2. Answer the following :   2×4=8

(a) What are peak value and mean value of alternating current?

(b) What do you mean by thermocouple and thermo-e.m.f.?

(c) What are magnetic flux and magnetic flux density?

(d) Write the relation between true power and power factor.

3. Answer any *three* from the following :   5×3=15

(a) Calculate the value of the torque on a current loop placed in a uniform magnetic field.

(b) An e.m.f. of 10 volts is applied to a circuit having a resistance of 10 ohms and an inductance of 0·5 henry. Find the time required by the current to attain 63·2 % of its final value. What is the time constant of the circuit?

(c) A capacitor of capacitance 0·1 μF is first charged and then discharged through a resistance of 10 megaohms. Find the time, the potential will take to fall to half its original value.

(d) The e.m.f. of a thermocouple, one junction of which is kept at $0\,°C$, is given by $E = bt + ct^2$. Find the neutral temperature and the Peltier and Thomson coefficient.

(e) (i) What do you mean by mutual and self-inductance? 2

    (ii) Two coils, a primary of 600 turns and a secondary of 30 turns are wound on an iron ring of radius 0.1 m and cross-section 4×10^{-2} m diameter. Find their mutual inductance (μ for iron = 800). 3

4. Answer any *three* from the following : $10 \times 3 = 30$

(a) Define the current density at any point. Derive an expression for current density. Prove the equation of continuity

$$div\ J + \frac{dy}{dt} = 0$$

(b) An alternating e.m.f. is applied to a circuit containing an inductor, capacitor and resistor in series. Obtain expression for the current, impedance and phase of current. Obtain the condition for the current to be a resonance with the applied e.m.f. Obtain the resonance frequency.

(d) The e.m.f. of a thermocouple, one junction of which is kept at 0 °C, is given by $E = bt + ct^2$. Find the neutral temperature and the Peltier and Thomson coefficient.

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(c) A charge capacitor of capacitance C discharges through a circuit containing of a coil of inductance L and a resistance R. Find the charge on the capacitor in t sec after it starts discharging. Deduce the condition under which the discharge is oscillatory. Find the period and frequency of the oscillatory discharge, where R is very small.

(d) State Biot-Savart law. Using Biot-Savart law, calculate the value of magnetic field due to an infinitely long straight wire carrying a current i amp at a distance d from the wire.

(e) Write a short note on any *one* of the following :

   (i) Transformer

   (ii) Anderson's bridge

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