17323

15162

3 Hours / 100 Marks Seat No. | | | | | | | | |

Instructions : *(1)* ***All*** *questions are* ***compulsory****.*
(2) Answer ***each*** *next main question on a* ***new*** *page.*
(3) Illustrate your answers with ***neat*** *sketches* ***wherever*** *necessary.*
(4) Figures to the ***right*** *indicate* ***full*** *marks.*
(5) ***Assume*** *suitable data, if* ***necessary****.*
(6) Use of Non-programmable Electronic Pocket Calculator is ***permissible****.*

Marks

1. Attempt **any ten** of the following : **20**

a) State the terms instantaneous value and maximum value of an alternating quantity.

b) State the average power taken by a pure inductor and a pure capacitor when connected across a.c. supply.

c) Define power factor and state its value for pure resistive circuits.

d) Draw impedance triangle and voltage phasor diagram for R-L series circuits.

e) Define the terms admittance and susceptance. State their units.

f) Define phase sequence w.r.t. 3 ϕ A.C.

g) Represent the following by symbols :
   i) Ideal current source
   ii) Practical current source.

h) State the conditions under which super position theorem can be applied.

i) State the maximum power transfer theorem for D.C. circuits.

j) State the behaviour of following elements at the time of switching i.e. transient period :
   i) Pure L ii) Pure C.

k) Define quality factor for parallel resonance and write its mathematical expression.

l) State the numerical relationship for delta connected load between :
   i) Line current and phase current
   ii) Line voltage and phase voltage.

2. Attempt **any four** of the following : **16**

a) Define the following terms with reference to alternating quantity.
   i) Waveform ii) Cycle
   iii) Frequency iv) Time period.

Marks

b) A 318 μ F capacitor is connected across a 230V, 50Hz system.

Determine :

i) Capacitive reactance ii) R. M. S. value of current

iii) Equation for voltage iv) Equation for current.

c) Write down different powers in A.C. circuits, also write their equations and units. Draw power triangle.

d) A capacitor having capacitance of 20 μ F is connected in series with a noninductive resistance of 120 Ω , across 100V, 50Hz supply. Calculate :

i) Current

ii) The phase difference between voltage and current

iii) The power also draw the vector diagram.

e) Draw graphical representation of resistance, inductive reactance, capacitive reactance and impedance related to frequency for series resonance circuit.

f) Compare series and parallel circuits on any four points.

3. Attempt **any four** of the following : **16**

a) Explain the response of A.C. supply to pure inductance, draw wave form for the same.

b) Draw vector diagram, impedance triangle and power triangle for series R-L-C circuit when connected to single phase a.c. supply for the condition XL < XC.

c) A 200W, 100V lamp is connected in series with a capacitor of 20 μF to a 120V, 50Hz a.c. supply. Calculate :

i) Impedance of the circuit

ii) The current flowing through circuit

iii) The phase angle between voltage and current.

d) A circuit having a resistance of 5 Ω , L = 0.4H and capacitance in series is connected across a 100V, 50Hz supply. Calculate :

i) Value of capacitance to give resonance

ii) Circuit current at resonance

iii) Voltage across resistor

iv) Q factor of resonance.

e) State the various methods of solving parallel AC circuits. Explain any one method for a simple parallel circuit.

f) Two impedances (3 + j4) Ω and (12 – j4) Ω are connected in parallel across 230V, 1 ϕ , 50Hz a.c. supply. Determine current drawn by each path and total current in the circuit.

4. Attempt **any four** of the following : **16**

a) A choke coil has a resistance of 4 Ω and inductance of 0.07H is connected in parallel with another coil of resistance 10 Ω and inductance of 0.12H. The combination is connected across 230V, 50Hz supply. Determine total current and current through each branch.

b) Derive the condition for parallel resonance.

c) Explain in brief the process of generation of 3 phase e.m.f.

Marks

d) State any four advantages of polyphase circuits over single phase circuit.

e) A balanced delta connected load having phase impedance of $3 + j4\ \Omega$ connected to 400V, 3ϕ A.C. supply. Determine :

i) Line current ii) Power factor

iii) Active power iv) Apparent power.

f) A balanced star connected load of $(8 + j6)\ \Omega$ per phase is connected to a balanced 3-phase 400V, supply. Find the line current, power factor, power and total volt amperes.

5. Attempt **any two** of the following : **16**

a) Determine the current through $1.5\ \Omega$ in the network using Thevenin's theorem. Fig. No. 1

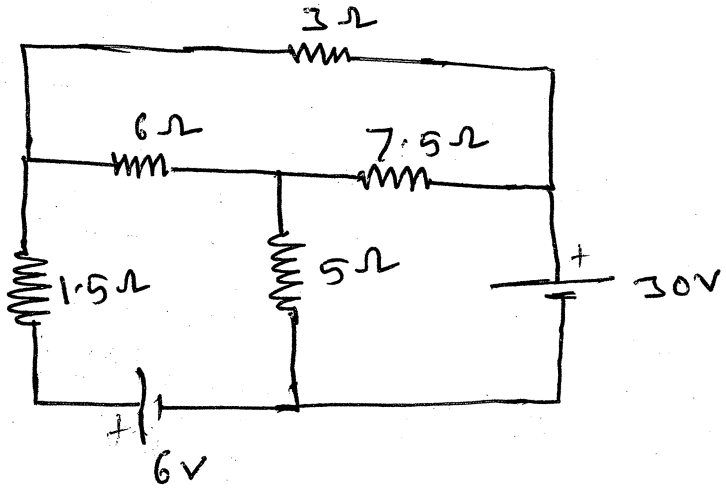

Fig. No. 1

b) Find the current in $40\ \Omega$ and $10\ \Omega$ in Fig. No. 2 by node voltage analysis method.

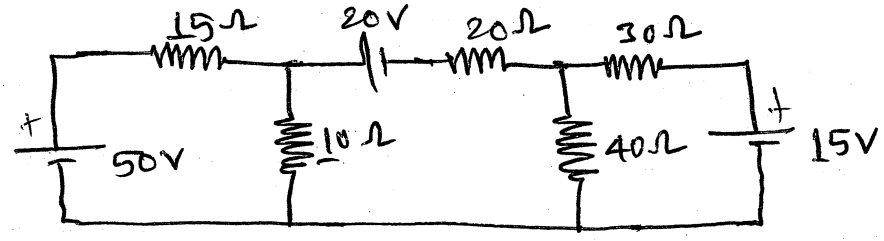

Fig. No. 2

c) Calculate current in $10\ \Omega$ resistance using mesh analysis in the circuit shown in Fig. No. 3.

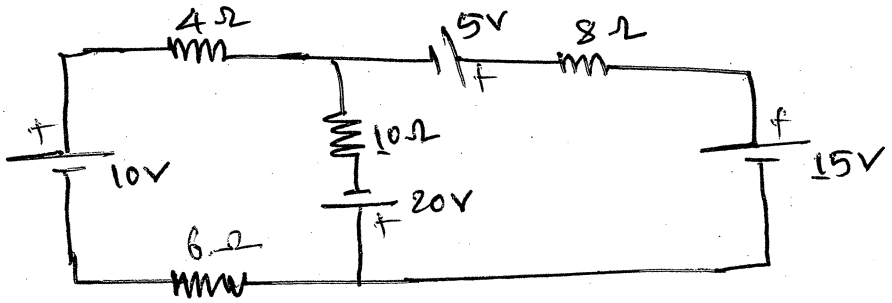

Fig. No. 3

Marks

6. Attempt **any four** of the following : **16**

a) Explain the concept of initial and final conditions in switching for the elements R, L and C.

b) Find the current through 4 Ω resistance shown in Fig. No. 4 using superposition theorem.

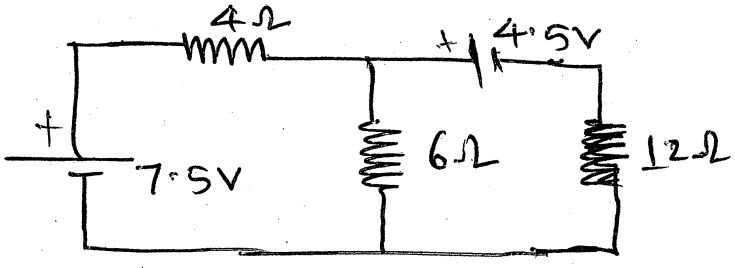

Fig. No. 4

c) Use Norton's theorem, find the current through 3 Ω resistance. For the circuit shown in Fig. No. 5.

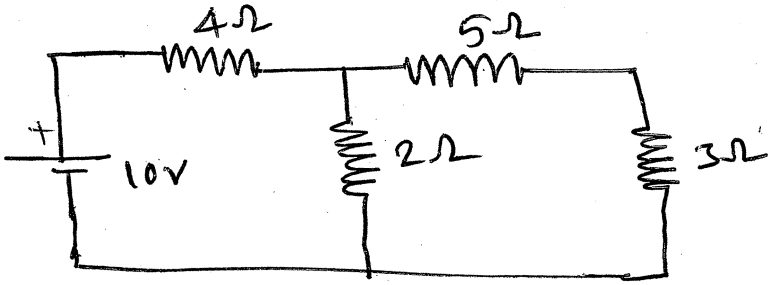

Fig. No. 5

d) State Norton's theorem and write its procedural steps to find current in a branch (Assume a simple circuit).

e) Find the value of resistance to be connected across AB so as to consume maximum power in Fig. No. 6. Also find maximum power consumed by it.

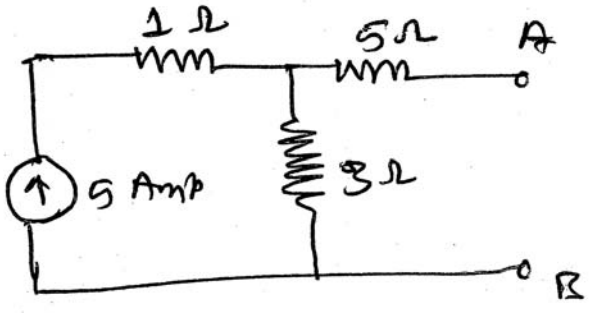

Fig. No. 6

f) Prove that in a 3 phase star connected balanced load system, line voltage is $\sqrt{3}$ times phase voltage.