

Department of Electronics & Communication Engineering

Faculty of Engineering, Integral University, Lucknow

Home Assignment-2

Basic Electrical Engineering (IEN-101)

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Section : EC-1

Problems : 10

1. A mild steel ring has a mean diameter of 20 cm and cross-sectional area of 400mm^2 . Calculate the (i) reluctance of the ring and mmf to produce a flux of $500\mu\text{Wb}$. Assume the relative permeability of mild steel to be 1000. [1.25x 10^6 AT/Wb, 625AT]

2. A steel magnetic circuit has a uniform cross-sectional area of 4 cm^2 and a length of 50 cm. A coil of 250 turns is wound uniformly over the magnetic circuit. When the current in the coil is 1.5A, the total flux is 0.25mWb ; when the current is 5A, the total flux is 0.6mWb . For each value of current, calculate the (i) magnetic field strength and (ii) relative permeability of the steel. [750 AT/m, 663, 2500AT/m, 477.5]

3. A cast steel magnet has an air gap of length 2 mm and an iron path of 30 cm. Find the number of ampere turns necessary to produce a flux density of 1.2 Wb/m^2 . The relative permeability of cast steel is 900. Neglect leakage and fringing. [2228.3AT]

4. Enumerate the reasons, the advantages of using three-phase supply systems over single phase supply systems.

5. A balanced three-phase load consisting of three coils, each with a resistance of 3 ohm and inductance of 0.04H, is connected to a three phase 415V, 50Hz supply. Determine the total active power when the coils are (a) star connected (b) delta connected. [3.1kW, 9.302kW]

6. A balanced star connected load of $(4+j3)$ per phase is connected to a three phase, 415V, 50Hz supply. Find the (a) line current (b) the power factor (c) the power (d) the reactive volt-amperes, and (e) the total volt-amperes.

[(a) 47.92A (b) 0.8 (c) 27.556kW (d) 20.667 kVAR (e) 34.445 kVA]

7. A balanced 3-phase, star connected load of 6kW takes a leading current of 10A with a line voltage of 415V, 50Hz. Find the circuit constants of the load per phase.

[R=20 Ω , C=241.37 μF]

8. Three similar coils, connected in star, take a total power of 3kW from three phase, three wire 415V, 50 Hz supply at a power factor of 0.3. Calculate (a) the resistance and inductance of each coil and the (b) line current if one of the coils is short circuited.

[(a) 5.17 Ω , 5.23 mH (b) 24.1A, 41.75A]

9. Prove that the instantaneous three- phase power in a circuit is equal to the average power.

10. The load taken by a three phase induction motor is measured by the two wattmeter method and the readings are 750W and 200W. What is the active power taken by the motor and at what power factor is it working? [0.95kW, 0.705]

Basic Electrical Engineering By T.K.NAGSARKAR AND M.S.SUKHIJA, Oxford University Press