Q.P. Code : 25675

(3 Hours) | Total Marks : 80

N.B. : (1) **Question No.1** is **compulsory**.
     (2) Solve **any three** from remaining questions.
     (3) Assume suitable **data** if **necessary**.
     (4) **Figures** to the **right** indicate **full marks**.

1. Answer **any Five** :

(a) A voltage $v(t)=282.85 \sin 100\pi t$ is applied to a coil, having resistance of 20Ω in series with inductance of 31.83mH. Find   **04**
    (i) RMS value of voltage;
    (ii) RMS value of current;
    (iii) power dissipated in the coil and
   (iv) power factor of the coil.

(b) Derive the relation between line voltage and phase voltage in star connected three phase system.   **04**

(c) Find the node voltage V_2 by nodal analysis.   **04**
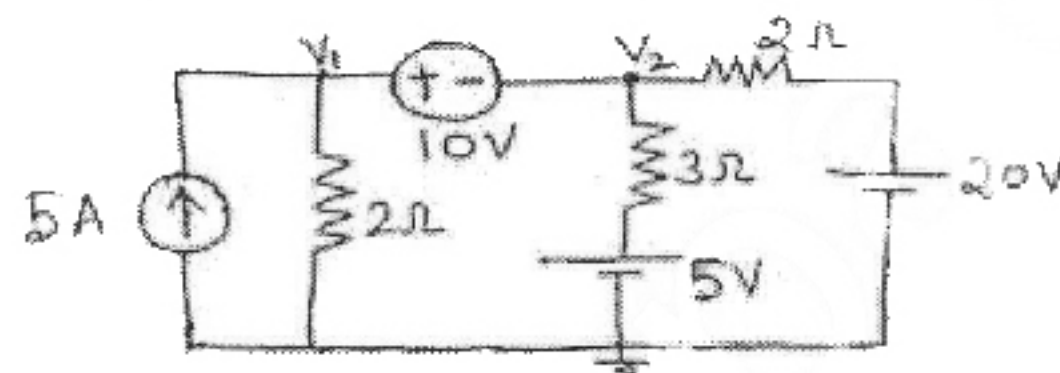
(d) A single phase transformer has a turn ratio (N_1/N_2) of 2:1 and is connected to a resistive load. Find the value of primary current (both magnitude and angle with reference to flux), if the magnetizing current is 1A and the secondary current is 4A. Neglect core losses and leakage reactance. Draw the corresponding phasor diagram.   **04**

(e) Find the Norton's equivalent of the given circuit across Rx.   **04**
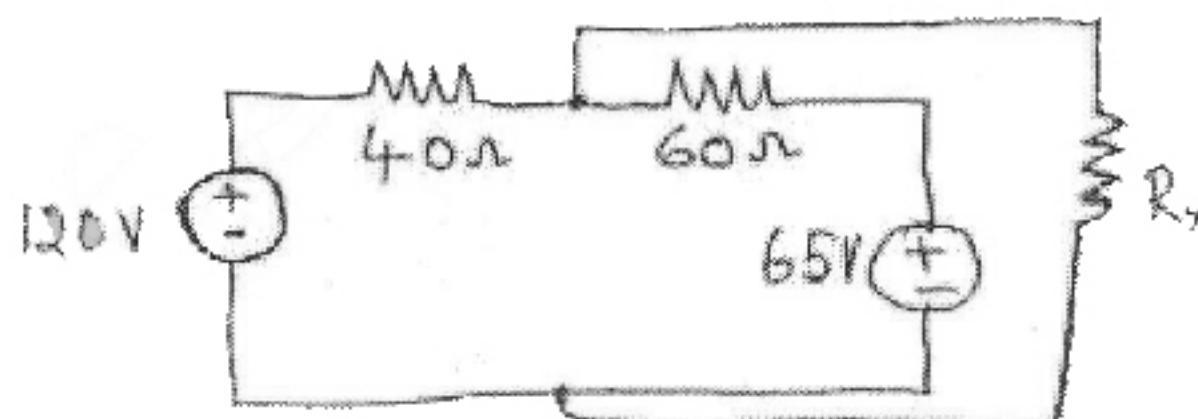
(f) A coil having a resistance of 20Ω. and an inductance of 0.1H is connected in series with a $50\mu F$ capacitor. An alternating voltage of 250V is applied to the circuit. At what value of frequency will the current in the circuit be maximum? What is the value of this current? Also find the voltage across the inductor and quality factor.   **04**

TURN OVER

2. (a) With necessary diagrams, prove that three phase power can be measured by **10** only two watt meters. Also prove that reactive power can be measured from the wattmeter readings.

(b) A circuit has L= 0.2H and inductive resistance 20Ω is connected in parallel with **10** 200μF capacitor with variable frequency, 230V supply. Find the resonant frequency and impedance at which the total current taken from the supply is in phase with supply voltage. Draw the phasor diagram and derive the formula used (both impedance and frequency). Also find the value of the supply current and the capacitor current.

3. (a) Two impedances $14 + j5\Omega$ and $18 + j10\Omega$ are connected in parallel across **10** 200V, 50 Hz, single phase supply. Determine:
   (i) Admittance of each branch in polar form;
   (ii) Current in each branch in polar form;
   (iii) power factor of each branch.;
   (iv) active power in each branch and
   (v) reactive power in each branch.

(b) Derive the emf equation of a single phase transformer. Find the value of the **06** maximum flux in a 25kVA, 3000/240V, single phase transformer with 500 turns on the primary. The primary winding is connected to 3000V, 50Hz supply. Find primary and secondary currents. Neglect all voltage drops.

(c) Compare core type and shell type transformer (any four points). **04**

4. (a) An alternating voltage is represented by $v(t)=141.4 \sin (377t)$ V. Derive the **08** RMS value of this voltage. Find :
   (i) instantaneous value at t = 3ms and
   (ii) the time taken for the voltage to reach 70.7V for the first time.

(b) State Superposition theorem. Find I_x using Superposition Theorem without **12** using source transformation technique.
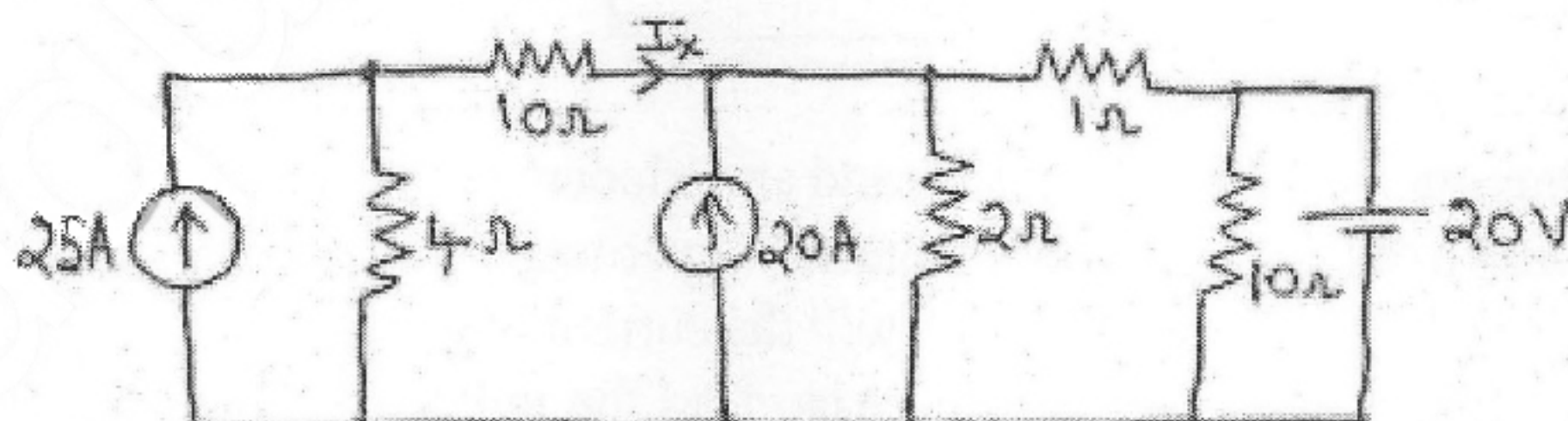
5. (a) State and prove maximum power transfer theorem. Find the value of the resistance 10 R_L using maximum power transfer theorem and find the value of maximum power transferred.
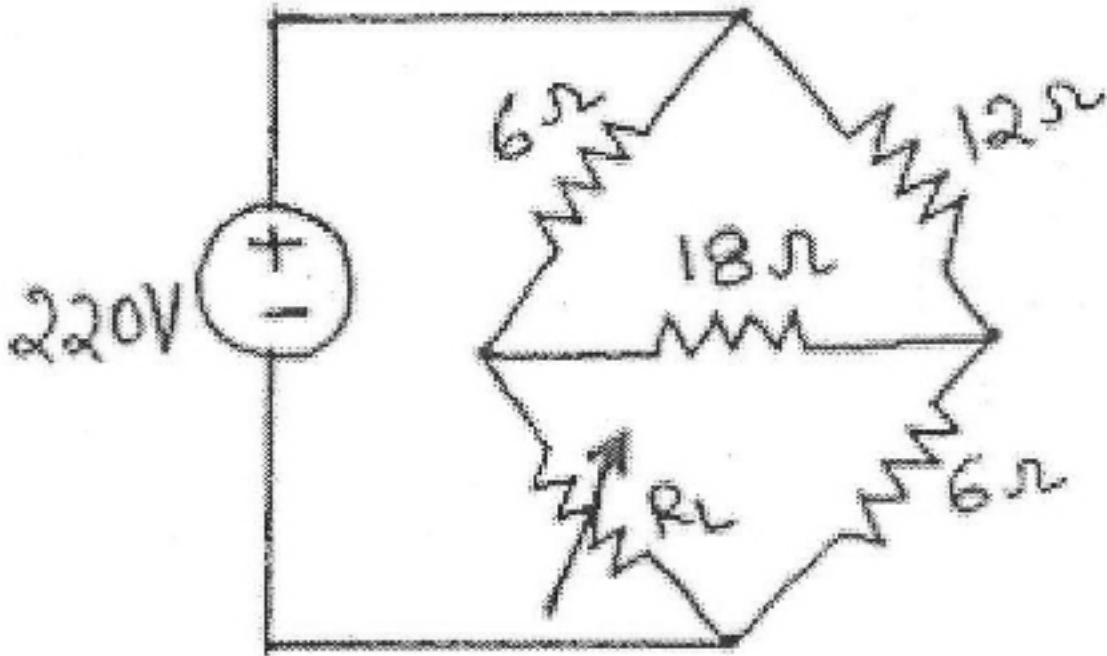
(b) A balanced load of phase impedance 100Ω and power factor 0.8 (lag) is connected 10 in delta to a 400 V, 3-phase supply. Calculate :
   (i) phase current and line current;
   (ii) active power and reactive power. If the load is reconnected in star across the same supply, find
   (iii) phase voltage and line voltage;
   (iv) phase current and line current. What will be the wattmeter readings if the power is measured by two wattmeter method (either star or delta).

6. (a) The readings when open circuit and short circuit tests are conducted on a 12 4kVA, 200/400 V, 50 Hz, single phase transformer are given below. Find the equivalent circuit parameters and draw the equivalent circuit referred to primary. Also find the transformer efficiency and regulation at full load and half load for 0.8 pf lagging.

OC test on LV side	200V	0.7 A	70 W
SC test on HV side	15V	10 A	85 W

(b) With neat diagram explain the main parts of a d.c. machine? Mention the functions 08 of each part.

_____