

III B.Tech I Semester Supplementary Examinations, May 2005
ELECTRO MECHANICS-III
(Electrical & Electronic Engineering)

Time: 3 hours

Max Marks: 80

Answer any FIVE Questions
All Questions carry equal marks

1. Derive an expression for an induced e.m.f in a synchronous generator. Also explain how the e.m.f is having sinusoidal wave form.
2. Explain the effect of armature reaction on terminal voltage of an alternator at
 - (a) u.p.f.
 - (b) zero p.f. load.
 Draw the relevant phasor diagrams. What is leakage reactance?

3. (a) Write short note on Two reaction theory
- (b) The following test results are obtained on a 3-phase 6600V alternator

O.C. Voltage	3,100	4,900	6,600	7,500	8,300
Field Current (amp)	16	25	37.5	50	70

A field current of 20A is found necessary to circulate full load current on S.C. of the armature. Determine the full load regulation at 0.8P.f by A.T. method

4. (a) Define the significance of transient and sub-transient reactances in an alternator.
- (b) Two 15KVA, 400V, 3-phase alternators in parallel supply a total load of 25 KVA at 0.8 p.f. lagging. If one alternator shares half the power at unity power factor, determine the power factor and KVA shared by the other alternator.
5. A 20-pole, 693V, 50Hz, 3ϕ , Δ - connected synchronous motor is operating at no-load with normal excitation. It has armature resistance per phase of 10Ω and negligible synchronous reactance. If rotor is retarded by 0.5° (mech.) from its synchronous position, compute
 - (a) rotor displacement in electrical degrees
 - (b) armature emf/phase
 - (c) armature current / phase
 - (d) power drawn by the motor
 - (e) power developed by the armature

How will these quantities change when motor is loaded and the rotor displacement increases to 5° (mech.)?

6. (a) For a salient pole synchronous motor, working at lagging p.f., Show that $\tan \delta = \frac{I_a(X_q \cos \theta - r_a \sin \theta)}{V_t - I_a(X_q \sin \theta + r_a \cos \theta)}$.
- (b) Find an expression for power in terms of load angle δ , for a salient pole synchronous motor working at a lagging p.f. Armature resistance may be neglected.
7. (a) Prove that a single phase motor winding when excited by a single phase supply produces two equal and opposite revolving fields.
- (b) “The centrifugal switch of a single phase motor failed to open”. Explain the after effects in the performance.
8. (a) Compare the constructional features of a.c series motor with d.c. series motor.
- (b) Why cannot a shaded pole motor be made to rotate in the reverse direction?

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