

Total No. of Questions : 8] [Total No. of Printed Pages :

Roll No.

EX-503(N)

B. E. (Fifth Semester) EXAMINATION, Dec., 2010

(New Scheme)

(Electrical & Electronics Engg. Branch)

ELECTRICAL MACHINE – II

[EX – 503(N)]

Time : Three Hours

Maximum Marks : 100

Minimum Pass Marks : 35

Note : Attempt any five questions. All questions carry equal marks. Assume suitable data if necessary.

1. (a) With the help of experimental set up how regulation is determined from e.m.f. method under unity, lagging and leading pf. Draw phasor diagrams. Comment on the shape of OCC and SC characteristic. 10
- (b) The open circuit and short circuit readings for a 3-phase, star connected 1000 KVA, 2000 V, 50 Hz, synchronous generator are : 10

Field current (Amps)	Line e.m.f. (Volts)	SC current (Amps)
10	800	—
20	1500	200
25	1760	250
30	2000	300
40	2350	—
	2600	—

The effective armature resistance is $0.2 \Omega/\text{phase}$. Using ampere turn method, find the full load voltage regulation at :

- (i) 0.8 pf lagging
- (ii) 0.8 pf leading

(a) Explain the following : 4 each

- (i) Distributive winding and its advantages
- (ii) Distribution factor and pitch factor
- (iii) Integral slot and fractional slot winding

(b) Explain the importance of computing voltage regulation in an alternator. 8

(a) Based on two reaction theory draw and explain the phasor diagram of a salient pole alternator. How voltage regulation is determined ? 10

(b) A 3-phase star connected round rotor synchronous generator rated at 10 kVA , 230 V has an armature resistance of 0.5Ω per phase and a shunt resistance of 1.2Ω per phase. Calculate the percent voltage regulation at full load at 0.8 pf lag. Also determine the pf such that the voltage regulation is zero on full load. 10

(a) Discuss the industrial applications where synchronous motors are preferred to induction motors. 10

(b) Deduce an expression for the synchronising torque on no load of a 3-phase synchronous machine in terms of the line voltage V , the short circuit current I_{SC} , the electrical angle displacement θ and the speed in revolution per sec. 10

5. (a) Explain how 'V' and inverted 'V' curves are drawn for a synchronous motor in the laboratory. <http://www.onlineeqp.com> 10
- (b) With the help of neat diagram explain how slip test is performed in laboratory. 10
6. (a) Explain how subtransient, transient and steady state reactances and time constants can be determined from the short circuit oscillogram and equivalent circuits. 10
- (b) Two 3-phase, λ -connected alternators 1 and 2 supply a total load of 18 MVA at 0.7 lagging pf at a line voltage of 6.6 kV. The two alternators are rated at 10 MVA, 6.6 kV. The machine 1 is operating on full load at 0.8 pf lagging. Find : 10
- (i) The current supplied by machine 2
 - (ii) Operating pf of machine 2
 - (iii) Power delivered by each machine
7. (a) Explain the concept of transformer and speed voltage. 10
- (b) What is connection matrix ? Explain with an appropriate example its use for obtaining new impedance and new voltage matrix. 10
8. Write short notes on any *two* of the following : 10 each
- (a) Stepper motor
 - (b) Repulsion motor
 - (c) Universal motor
 - (d) Brushless DC motor
 - (e) Hybrid motor
 - (f) Reluctance motor