Total number of printed pages–8

53 (EE 201) BEEN

2021

BASIC ELECTRICAL ENGINEERING

Paper : EE 201

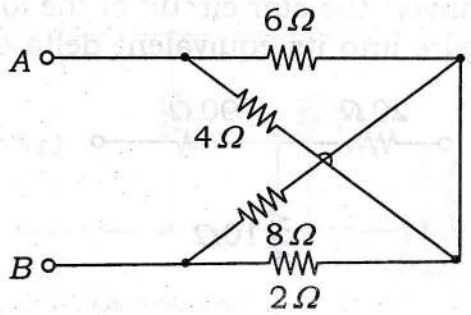
Full Marks : 100

Time : Three hours

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

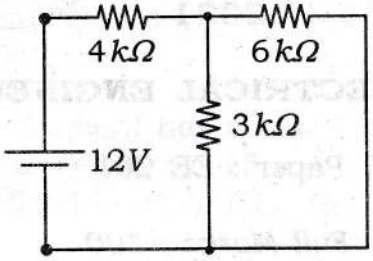
*Answer **any five** questions.*

1. *(a)* What is the equivalent resistance of the circuit of the following *figure* across the terminals *A* and *B*? 5

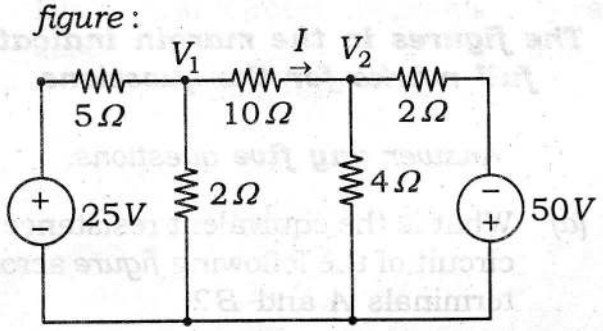


Contd.

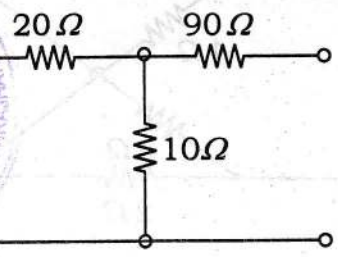
(b) Find the current and power supplied by the battery to the circuit of the following *figure* : 5



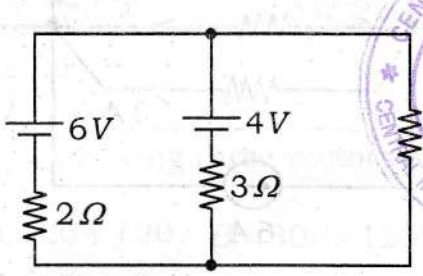
(c) Find the magnitude and direction of current I in the network of following *figure* : 10



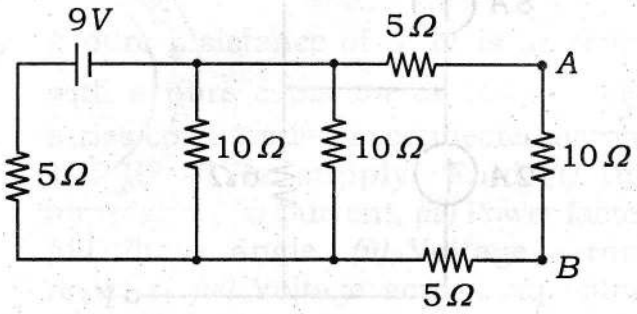
2. (a) Convert the star circuit of the following *figure* into its equivalent delta circuit : 5



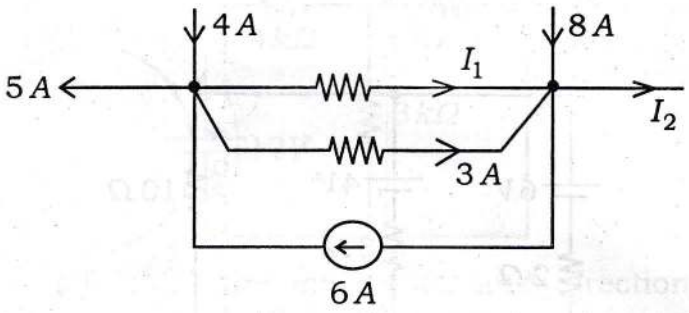
(b) Apply the principle of Superposition to the network shown in the following *figure* to find out the current in $10\,\Omega$ resistance : 5



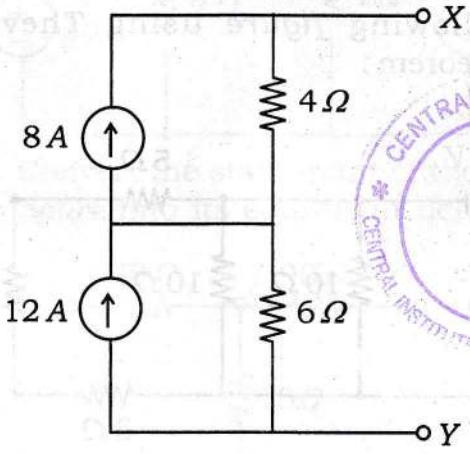
(c) Compute the current flowing through the load resistance of $10\,\Omega$ connected across terminals *A* and *B* of the following *figure* using Thevenin's theorem : 10



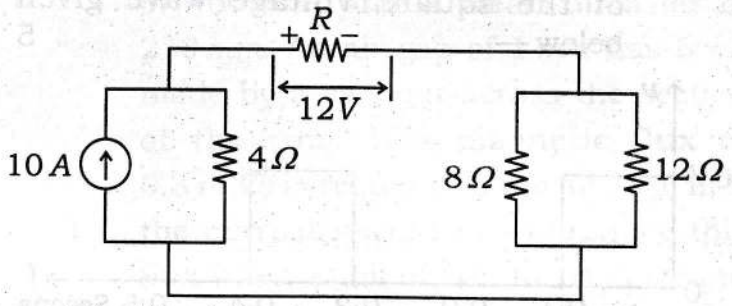
3. *(a)* Find the unknown currents in the circuit given below — 5



(b) Convert the following circuit into a single voltage source : 5



(c) Find 'R' in the given circuit — 10



4. (a) The following three vectors are given —

$A = 20 + j.20$, $B = 30\angle -120°$,

$C = 10 + j.0$ 5

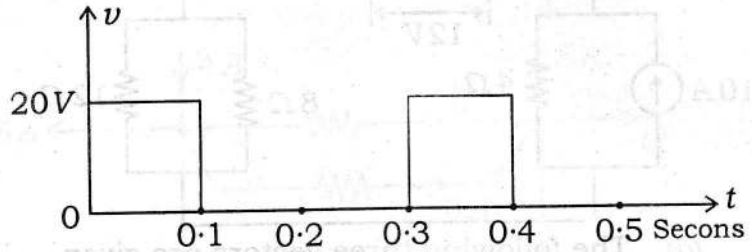
Perform the following indicated operations —

(i) AB/C

(ii) BC/A

(b) A pure resistance of $50\,\Omega$ is in series with a pure capacitor of $100\,\mu F$. The series combination is connected across 100 V, 50 Hz supply. Find *(i)* the impedance, *(ii)* Current, *(iii)* Power factor *(iv)* Phase angle, *(v)* Voltage across resistor, *(vi)* Voltage across capacitor. Draw the vector diagram. 10

(c) Compute the average and RMS values of the square Voltage wave given below — 5



5. (a) The impedances $Z_1 = (8 + j.6)\,\Omega$ and $Z_2 = (3 - j.4)\,\Omega$ are connected in parallel. Find the total impedance and represent the resultant impedance in polar form. 5

(b) Describe the Delta or Mesh Connection of three phase system with the help of diagram. Write down the relationships between the line voltages and phase voltages. Also, write down the relationships between the line currents and phase currents. 5

(c) A balanced star-connected load of $(8 + j.6)\,ohm/phase$ is connected to a balanced $3-\theta$, 400 V supply. Find the line current, power factor, power and total Volt-amperes. 10

6. *(a)* An iron ring has a cross-sectional area of 400 mm^2 and a mean diameter of 250 *mm*. An air-gap of 1 *mm* has been made by a saw-cut across the section of the ring. If a magnetic flux of 0.3 *mWb* is required in the air-gap, find the current necessary to produce this flux when a coil of 400 turns is wound on the ring. Relative permeability of iron is 500. 10

(b) Write the SI units of the following : 5

(i) Magnetising force

(ii) Permeance

(iii) Conductivity

(iv) Current density

(v) Flux density

(c) What do you mean by *mmf*? How does it differ from *emf*? Derive a relation between *mmf*, flux and reluctance in a magnetic circuit? 5

7. *(a)* State and explain the Faraday's laws of electromagnetic induction. 5

(b) Write the advantages of PMMC type instruments. 5

(c) The meter element of a PMMC instrument has a resistance of 5 *ohms* and requires 15 *mA* for full-Scale deflection. Calculate the resistance to be connected *(i)* in parallel to enable the instrument to read up to 1 *A*. *(ii)* in series to enable it to read upto 15 *V*. Draw neat circuit diagrams for each case. 5+5=10