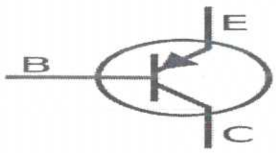
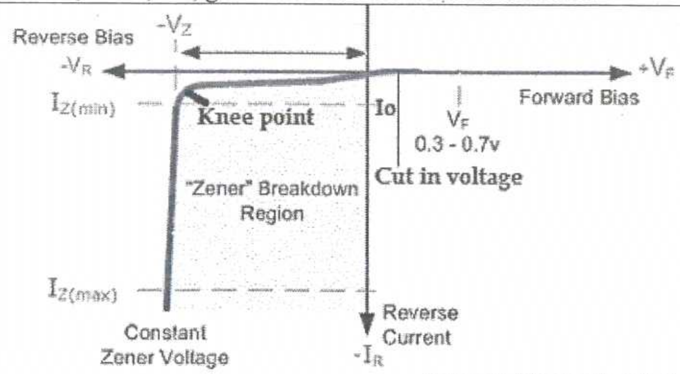
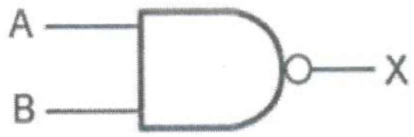
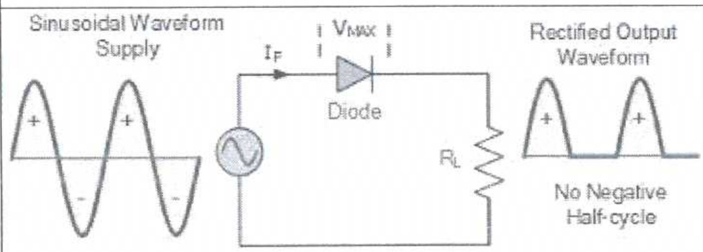
Scoring Indicators

COURSE NAME : Fundamentals of electrical and electronics

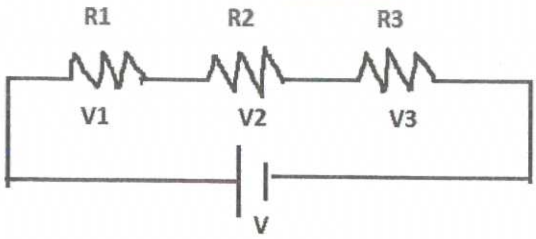
COURSE CODE : 2031 **QID :2106220062**

Q No	Scoring Indicators	Split score	Sub Total	Total score
	PART A			**9**
I. 1	A) doubled		1	
I. 2	No of cycles per second is known as frequency of the wave.		1	
I. 3	Miniature circuit breaker		1	
I. 4	Kilowatt hour.		1	
I. 5	Active power = V I cos ϕ		1	
I. 6	It is the ratio of no of turns in secondary to no of turns in primary.		1	
I. 7	Unit of inductance - henry Unit of capacitance - farad	0.5x2	1	
I. 8			1	
I. 9	A = 1 and B = 0 then output of AND gate is equal to 0.		1	
	PART B			24
II. 1	Laws of resistance 1. Resistance is directly proportional to length of material. 2. Resistance is inversely proportional to area of crossection. 3. Resistance depend on type of material. 4. Resistance of material depends on temperature	Any 3 (1x3)	3	
II. 2	Active power : The real component of the power of an alternating current circuit; the product of the voltage and that part of the current that is in phase with the voltage. Reactive power : Reactive power is the part of complex power that corresponds to storage and retrieval of energy rather than consumption. Apparent power : it is the total amount of power consumed from the supply. It is the product of voltage and current.	1 mark for each	3	
II. 3	Conduit wiring There are two types of conduit wiring 1. open type : in open type steel tubes are installed on the surface of wall by means of saddles or pipe hooks. 2. In concealed type the conduits are buried under plaster. VIR or PVC cables are drawn into the conduits by means of GI wire	1.5 marks for each type	3	

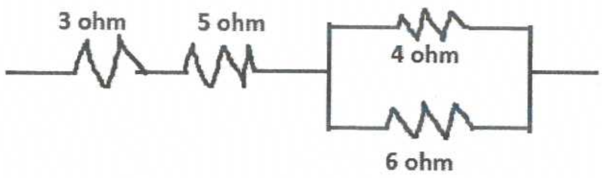
II. 4	1. Never touch or try repairing any electrical equipment or circuits with wet hands. 2. Never use equipment with frayed cords, damaged insulation, or broken plugs. 3. Always use insulated tools while working. 4. Always use appropriate insulated rubber gloves and goggles while working on any branch circuit or any other electrical circuit. 5. Never try repairing energized equipment. 6. Never use an aluminum or steel ladder if you are working on any receptacle at height.	Any Three (1x3)	3	
II. 5	Earth Leakage Circuit Breaker or ELCB An Earth-leakage circuit breaker (ELCB) is a safety device used in electrical installations with high Earth impedance to prevent electric shocks. It detects small stray voltages on the metal enclosures of electrical equipment, and interrupts the circuit if a dangerous voltage is detected. ELCB help detect current leaks and insulation failures in the electrical circuits that would cause electrical shocks to anyone coming into contact with the circuit.		3	
II. 6	i) Red, yellow, orange, gold $R = 24 \times 10^3$ and 5% tolerance ii) brown, black, red, gold $R = 10 \times 10^2$ and 5% tolerance	1.5x2	3	
II. 7	 Reverse Characteristics When a reverse voltage is applied to a Zener voltage, a small reverse saturation current Io flows across the diode. This current is due to thermally generated minority carriers. As the reverse voltage increases, at a certain value of reverse voltage, the reverse current increases drastically and sharply. This is an indication that the breakdown has occurred. We call this voltage breakdown voltage or Zener voltage, and Vz denotes it.	Characteristics - 1.5 marks Explanation - 1.5 marks	3	
II. 8		symbol 1.5	3	

	$X = \overline{A.B}$  A B X 0 0 1 0 1 1 1 0 1 1 1 0	marks Truth table 1.5 marks		
II.9	 	Circuit diagram - 1.5 marks Wave form- 1.5 marks	3	
II.10	Diode as rectifier Clipping circuit Clamping circuit Diodes in logic gates Diodes in voltage multiplier circuits Diodes in reverse polarity protection Diodes in solar panels Diodes as light emitting diodes	Any three points (0.5x6)	3	
	PART C			42
III.	First law : Whenever a conductor is placed in a varying magnetic field, an electromotive force is induced. If the conductor circuit is closed, a current is induced, which is called induced current. Second law : The induced emf in a coil is equal to the rate of change of flux linkage. $E = -N\, d\varphi / dt$ **Statically Induced EMF** When the conductor is stationary and the magnetic field is changing, the induced EMF in such a way is known as statically induced EMF	Faraday's law - 4 marks Statically induced and Dynamically induced emf - 3 marks	7	7

<table>
<tr><td></td><td>Dynamically Induced EMF

When the conductor is moved in a stationary magnetic field so that the magnetic flux linking with it changes in magnitude, as the conductor is subjected to a changing magnetic, therefore an EMF will be induced in it. The EMF induced in this way is known as dynamically induced EMF</td><td></td><td></td><td></td></tr>
<tr><td>IV.</td><td>

In the circuit diagram R_1 R_2 and R_3 are in series
In series circuits current is same and potential difference is different
So total voltage $V = V_1 + V_2 + V_3$
Since the current is similar then
$IR = I\,R_1 + I\,R_2 + I\,R_3$
So $R = R_1 + R_2 + R_3$</td><td>Circuit diagram - 2 marks

Derivation - 5 marks</td><td>7</td><td>7</td></tr>
<tr><td>V.</td><td>

Since 6 ohm resistor and 4 ohm resistor are in parallel so total resistance of the combination is 2.4 ohm.
Since 2.4 ohm , 3ohm and 5 ohm are in series so total resistance of the circuit = 3+5+2.4 =10.4 ohm.</td><td></td><td>7</td><td>7</td></tr>
<tr><td>VI.</td><td>Resistance of 100 W 250 V lamp = 625 ohm
Resistance of 100 W 200 V lamp = 400 ohm
Since the lamps are connected in series and across 250 V supply.
Total resistance of the circuit = 625 + 400 = 1025 ohm
Current in the circuit I = 250/1025 = 0.24 A</td><td>2

5</td><td>7</td><td>7</td></tr>
<tr><td>VII.</td><td><table><tr><td>Device</td><td>Power rating</td><td>Working hours</td><td>Energy consumption per day</td></tr><tr><td>Tube light</td><td>40 W</td><td>5 hours</td><td>200 WHr</td></tr></table></td><td></td><td>7</td><td>7</td></tr>
</table>

<table>
<tr><td></td><td>Filament lamp 60 W 8 hours 480 WHr
Water pump 0.5 KW 3 hours 1.5 KWHr
Total energy consumption = (40*4*5)/1000 * (60*8*2)/1000 *(0.5*3) = 2.27 KWHr</td><td></td><td></td><td></td></tr>
<tr><td>VIII.</td><td>Active power = 700 W
Active power = V*I*power factor
700 = 230*5*power factor
Power factor = 700/230*5 = 0.608
Reactive power = V*I* sin ϕ = 230*5* 0.79 = 912.4 VAR
Apparent power = V*I = 230*5 = 1150 VA</td><td>1
2
3
1</td><td>7</td><td>7</td></tr>
<tr><td>IX.</td><td>Self inductance : When there is a change in the current or magnetic flux of the coil, an electromotive force is induced. This phenomenon is termed Self Inductance.

When the current starts flowing through the coil at any instant, it is found that, that the magnetic flux becomes directly proportional to the current passing through the circuit. $\phi \propto I$ $\phi = L I$

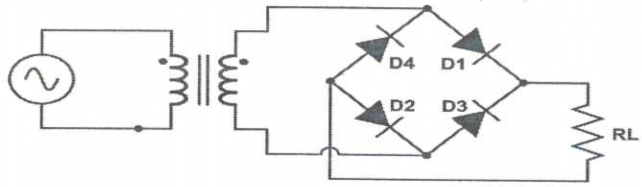
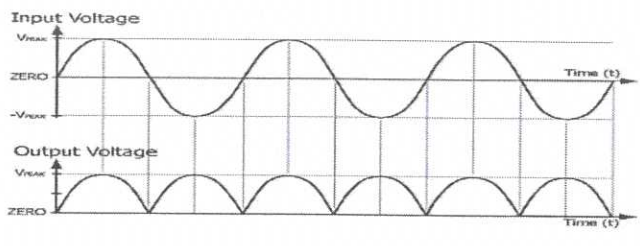
Where L is termed as the self-inductance of the coil or the coefficient of self-inductance, the self-inductance depends on the cross-sectional area, the permeability of the material, and the number of turns in the coil.

Mutual inductance : When there is a change in the current or magnetic flux linked with the two coils, an opposing electromotive force is produced across each coil, and this phenomenon is termed Mutual Inductance.

This phenomenon is given by the relation: $\phi = M I$

Where M is termed as the mutual inductance of the two coils or the coefficient of the mutual inductance of the two coils.</td><td>Self inductance - 3.5 marks

Mutual inductance - 3.5 marks</td><td>7</td><td>7</td></tr>
<tr><td>X.</td><td><table>
<tr><td>Wire wound resistor</td><td>Carbon composition resistor</td></tr>
<tr><td>Large in size and weight</td><td>Small in size and weight</td></tr>
<tr><td>They are costly</td><td>Cheaper in cost</td></tr>
<tr><td>Can be used in heavy power and voltage circuits</td><td>Not useful for applications above 5 watts</td></tr>
<tr><td>Resistance variation is less with aging</td><td>Resistance vary with aging</td></tr>
<tr><td>Resistors can withstand mechanical shock and vibration</td><td>It cannot with stand these situations</td></tr>
<tr><td>Not suitable for high frequency operations</td><td>Suitable for high frequency operations</td></tr>
<tr><td>A wide range of resistances are not available</td><td>A wide range of resistances are available</td></tr>
</table></td><td>Any 4</td><td>7</td><td>7</td></tr>
<tr><td>XI.</td><td>Electrolytic capacitor
Construction : consists of an aluminium foil electrode which has an aluminium oxide film covering on one side. The aluminium plate</td><td>Construction - 3 marks</td><td>7</td><td>7</td></tr>
</table>

	serve as positive plate and the oxide as the dielectric. The oxide in contact with a paper saturated with an electrolyte. This electrolyte act as negative plate. Advantages 1. Has very high capacity in small volume 2. Lower cost as per micro farad. Disadvantages 1. Have large amount of leakage resistance. 2. Only work under DC potentials	Advantages - 2 marks Disadvantages - 2 marks		
XII.	 Since the capacitors are connected in parallel the current is similar and the charge across it is also similar. If Q is the charge across the capacitors then If V_1 and V_2 are the voltages across C_1 and C_2 Capacitance $C_1 = Q / V_1$ Capacitance $C_2 = Q / V_2$ Total capacitance $C = Q / V$ $V = V_1 + V_2$ $Q/C = Q/C_1 + Q/C_2$ $1/C = 1/C_1 + 1/C_2$ $C = C_1 C_2 / C_1 + C_2$		7	7
XIII.	Bridge rectifiers as a type of full-wave rectifier that uses four or more diodes in a bridge circuit configuration to efficiently convert alternating (AC) current to a direct (DC) current.  	Circuit diagram - 2 marks Wave form - 3 marks Explanation - 2 marks	7	7
XIV.	➢ Transistors can act as amplifiers while they are functioning in the active region or when it is correctly biased. ➢ A transistor can take in a very small weak signal through the base junction and release the amplified signal through the collector. ➢ For a transistor to work as an amplifier we usually use the common-emitter configuration. ➢ Due to high gain of CE configuration of transistor it is	Figure - 4 marks Explanation -3 marks	7	7

	used as amplifier **Transistor as an Amplifier in Common Emitter**