Code: 13A02504 **R13**

B.Tech III Year I Semester (R13) Supplementary Examinations June 2017

ELECTRICAL MACHINES – III

(Electrical and Electronics Engineering)

Time: 3 hours Max. Marks: 70

PART – A

(Compulsory Question)

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1 Answer the following: (10 X 02 = 20 Marks)

(a) What is armature reaction of a synchronous machine and mention its effects?

(b) What are the advantages of salient pole type of construction used for synchronous machines?

(c) Why the MMF method of estimating the voltage regulation is considered as the optimization method?

(d) Draw the phasor diagram of an alternator on load of lagging power factor.

(e) Why alternators are operated in parallel?

(f) Define synchronizing power and torque of an alternator.

(g) Examine the effect of changing excitation of constant load on a synchronous motor.

(h) Distinguish between synchronous phase modifier and synchronous condenser.

(i) Compose how can a universal motor be reversed.

(j) Name the applications of switched reluctance motor.

PART – B

(Answer all five units, 5 X 10 = 50 Marks)

UNIT – I

2 A 3-phase, 8-pole, 750 rpm star – connected alternator has 72 slots on the armature. Each slot has 12 conductors and winding is short chorded by 2 slots. Find the induced e.m.f between lines, given the flux per pole is 0.06 Wb.

OR

3 (a) What are the causes of harmonics in the voltage waveform of an alternator?

(b) Enumerate various methods used for minimizing harmonics in turbo-alternator.

UNIT – II

4 Explain clearly what is meant by synchronous impedance of an alternator and how it can be determined experimentally. How does the value of regulation as calculated by synchronous impedance method compared with that obtained from an actual load test and why?

OR

5 (a) Explain the two reaction theory applicable to salient pole synchronous machine.

(b) A 3-phase, star connected, 1000 kVA, 11 kV, alternator has rated current of 52.5 A. The AC resistance of the winding per phase is 0.45 ohms. The test results are given below:

OC test: Field current = 12.5 A, Voltage between the lines = 422 V.

SC test: Field current = 12.5 A, Line current = 52.5 A.

Determine the full load voltage regulation of the alternator at a power factor of: (i) 0.8 leading. (ii) 0.8 lagging.

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UNIT – III

6 (a) Show that in order to obtain a constant voltage, constant frequency of a practical bus bar system, the number of alternators connected in parallel should be as large as possible.

(b) A 75 kW, 400 V, 4-pole, 3-phase, star connected synchronous motor has a resistance and reactance per phase of 0.04 ohm and 0.4 ohm respectively. Compute for full load 0.8 p.f lead the open circuit e.m.f per phase and gross mechanical power developed. Assume an efficiency of 92.5%.

OR

7 (a) Explain the procedure to determine the sub-transient, transient and steady state reactance of an alternator.

(b) A 5 MVA, 11 kV, 4-pole, 3-phase and 50 Hz alternator is operating on an infinite bus bar. Find synchronizing power per mechanical degree of angular displacement at full load a rated voltage and current at 0.8 p.f lagging. Also find synchronizing torque for a 0.5º mechanical displacement. Take X_s= 0.2 pu.

UNIT – IV

8 (a) Explain the working of a synchronous -induction motor.

(b) What is hunting and how it can be suppressed.

OR

9 Explain the effect of excitation on armature current and power factor and hence draw the 'V' and inverted 'V' curves.

UNIT – V

10 Discuss in detail the working and principle of:

(a) Capacitor start capacitor run motors.

(b) Hysteresis motor.

OR

11 (a) Explain double-field revolving theory of a single phase induction motor.

(b) With a neat diagram, describe the principle & working of shaded pole motor.

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