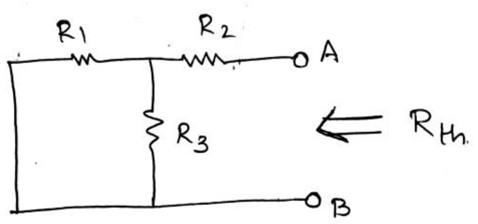
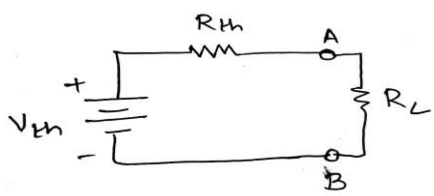
Potential rise:

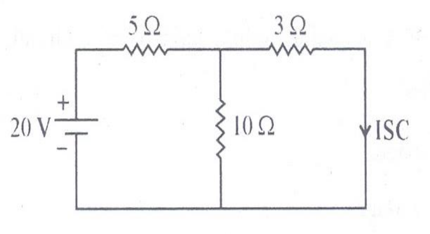
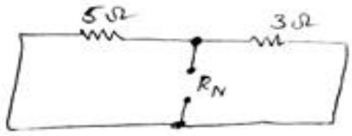
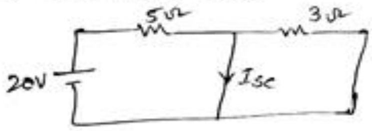
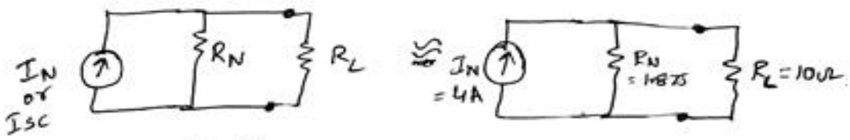
In a loop, if we go through a resistor in the direction opposite to the current, then there is a rise in potential because current flows from a higher to a lower potential, then the potential rise is considered Positive.

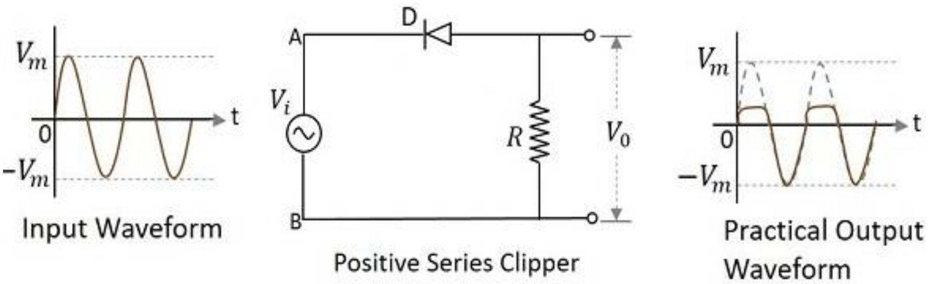
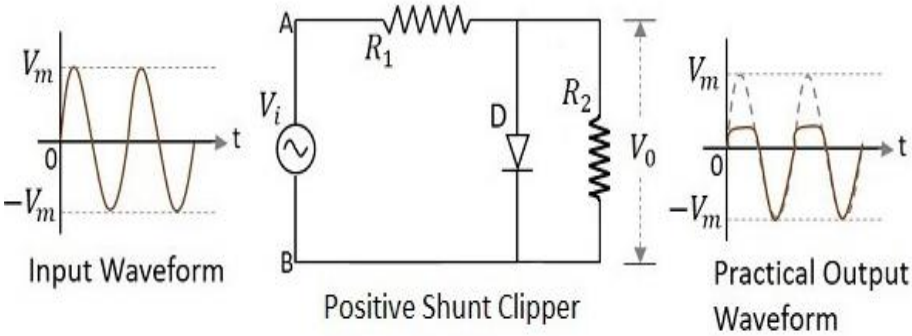
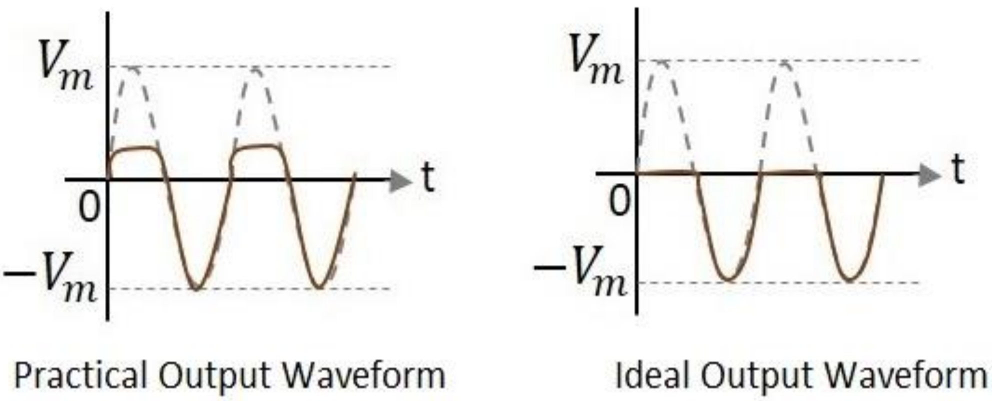
Potential drop:

In a loop, if we go through a resistor in the same direction as the current, then there is a fall in potential because current flows from a higher to a lower potential then the potential drop is considered Negative.

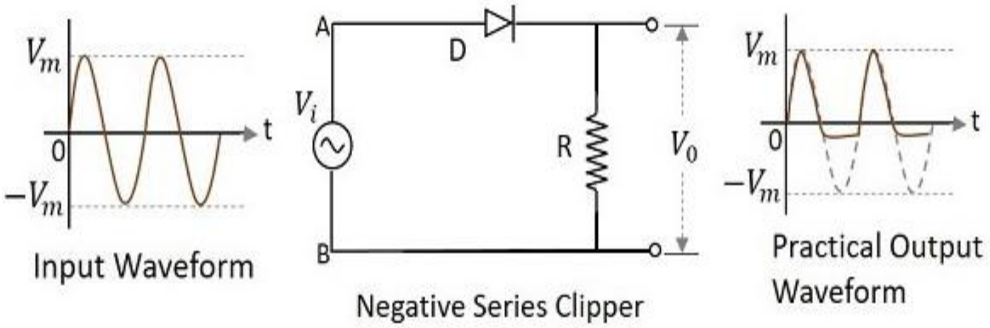
	c	**State and explain Thevenin's theorem with suitable example.**	**4M**
	Ans:	**(Note: Any suitable example can be considered and given marks)** **Statement:** Any network containing active and/or passive elements and one or more dependent and/or independent voltage/or current sources can be replaced by an equivalent network containing a voltage source (Thevenin"s equivalent voltage V_{TH} or V_{OC}) and a series resistance (called Thevenin"s equivalent resistance R_{TH})	**Statement (2 Mark)**

		Figure below represents a linear network containing resistances and voltage sources.  To measure Vth, the load resistances is disconnected and voltage is measured across open terminals A and B.  To find Rth the source is replaced by its internal resistance and the resistance is measured across A and B .  The internal resistance of an ideal voltage source is zero and that of an ideal current is source is infinite. The equivalent circuit is obtained by connecting Voc or V_{th} and Rth in series. 	**Explanation (2 Mark)**

		R_L is connected between A and B of eq. circuit. Load current is given by $I_L = V_{TH}/(R_{TH}+R_L)$ figures above illustrate the concept of Thevenin"s theorem.	
	d	**Calculate the current in 10 ohm resistance using Norton's theorem shown in Figure 2**  **Fig. No. 2**	**4M**
	Ans:	Sol 1) To calculate R_N  $R_N = 5//3$ $R_N = \frac{15}{8} = 1.875\ \Omega$ 2) To Find I_N  $\therefore I_{sc} = \frac{20}{5} = 4A$ 3) Norton's equivalent circuit:  $I_L = \frac{I_N R_N}{R_N + R_L} = \frac{4 \times 1.875}{1.875 + 10} = 0.6315A$ $\therefore I_L = 0.6315A$	**1M for R_N** **1 M for Isc** **2M for I_L**

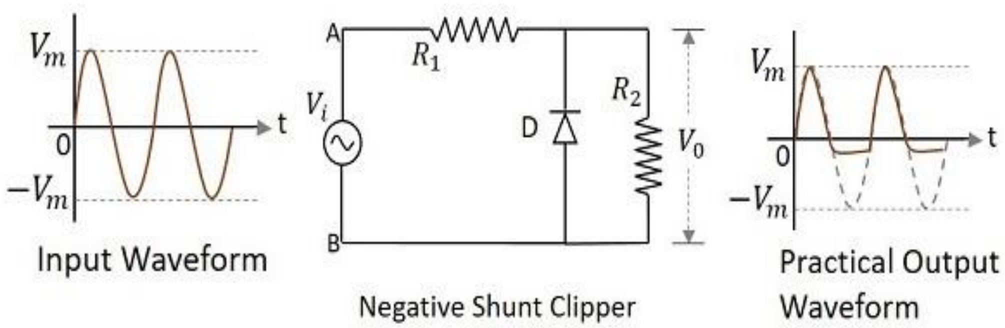
	e	**Draw circuit diagram for positive and negative clipper with input and output waveforms.**	**4M**
	Ans:	**Positive Series clipper:**  **(OR)** **Positive Shunt clipper**  **Output waveform of positive clipper:** 	**Marks may be given to any one type of Positive and Negative clipper.** **1M for dia.** **1M for i/p and o/p waveforms**

Negative Series clipper:

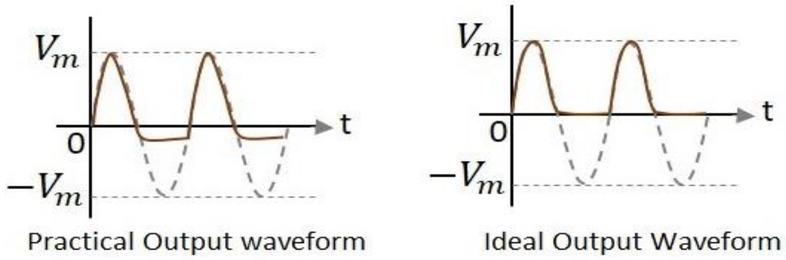


OR

Negative Shunt clipper:



Output waveform of Negative clipper:-



	f	**Find the value of load resistance R_L so that maximum power is transferred in the circuit shown in figure 3.**	**4M**

Ans:

Q.6 f)

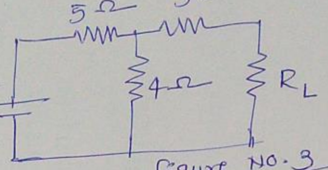
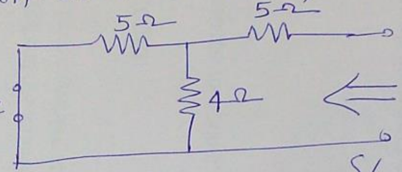


figure No. 3

To find : R_L (for maximum power transfer)

Solution :- i) To find equivalent resistance R_{th}. The R_L should be open and voltage source to be short circuited. Hence, circuit becomes.



$$\therefore R_{Th} = \frac{5 \times 4}{5+4} + 5 \quad \text{------} \{(5\Omega \text{ ||el } 4\Omega) + 5\Omega\}$$

$$= \frac{20}{9} + 5$$

$$= 2.22 + 5$$

$$\boxed{R_{Th} = 7.22\ \Omega} \text{ —— } \boxed{\text{2 Marks}}$$

ii) for maximum power transfer to take place

$$R_L = R_{Th}$$

$$\therefore R_L = 7.22\ \Omega \text{ —— } \boxed{\text{1 Mark}}$$

1M for Rth Circuit dia.

2M for Rth calculation

1M for R_L