Code: 13A02504 **R13**

B.Tech III Year I Semester (R13) Regular & Supplementary Examinations November/December 2016

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) Explain different types of harmonics.

(b) Give the limitations of synchronous impedance method.

(c) Justify the statement of “Behaviour of a synchronous machine on infinite bus is quite different from its isolated operation".

(d) Define excitation circle and power circle.

(e) List the applications of single phase induction motor.

(f) What is a distribution factor?

(g) List the advantages of connecting alternators in parallel.

(h) Give the industrial applications of a.c series motor.

(i) Define running torque.

(j) What is voltage regulation? Name the various methods used to determine voltage regulation of an alternator.

PART – B

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

UNIT – I

2 (a) Explain the various winding factors. Explain the effects of each of them

(b) What is armature reaction? Explain the effect of armature reaction on the terminal voltage of an alternator at: (i) u.p.f load. (ii) Zero lagging p.f load. (iii) Zero leading p.f load.

OR

3 An alternator has 18 slots/pole and the first coil lies in slots 1 and 16. Calculate the pitch factor for: (i) Fundamental. (ii) 3^{rd} harmonic. (iii) 5^{th} harmonic. (iv) 7^{th} harmonic.

UNIT – II

4 A 30 kVA, 440 V, 3-phase, 50 Hz, star connected alternator gave the following test data:

Filed current	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	46	46	57	69	80

Resistance between any two terminals is 0.3 Ω. Find the regulation at full-load 0.8pf lagging.

OR

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

(b) Draw and explain the phasor diagram of a salient pole synchronous generator supplying a lagging p.f.

UNIT – III

6 Two single phase alternators operating in parallel have induced e.m.f’s on open circuit of 220 V at an angle of 0° and 220 V at an angle of 10° and respective reactances of j3Ω and j4Ω.

Calculate: (i) Terminal voltage. (ii) Currents. (iii) Power delivered by each of the alternators to a load resistance 6 Ω.

OR

7 Two star connected alternators supply a load of 3 MW at 0.8 p.f. lagging and share the load equally. The excitation of second machine is adjusted so that it is supplying 150 A at a lagging p.f. The synchronous impedances are 0.4 + j12Ω/ph and 0.5 + j10Ω/ph. Find current, power, induced e.m.f and load angle of each machine. Terminal voltage is 6.6 kV.

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UNIT – IV

8 A 3-phase, 415 V, 6-pole, 50 Hz, star connected synchronous motor has an e.m.f of 520 V (L-L). The stator winding has a synchronous reactance of 2 ohms/ph and motor develops a torque of 220 N-m. Find current drawn supply and operating power factor.

OR

9 (a) What are the salient features of a synchronous motor?

(b) Explain the power factor v/s field current and armature current v/s field current characteristics of synchronous motor.

UNIT – V

10 (a) Explain the operating characteristics of ac series motor.

(b) Explain the construction, operation and advantages of permanent magnet ac motors.

OR

11 A 220 V 60 Hz, 1/4H.P. Universal motor runs at 1500 r.p.m and takes 0.4 A when it is connected to a 220 V, D.C source. Determine the speed, torque and power factor of the motor when it is connected to a 220 V, 50 Hz supply and it is loaded to take 0.4 (r.m.s) of current. The resistance and inductance measured at terminals of the machine are 30 Ω and 0.3H respectively.

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