Total number of printed pages–7

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 unknown currents in the circuits shown in *Fig. (i)* 5

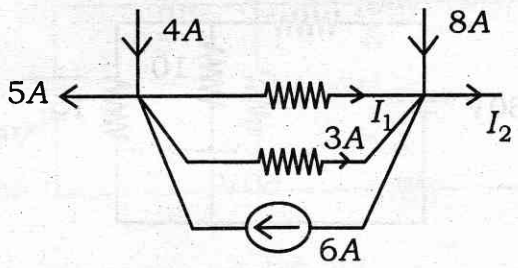

Fig. (i)

Contd.

(b) Find the equivalent Thevenin voltage across the open-circuited terminals *A* and *B* to the circuit shown in *Fig. (ii)*. All resistances are in *ohm*. 5

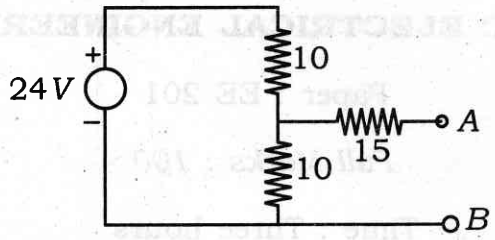

Fig. (ii)

(c) Find the current in every branch of the circuit shown in *Fig. (iii)*. All resistances are in *ohm*. 10

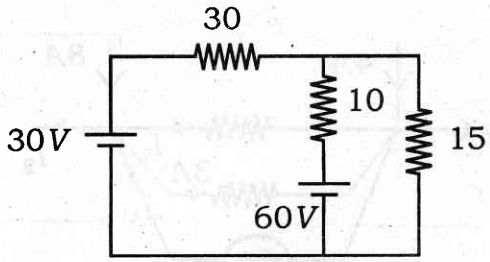

Fig. (iii)

2. (a) Find the equivalent resistances across the open-circuited terminals *a* and *b* of the *Fig. (iv)*. All the resistances are in *ohm*. 5

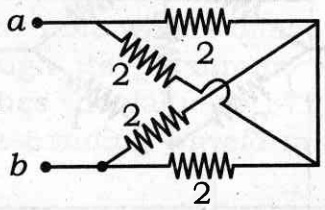

Fig. (iv)

(b) Find the Norton equivalent resistance for the active linear network shown in *Fig. (v)*. All resistances are in *ohm*. 5

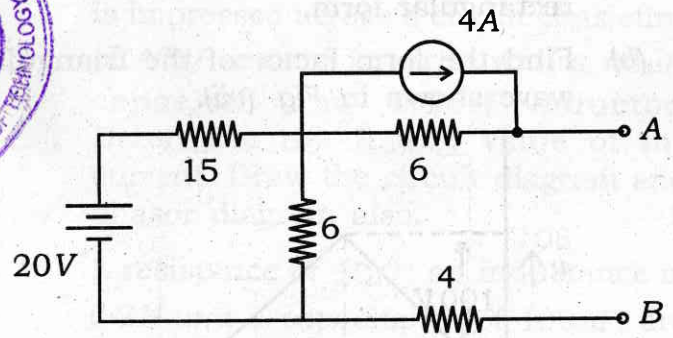

Fig. (v)

(c) Using delta-star transformation, determine the current drawn from the source in the given circuit in *Fig. (vi).* All the resistances are in *ohm.* 10

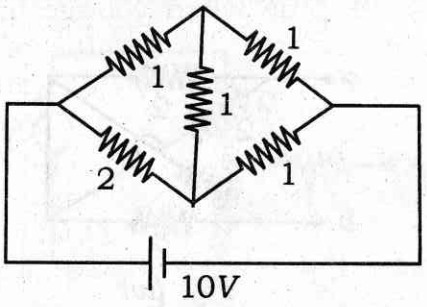

Fig. (vi)

3. (a) Perform the following operation.

$(16+8j)\div(3-4j)$

Write the answer in polar as well as rectangular form. 5

(b) Find the form factor of the triangular wave shown in *Fig. (vii).* 5

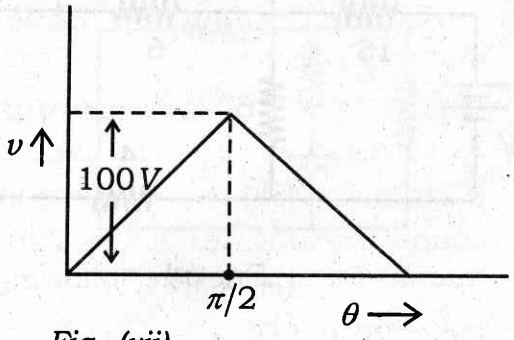

Fig. (vii)

(e) A sinusoidal alternating voltage has an r.m.s. value of 200*V* and a frequency of 50*Hz*. It crosses the zero axis in a positive direction when $t=0$. Determine *(i)* the time when voltage first reaches the instantaneous value of 200*V* and *(ii)* the time when voltage after passing through its maximum positive value reaches the value of 141·4*V*. Draw the corresponding waveform. 10

4. (a) A circuit takes a current of 8*A* at 100*V*, the current lagging by 30° behind the applied voltage. Calculate the impedance in polar form as well as rectangular form. 5

(b) An emf represented by $e=100\sin 100\pi t$ is impressed across a circuit consisting of 40Ω resistor in series with a 40μ*F* capacitor and 0·25*H* inductor. Determine the R.M.S. value of the current. Draw the circuit diagram and phasor diagram also. 5

(c) A resistance of 20Ω, an inductance of 0·2*H* and a capacitance of 100μ*F* are connected in series across 220*V*, 50*Hz* mains. Determine the following :

(a) impedance

(b) current

(c) voltage across R, L and C

(d) power in *watt* and *VA*

(e) power factor and angle of lag/lead.

Draw the circuit diagram and phasor diagram also. 10

5. *(a)* Write the expressions of three-phase voltages of star-connected balanced voltage source. Also write the corresponding phasors. 5

(b) Draw the phasor diagram of line voltages and phase voltages of star-connected balanced three phase voltage source. 5

(c) Given a balanced 3-phase system with star-connected load for which line voltage is $230V$ and impedance of each phase is $(6+8j)\Omega$. Find the line currents and active power absorbed by each phase. Draw the circuit diagram also. 10

6. *(a)* A wire is bent into a plane to form a square of $30cm$ side and a current of $100A$ is passed through it. Calculate the magnetic field strength set up at the centre of the square. 5

(b) Two infinite parallel conductors carry parallel currents of $10A$ each. Find the magnitude and direction of the force between the conductors per metre length if the distance between them is $20cm$. 5

(c) An iron ring of mean length $50cm$ has an air gap of $1mm$ and a winding of 200 turns. If the permeability of iron is 300 when a current of $1A$ flows through the coil, find the flux density. 10

7. *(a)* With the help of 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) Write the advantages of PMMC type instruments. 5

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

(i) Ammeter 0-10 A range

(ii) Voltmeter 0-250V range ?

Draw the circuit diagrams for each case and clearly show the necessary steps.