22324

23124

3 Hours / 70 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 FIVE of the following: **10**

a) Draw power triangle for R-C series circuit. State the nature of power factor of this circuit.

b) State relationship between line and phase values of voltage and current in balanced delta connection.

c) Define Reactive Power and Active Power and state its unit.

d) Define Conductance and Susceptance related to AC circuit and state their units.

e) Distinguish between loop and mesh.

f) State the value of internal resistance of

i) Ideal Voltage Source and

ii) Ideal current Source

g) State Norton's Theorem

Marks

2. Attempt any THREE of the following: 12

a) With neat diagram, explain the phasor representation of sinusoidal quantity.

b) An AC circuit consists of two branches in parallel.

Branch I : $R = 10\Omega$ and $L = 0.1\,H$ in series

Branch II : $C = 50\,\mu f$

If the circuit is supplied from 200 V, 50 HZ supply

Calculate :-

i) Branch impedances

ii) Branch Currents

iii) Circuit Power factor

iv) Power consumed by Ckt

c) With the help of neat phasor diagram, derive the relationship between line and phase values of voltage in balanced star connection.

d) State the equivalent delta connection for star connection of three resistances R_1, R_2 and R_3, with proper equations.

3. Attempt any THREE of the following: 12

a) For series R-L-C circuit, draw neat circuit diagram. State the conditions for RLC series ckt. Draw phasor diagram and voltage triangle impedance triangle for any 1 condition.

b) State any four properties of Parallel Resonance.

c) With neat labelled diagram, explain unbalanced star connected load.

d) With neat circuit diagram, explain how to convert a practical voltage source into an equivalent practical current source.

e) Explain the concept of “duality” in electric circuit with one example.

Marks

4. Attempt any THREE of the following: 12

a) A series R-L-C circuit has R = 5 Ω, L = 10 mH and C = 15 μF. Calculate

i) Resonant frequency

ii) Q-factor of the circuit

iii) Bandwidth

iv) Voltage magnification

b) Explain the "Current Magnification" in parallel resonant circuit consisting of inductive branch (RL) in parallel with a pure capacitor (C). Derive equation for it.

c) Draw waveform of three-phase voltages. Draw phasor diagram for these voltages. Write equations for instantaneous values of these voltages. Express these voltages in polar form.

d) State and explain "Reciprocity theorem".

5. Attempt any TWO of the following: 12

a) A coil having resistance of 5 Ω and an inductance of 0.2 H is connected in parallel with a series combination of 10 Ω resistor and 80 μF capacitor. If supply voltage is 230 V, 50 Hz, determine :

i) Total circuit impedance

ii) Total current taken by the circuit

iii) Power factor of the circuit

iv) Branch currents

v) Power consumed by the circuit

b) Using mesh analysis, find current in 5 Ω resistor in the network shown in Fig. No. 1.

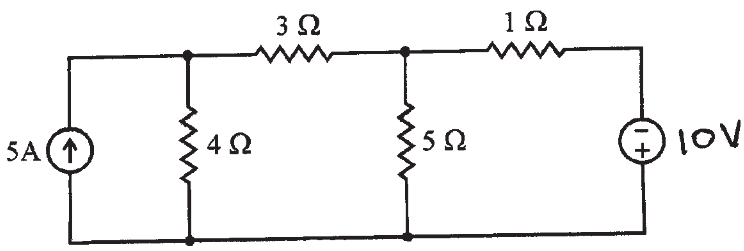

Fig. No. 1

Marks

c) For the network shown in Fig. No. 2 below, determine value of R so that maximum power is delivered to it. Also compute the maximum power delivered.

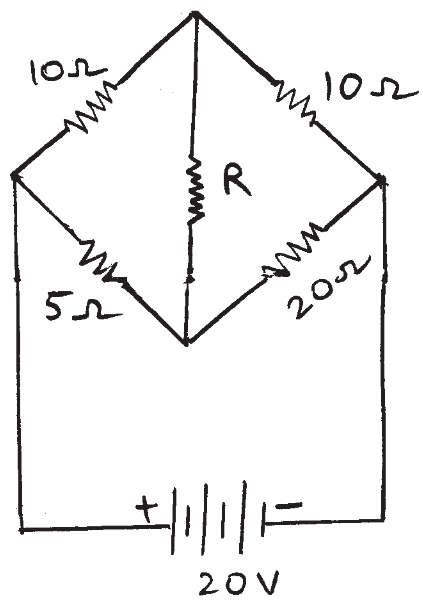

Fig. No. 2

6. Attempt any TWO of the following: 12

a) For a series R-L-C circuit consisting of R = 5Ω, L = 0.01H and C = 10μF supplied with 230 V, 50 Hz supply, determine -

i) Circuit impedance

ii) Circuit current

iii) Circuit power factor

iv) Active power

v) Reactive power

vi) Apparent power

Marks

b) A star connected capacitive load is supplied from 3 Phase, 415 V, 50 Hz supply. If the line current is 15 A and total 3 phase power taken from supply is 30 kW, Find

i) Power factor

ii) Resistance in each phase

iii) Capacitance in each phase

c) Determine the voltage 'V' across 5Ω resistor in network shown in Fig. No. 3 using superposition theorem.

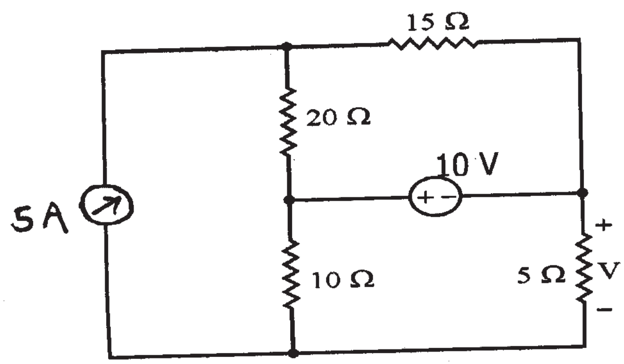

Fig. No. 3