Basic Electrical Engineering (EE – 1201)

i. Answer all questions
ii. Use SINGLE answer script for both halves

Full Marks: 30 **Time: 2 hrs**

First Half

1. **(a)** Define the Thevenin's theorem. How is it different from the Norton's theorem?
   (b) Find out the current in the R_L resistance of the following network **Fig. 1.**

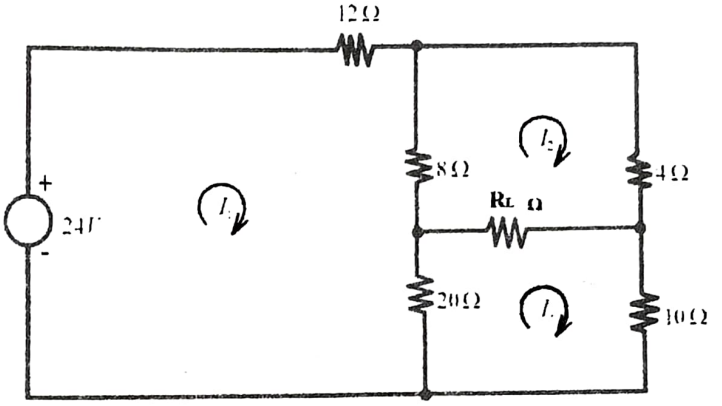

Fig. 1 **[2+3]**

2. **(a)** Enumerate the variation of Maximum Power Transfer across a circuit with the help of a curve, and an equation showing clearly the circuit parameters and the variables depicting the curve.
   (b) What should be the value of R such that maximum power transfer can take place from the rest of the network to R as shown in the network below in **Fig.2**? Calculate the amount of this power.

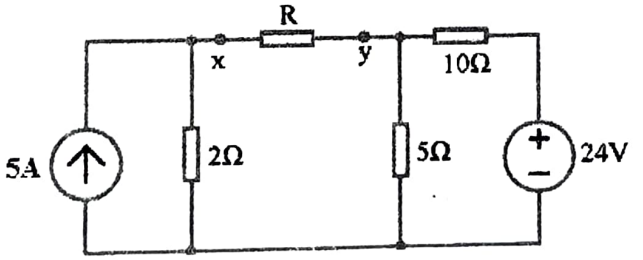

Fig. 2 **[2+3]**

3. **(a)** Write a short note on how to determine the direction and magnitude of force on a current carrying conductor placed in a magnetic field.
   (b) A steel ring of **25 cm** mean diameter and of circular section **3 cm** in diameter has an air gap of **1.5 mm** length. It is wound uniformly with **700** turns of wire carrying a current of **2** A. Calculate (i) magnetomotive force, and (ii) flux density of the air-gap.
   [Neglect magnetic leakage and assume that the iron path takes about **35%** of the total magnetomotive force.] **[2+3]**

Second Half

4. A coil of resistance **5 Ω** and inductance **1 mH** is connected in series with a **0.20 μF** capacitor. The circuit is connected to a **2 V**, variable frequency supply. Calculate the frequency at which resonance occurs. Also, calculate the voltages across the coil and the capacitor at resonant frequency. **[5]**

5. **(a)** Define admittance and susceptance of an electrical network excited by a sinusoidal source.
(b) (i) Draw the equivalent circuit in frequency domain for the given electrical network as shown in **Fig. 3**.
(ii) Find the angle between I_1 and I_2.
(iii) Draw the corresponding phasor diagram for I_1 and I_2. **[2+3]**

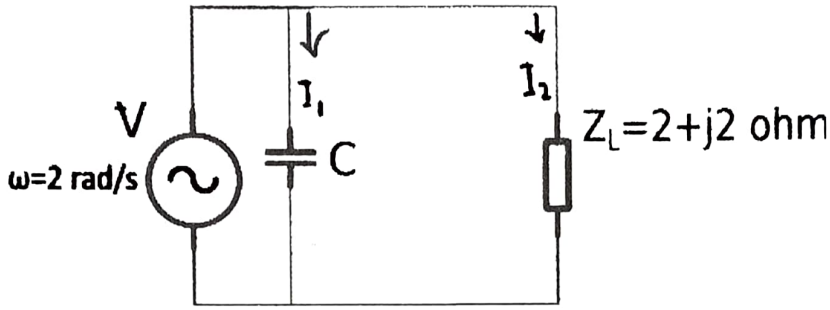

Fig. 3

6. (a) Derive the expression of active power for any AC network.
(b) A current has the following steady values in amperes for equal intervals of time changing suddenly from one value to the next (like 0, 10, 20, 30, 20, 10, 0, -10, -20, -30, -20, -10, 0 A) as shown in the **Fig. 4** :

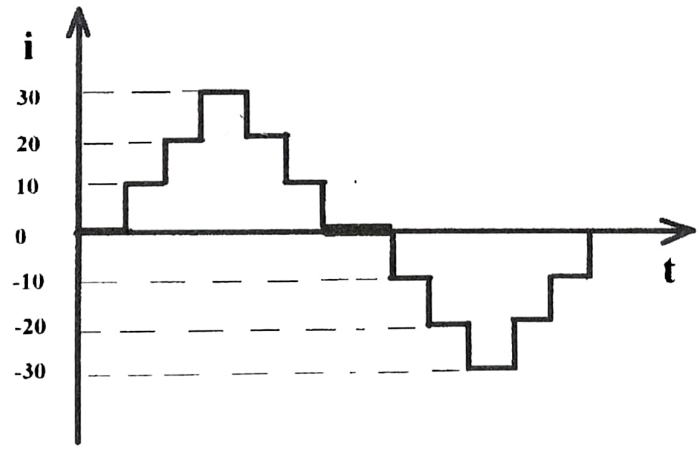

Fig. 4

Determine, (i) Average value, (ii) RMS value, (iii) Form Factor and (iv) Peak Factor **[3+2]**