53 (EE 201) BEEN

2018

BASIC ELECTRICAL ENGG.

Paper : EE 201

Full Marks : 100

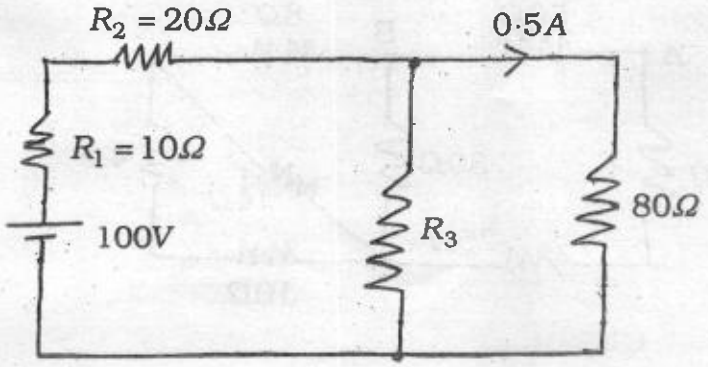
Time : Three hours

The figures in the margin indicate full marks for the questions.

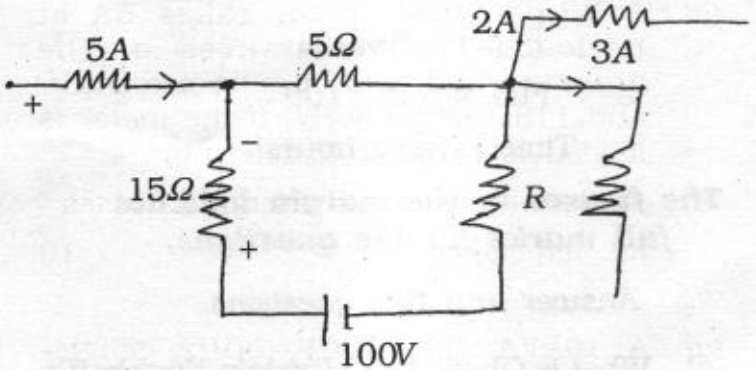
*Answer **any five** questions.*

1. *(a)* What is Ohm's law ? Explain Kirchhoff's voltage law with an example. 2+3=5

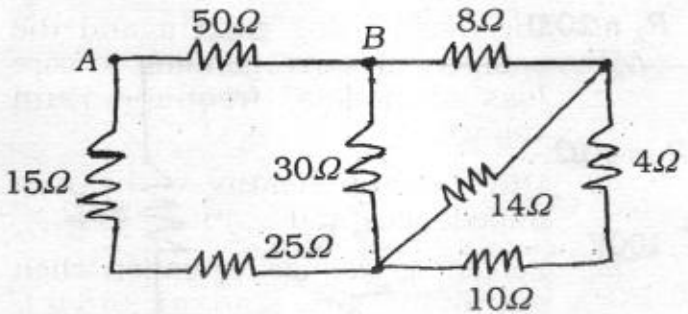
(b) Find the voltage drop across R_1 and R_2. The resistance R_3 is not specified. 5



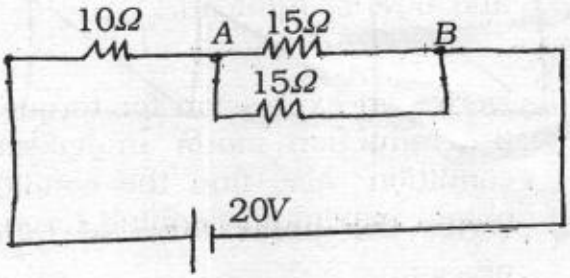
(c) The voltage drop across the 15Ω resistance in the following circuit is 30V having the polarity indicated. Find the value of *R*. 10



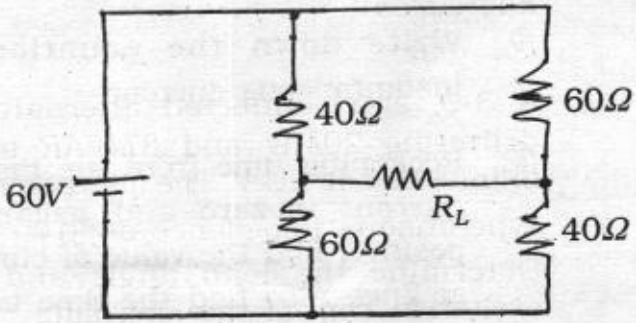
2. (a) What is the resistance between points *A* and *B* of the following circuit. 5



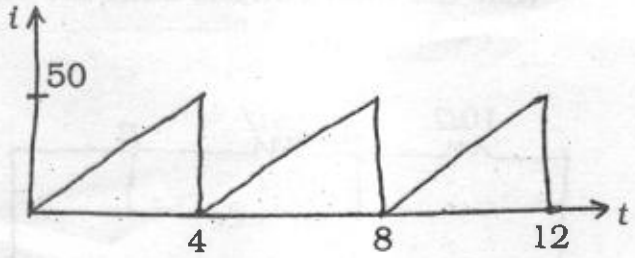
(b) In the following figure what resistance must be shunted across A and B so that the total current from the source is 1·5A. 5



(c) Use Thevenin's theorem to replace the three-loop equivalent circuit of following figure by a single-loop equivalent circuit in which the identity of R_L is preserved. All resistances are expressed in ohms. 10



3. *(a)* Find the form-factor of the following waveform. 5



(b) Write the polar form of following phasors. 5

(i) $-5-6j$

(ii) $-6+5j$

(c) A sinusoidal alternating current of 50*Hz* has maximum value of 120*A*. 10

(i) Write down the equation of instantaneous current.

(ii) Reckoning time from the instant current is zero and becoming positive, find the value of current at 2*ms*. Also find the time taken to reach 96*A* for first time.

4. *(a)* Two impedances $Z_1 = 8 + 6j\Omega$ and $Z_2 = 3 - 4j\Omega$ are connected in parallel. If the total current of the combination is 25A, find the current taken and power consumed by each impedance. 10

(b) A circuit is composed of a resistance of 6Ω and a series capacitive reactance of 8 *ohms*. A voltage $e(t) = 141 \sin 377t$ is applied to the circuit. 10

(a) Find the complex impedance

(b) Determine the effective and instantaneous values of the current

(c) Compute the power delivered to the circuit.

5. *(a)* Draw the phasor diagram of a balanced 3-phase system showing line voltages and phase voltages in case of star-connection. 5

(b) If the phase voltage of one phase of a Y-connected three-phase balanced source is $\overline{V}_{an} = 120\angle 0°$. What are the expressions for the other two phase voltages ? What is the expression for the line voltage ? 5

(c) A 208V, three phase power supply is connected to star-connected load. All the phase impedances are identical and equal to $(5+8{\cdot}66j)\Omega$. Find the line currents and power absorbed by each phase. 10

6. (a) What is magnetomotive force? How does it differ from electromotive force? How is it similar? 5

(b) A long straight wire located in air carries a current of 4A. Assume the relative permeability of air is unity. Find the value of the magnetic field intensity at a distance 0·5m from the center of the wire. 5

(c) An iron ring of cross-sectional area 6cm^2 is wound with a wire of 100 turns and has a saw cut of 2mm. Calculate the magnetising current required to produce a flux of 0·1mWb if mean length of magnetic path is 30cm and relative permeability of iron ring is 470. 10

7. *(a)* With the help of a neat diagram, show how a single phase energy meter, main switch and a distribution box (with 4 subcircuits) are connected in a domestic wiring system. 5

(b) How will you use a PMMC instrument which gives a full scale deflection at $50mV$ potential difference and $10mA$ current as —

(i) Ammeter 0-10A range

(ii) Voltmeter 0-250V range

Draw the circuit diagrams for each case and clearly show the necessary steps. 5+5=10

(c) A sinusoidal voltage is

$$e(t) = 170\sin(377t + \pi/3)\, volt$$

What is the value of frequency of this voltage? 5