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First/Second Semester B.E. Degree Examination, July/August 2005

**Common to all branches
Basic Electrical Engineering**

Time: 3 hrs.]

[Max.Marks : 100

Note: Answer any FIVE full questions.

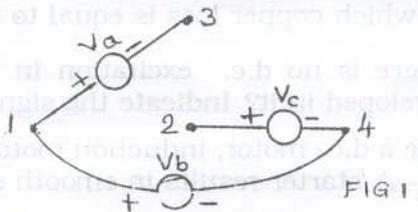
1. (a) Mention the three methods used to link conductors with flux to get induced e.m.f. Name the machine for which each is applicable. (6 Marks)

(b) The winding of an electromagnet is wound with 96 turns and has a resistance of 50 ohms. The exciting voltage is 250v and the flux linking the coil is 5 mWb. Find the energy stored in the magnetic field. Then if the current is reversed in 0.1 sec, what emf is induced in the coil? (6 Marks)

(c) What is power factor in a.c. circuits? Distinguish between lagging p.f. and leading p.f. Which of the following devices work at
i) Unity p.f. ii) Lagging p.f. iii) Leading p.f.
iv) Electric iron v) Fluorescent lamp vi) Incandescent lamp
vii) Condenser bank to improve p.f. viii) induction motor. (8 Marks)

2. (a) A current of average value 18.019A is flowing in a circuit to which a voltage of peak value 141.42 V is applied. Determine i) $Z_1 = R \pm jX$ ii) Power. V lags I by $\frac{\pi}{6}$ radians. (6 Marks)

(b) Three volatages are connected as shown in fig 1. If $V_a = 17.32 + j10V$, $V_b = 30 \angle 80^\circ V$, $V_c = 15 \angle -100^\circ V$. Find i) V_{12} ii) V_{23} and iii) V_{34} (6 Marks)



(c) How is a current of 10A shared by three impedances $Z_1 = 2 - j5\Omega$, $Z_2 = 6.708 \angle 26.56^\circ \Omega$ and $Z_3 = 3 + j4\Omega$ all connected in parallel? (8 Marks)

3. (a) Deduce the relationships for the line and phase values of voltage and current in a 3 phase balanced i) star and ii) delta connections. (6 Marks)

(b) A 3-phase Y connected supply with a phase voltage of 230V is supplying a balanced Δ load. The load draws 15KW at 0.8 p.f. lagging. Find the line currents and the current in each phase of the load. What is load impedance per phase? (6 Marks)

(c) Power is measured in a 3 phase balanced load using two Wattmeters. The line voltage is 400V. The load and its p.f. is so adjusted that the line current is always 10A. Find the reading of the Wattmeters when the p.f. is
i) unity ii) 0.866 iii) 0.5 and iv) zero. (8 Marks)

4. (a) Explain the principle of converting the internally induced a.c. voltage into d.c. voltage in a d.c. generator. (6 Marks)
- (b) What is the necessity of a starter for a d.c. shunt motor even though it is self starting? What is the function of i) No volt release and ii) Over load release in the three point starter? (6 Marks)
- (c) A 440V d.c. shunt motor takes an armature current of 20A and runs at 500 r.p.m. The armature resistance is 0.6Ω . If the flux is reduced by 30% and the torque is increased by 40%. What are the new values of armature current and speed? (8 Marks)
5. (a) Sketch N-I and T-I characteristics of D.C. i) series and ii) shunt motors. Mention two applications of each motor. (6 Marks)
- (b) Give reasons for the following in an alternator:-
i) Armature is stationary. field is rotating.
ii) Distributed winding is used instead of concentrated winding. (6 Marks)
- (c) A 3 phase Y connected alternator driven at 900 RPM is required to generate a line voltage of 460V at 60 Hz on open circuit. The stator has two slots/pole/phase and four conductor per slot. Calculate the number of poles and the useful flux per pole if the winding factor is 0.966. (8 Marks)
6. (a) In a transformer, why
i) There is a small current in the primary even when the secondary is open?
ii) Iron loss is constant but copper loss is variable
iii) The core is made up of laminations. (6 Marks)
- (b) The primary winding of a transformer is connected to a 240V 50Hz, supply. The secondary winding has 1500 turns. If the maximum value of the core flux is 0.00207 Wb, determine i) the secondary induced emf ii) number of turns in the primary iii) core area of cross section if the flux density has a maximum value of 0.465 Tesla. (6 Marks)
- (c) A 40 KVA transformer has a core loss of 450 W and a full load copper loss of 850W. If the load power factor is 0.8, calculate i) efficiency at full load ii) load at which copper loss is equal to iron loss iii) efficiency at this load. (8 Marks)
7. (a) There is no d.c. excitation in induction motor. But then how is torque developed in it? Indicate the significance of slip. (6 Marks)
- (b) Like a d.c. motor, induction motor also requires a starter. Why? Explain how Y - Δ starter results in smooth starting of induction motor. (6 Marks)
- (c) A 3 phase induction motor with four poles is supplied from an alternator having six poles and running at 1000 RPM. Calculate (i) synchronous speed of the induction motor. (ii) Its speed when slip is 0.04 (iii) frequency of the rotor e.m.f. when speed is 600 RPM. (8 Marks)
8. (a) Sketch one type of earthing and indicate why such earthing of electrical equipments is necessary. (6 Marks)
- (b) With a schematic explain the working of a dynamometer Wattmeter. (6 Marks)
- (c) As applied to an energy meter give reasons for the following:
i) There is a permanent magnet surrounding a portion of the rotating disc.
ii) Diagonally opposite holes are cut on the disc.
iii) A copper shading ring is provided on the central limb of the shunt magnet. (8 Marks)