17948

16117

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.

(7) Mobile Phone, Pager and any other Electronic Communication devices are not permissible in Examination Hall.

Marks

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

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

b) Draw impedance triangle and voltage phasor diagram for R–L series circuits.

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

d) Define susceptance and admittance for a parallel circuit.

e) Draw sinusoidal waveform of 3-phase emf and indicate the phase sequence.

f) Define balanced and unbalanced load in case of polyphase circuits.

Marks

g) Write the procedure of converting a given practical voltage source into current source.

h) Define quality factor of series A.C. circuit.

i) State Thevenin's theorem.

j) State maximum power transfer theorem.

k) State the behaviour of following elements at the time of switching i.e. transient period

(i) Pure L

(ii) Pure C.

l) An alternating quantity is given by $i = 14.14 \sin 314t$. Find rms value and frequency of the wave.

2. Attempt any <u>FOUR</u> of the following: **16**

a) An alternating current is represented by $i = 70.7 \sin 520t$. Determine -

(i) the frequency

(ii) the current 0.0015 second after passing through zero, increasing positively.

b) Derive an expression for resonant frequency of a series RLC circuit.

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

d) Two impedance $(3+j4)\ \Omega$ and $(12-j4)\ \Omega$ are connected in parallel across 230 V, 1ϕ, 50 Hz a.c. supply. Determine current drawn by each path and total current in the circuit.

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

Marks

f) Using mesh analysis calculate voltage drop across 10 Ω resistance for the circuit shown in Fig. No. 1

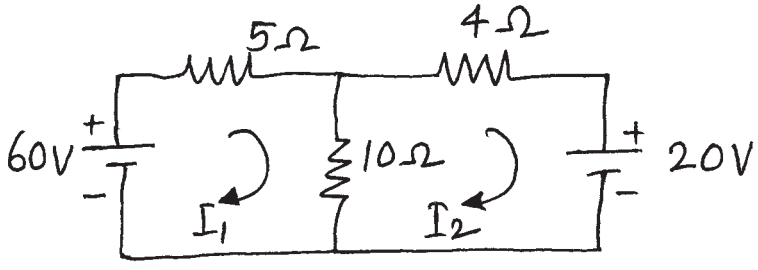

Fig. No. 1

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

a) Derive the expression for current in pure inductive circuit when connected to a sinusoidal ac voltage. Draw the phasor diagram.

b) A series combination of a resistance of 100 Ω and capacitance of 50 μF is connected across 230 V, 50 Hz a.c. supply. Calculate -

(i) Capacitive reactance

(ii) Current

(iii) Power factor of the circuit

(iv) Power consumed.

c) Compare series resonance with parallel resonance on the basis of -

(i) Resonant frequency

(ii) Impedance

(iii) Current and

(iv) Magnification

d) A balanced delta connected load having phase impedance of $3+j4\,\Omega$ connected to 400 V, 3ϕ, a.c. supply. Determine -

(i) Line current

(ii) Power factor

(iii) Active power

(iv) Apparent power

Marks

e) Using mesh analysis for Fig. No. 2 find the values of R1 and R2.

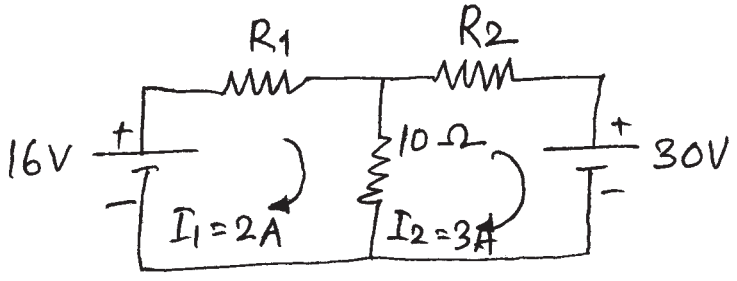

Fig. No. 2

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

4. 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

b) A resistance of 100 Ω, an inductance of 0.2 H and capacitance of 150 μF are connected in series across 230 V, 50 Hz a.c. supply. Calculate the current drawn by the circuit, power factor, its nature and power consumed by the circuit.

c) Impedance $Z_1 = (10 + j5)\,\Omega$ and $Z_2 = (8 + j6)\,\Omega$ are connected in parallel across $V = (200 + j0)$ V. Using the admittance method, calculate circuit current and the branch currents.

d) Three coils each with a resistance of 10 Ω and inductance of 0.35 mH are connected in star to a 3-phase, 440 V, 50 Hz supply. Calculate the line current and total power taken per phase.

Marks

e) Find the node voltages V_1 and V_2 in the circuit shown in Fig. No. 3.

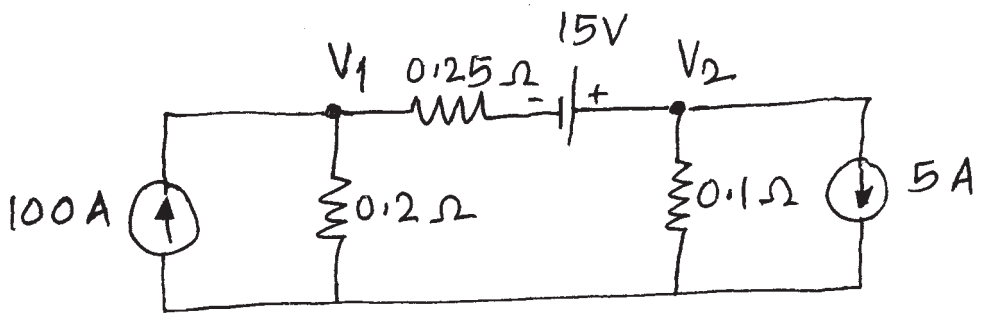

Fig. No. 3

f) Using superposition theorem find current through RL as shown in Fig. No. 4.

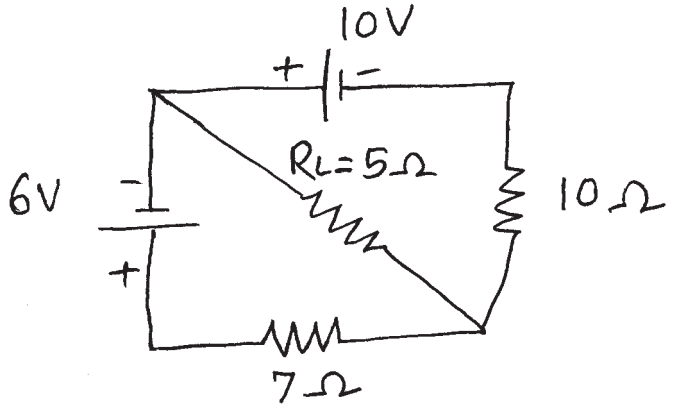

Fig. No. 4

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

a) With the help of phasor diagram, derive the relationship between line and phase values in a balanced star connected 3-phase supply

Marks

b) Find current through impedance $3+j5\,\Omega$ using superposition theorem in the Fig. No. 5.

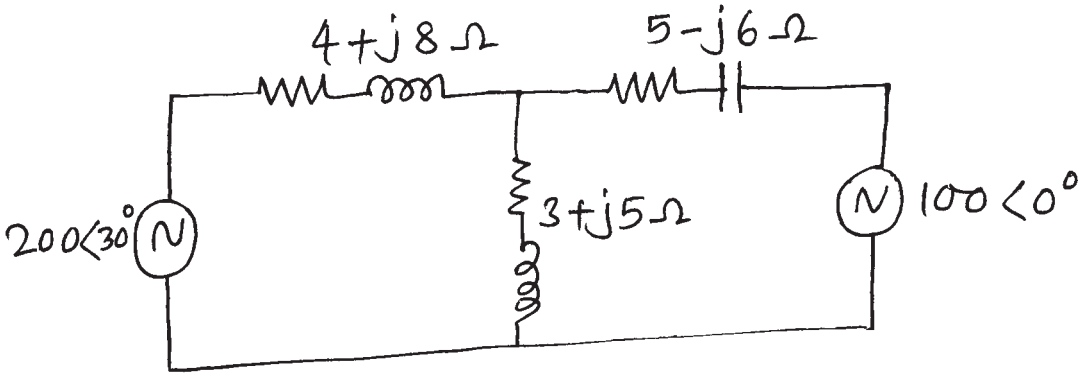

Fig. No. 5

c) (i) Apply Thevenin's Theorem to find current flowing through $10\,\Omega$ resistor in the circuit shown in Fig. No. 6.

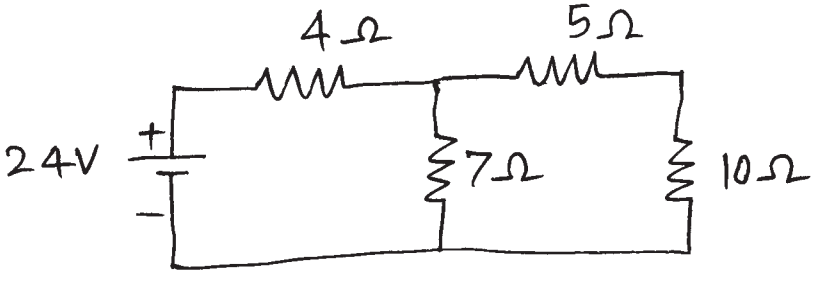

Fig. No. 6

(ii) Using Norton's theorem find current through R_L in Fig. No. 7.

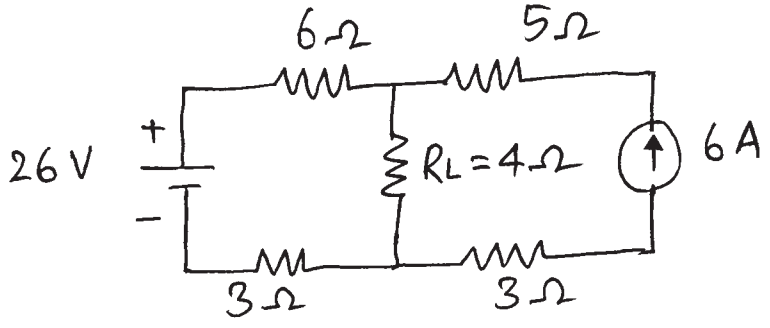

Fig. No. 7

Marks

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

a) Find the value of R_L to transfer maximum power in the network shown in Fig. No. 8.

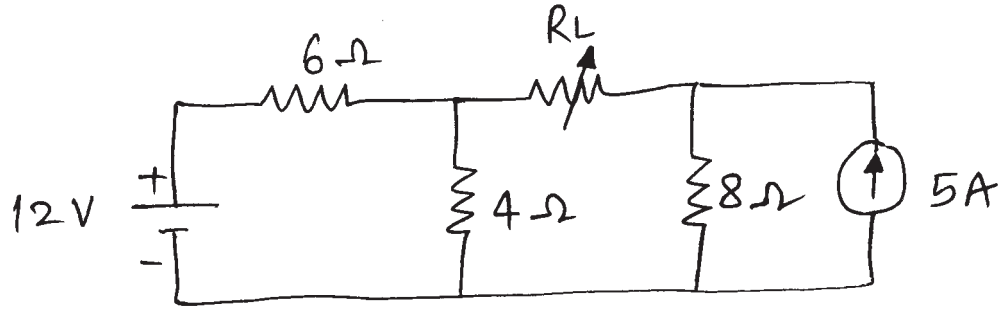

Fig. No. 8

b) Derive the formulae for star to delta transformation.

c) Explain the phenomenon of resonance in parallel circuit by drawing a parallel electric circuit.

d) Draw a circuit diagram of R.C. Series circuit. Draw impedance triangle, waveform and phasor diagram for the same circuit.

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

f) Explain how three phase emf can be generated. Write down three phase voltage equations and the meaning of phase sequence.