53 (EE 201) BEEN

2019

BASIC ELECTRICAL ENGINEERING

Paper : EE 201

Full Marks : 100

Time : Three hours

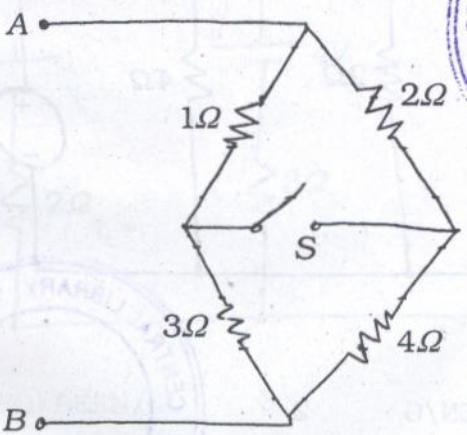
The figures in the margin indicate full marks for the questions.

*Answer **any five** questions.*

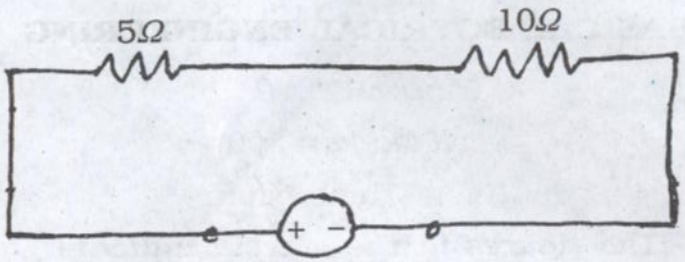
1. *(a)* Find the resistance between terminals *A* and *B* of the following figure when switch is — 5

   (i) Open

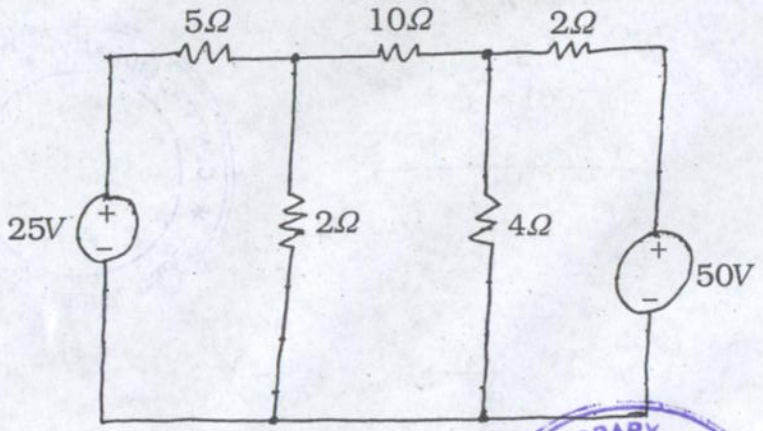
   (ii) Closed.



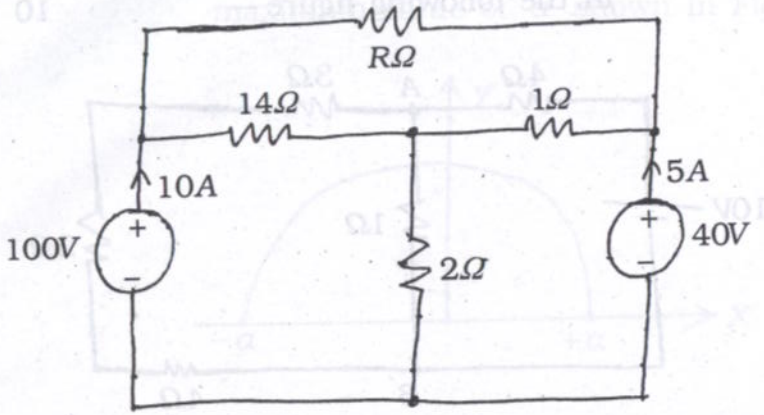
(b) In the following figure, the 10Ω resistor dissipates 360W. What is the voltage drop across the 5Ω resistor? 5



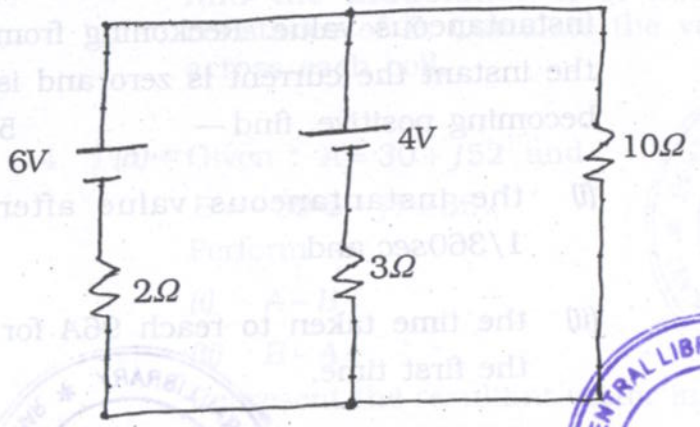
(c) Find the magnitude and direction of current flowing through 10Ω resistance of the given circuit — 10



2. (a) In the following figure, calculate the value of R. 5

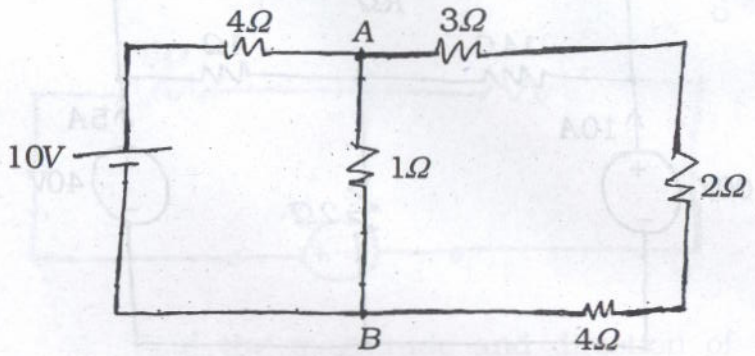


(b) Using the Superposition theorem, calculate the current in the 10Ω resistance. 5



Contd.

(c) Use Thévenin's theorem to find current in the branch AB of the network shown in the following figure — 10

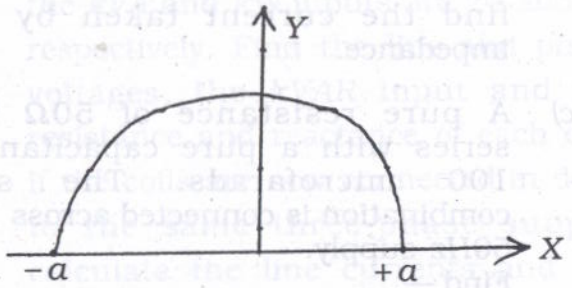


3. (a) An alternating current of frequency $60Hz$ has a maximum value of $120A$. Write down the equation for its instantaneous value. Reckoning from the instant the current is zero and is becoming positive, find — 5

(i) the instantaneous value after $1/360sec$ and

(ii) the time taken to reach $96A$ for the first time.

(b) Determine the r.m.s. value of semi-circular current wave which has a maximum value of 'a' shown in *Fig.* 5



(c) Two coils A and B are connected in series across a $240V$, $50Hz$ supply. The resistance of A is 50Ω and the inductance of B is $0{\cdot}015H$. If the input from the supply is $3kW$ and $2kVAR$, find the inductance of A and the resistance of B. Calculate the voltage across each coil. 10

4. (a) Given : $A = 30 + j52$ and $B = -39{\cdot}5 - j14{\cdot}36$.

Perform —

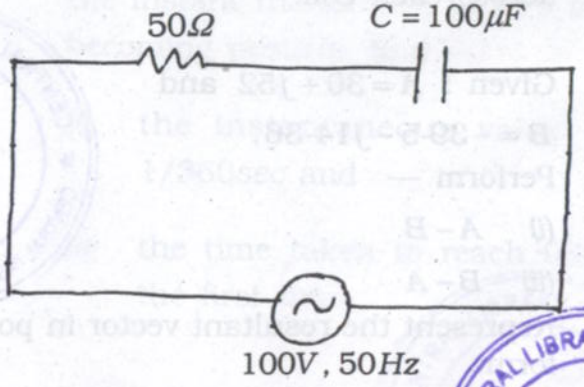
(i) $A - B$

(ii) $B - A$

Represent the resultant vector in polar form. 5

(b) Two impedance $Z_1 = (8 + j \cdot 6)\Omega$ and $Z_2 = (3 - j \cdot 4)\Omega$ are in parallel. If the total current of the combination is 25*A*, find the current taken by each impedance. 5

(c) A pure resistance of 50Ω is in series with a pure capacitance of 100 microfarads. The series combination is connected across 100*V*, 50*Hz* supply.
Find —
(a) the impedance
(b) current
(c) voltage across resistor
(d) power factor
(e) phase angle
(f) voltage across capacitor.
Draw the vector diagram. 10



5. (a) The load connected to a 3-ϕ supply comprises three similar coils connected in star. The line currents are 25*A* and the *kVA* and *kW* inputs are 20 and 11 respectively. Find the line and phase voltages, the *kVAR* input and the resistance and reactance of each coil. If the coils are now connected in delta to the same three-phase supply, calculate the line currents and the power taken. 10

(b) What is meant by phase sequence in the three-phase system? Write some advantages of three-phase system. 3+2=5

(c) Derive the relation between line voltage and phase voltage in a star-connection in the three-phase system. Draw the star-connection and its vector diagram. 5

6. (a) What is a fuse? Mention *two* advantages and *two* disadvantages of fuse. 1+2+2=5

(b) A moving coil ammeter has a fixed shunt of $0{\cdot}02\Omega$ with a coil circuit resistance of $R = 1k\Omega$ and need potential difference of $0{\cdot}5V$ across it for full-scale deflection.

(i) Find the total current corresponding to the above data.

(ii) Calculate the value of shunt to give full-scale deflection when the total current is $10A$ and $75A$. 5

(c) A coil is wound uniformly with 300 turns over a steel ring of relative permeability 900, having a mean circumference of $40mm$ and cross-sectional area of $50mm^2$. If a current of $25amp$ is passed through the coil, find —

(i) *mmf*

(ii) reluctance of the ring and

(iii) flux. 10

7. (a) Derive an expression for deflecting torque for PMMC instrument. 5

(b) Write the SI units of the following : 1×5=5

(i) Magnetic flux

(ii) Reluctance

(iii) Luminous intensity

(iv) Torque

(v) Angular momentum.

(c) A horseshoe magnet is formed out of a bar of wrought iron $45{\cdot}7cm$ long, having a cross-sectional area of $6{\cdot}45cm^2$. Exciting coils of 500 turns are placed on each limb and connected in series. Find the exciting current necessary for the magnet to lift a load of $68kg$ assuming that the load has negligible reluctance and makes close contact with the magnet. Relative permeability of iron = 700. 5

(d) How will you use a PMMC instrument which gives full-scale deflection at $50mV$ p.d. and $10mA$ current as a voltmeter of 0-250V range? 5