

2005 JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY

III B.TECH I SEMESTER SUPPLEMENTARY EXAMINATIONS
ELECTRO MECHANICS - III
 (ELECTRICAL & ELECTRONIC ENGINEERING)

/NOVEMBER 2005

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. [16]
2. Explain the effect of armature reaction on terminal voltage of an alternator at
 - (a) u.p.f. [12]
 - (b) zero p.f. load. Draw the relevant phasor diagrams. What is leakage reactance? [4]
3. (a) What happens to the value of synchronous reactance if air gap is increased
 (b) A 30KVA, 440V, 50Hz, 3-phase, Star-connected alternator gave the following test data:
 Field current (A) 2 4 6 7 8 10 12 14 Terminal voltage (V) 155 287 395 440 475 530 570 592
 S.C Current (A) 11 22 34 40 46 57 69 80 Resistance between any two terminals is 0.3W. Find the regulation at full load, 0.8 P.f Lagging, by MMF method [16]
4. (a) Define the significance of transient and sub-transient reactances in an alternator. [8]
 (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. [8]
5. (a) What are the salient features of a synchronous motor. [6]
 (b) The input to a 11KV, 3-, Y connected synchronous motor is 60A. The effective resistance and synchronous reactance per phase are 1 and 30 Find
 - i. Power supplied to the motor and
 - ii. the induced emf for a power factor of 0.8 leading. [5+5]
6. A manufacturing plant takes 350kW at a lagging power factor of 0.6. Calculate
 - (a) the rating of a synchronous motor which would deliver 140kW and at the same time make it possible for the plant to operate without overloading its 600Kva supply transformer
 - (b) The resultant power factor of the plant

(c) the power factor of the synchronous motor.

[4+4+8]

7. (a) Using double revolving field theory explain the torque-slip characteristic of a single phase induction motor and prove that it cannot produce starting torque.

(b) Explain the constructional details and principle of operation of a split phase induction motor. List out its industrial applications. [8+8]

8. (a) Compare the performance characteristics of a.c. series motor when it is connected across

i. a.c. supply and

ii. D.C. supply.

[3+3]

(b) Describe the construction and principle of operation of a single phase shaded pole motor with a neat diagram. Give its industrial applications. [10]

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