Code No: **R31025** **R10** **Set No. 1**

III B.Tech I Semester Supplementary Examinations, November - 2015

ELECTRICAL MACHINES-III

(Electrical and Electronics Engineering)

Time: 3 hours **Max. Marks: 75**

Answer any FIVE Questions

All Questions carry equal marks

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1 a) Explain the double field revolving theory for operation of single phase induction motor.

b) A 150 W, 4-pole, 110 V, 50 Hz, single phase induction motor delivers rated output at a speed of 1425 rpm. The total copper loss at full load is 30 watt. Determine the full load slip and full load efficiency. The rotational losses are assumed to be 25 watt and neglect the stator copper loss. Also determine the copper losses caused by two fields.

2 a) Describe with neat sketch the constructional details and operation of a salient pole type alternator.

b) A 3-phase, 16-pole alternator has a resultant air gap flux of 0.06 Wb per pole. The flux is sinusoidally distributed over the pole. The stator has 2 slots per pole per phase and 4 conductors per slot are accommodated in two layers. The coil span is 150^0 electrical. Calculate the phase and line voltage when the machine runs at 375 r.p.m.

3 a) Explain the sources of harmonics in an alternator. What are the various effects of harmonics on generated e.m.f in an alternator? Explain the methods to suppress the harmonics.

b) Calculate the r.m.s value of the induced e.m.f per phase of a 10-pole, 3-phase, 50 Hz, alternator with 2 slots per pole per phase and 4 conductors per slot in two layers. The coil span is 150^0 electrical. The flux per pole has a fundamental component of 0.12 Wb and a 20% third harmonic component.

4 a) With the help of neat sketches, explain how the voltage regulation can be determined using EMF method from the O.C and S.C test results.

b) A 220 V, 50 Hz, 6-pole star connected alternator with armature resistance of 0.06 ohm/phase gave the following data for open circuit and short circuit characteristics. Find the voltage regulation at full load current of 40 amps at a power factor of 0.8 lag by MMF method.

Field Current (A)	0.2	0.4	0.6	0.8	1.0	1.2	1.4	1.8	2.2	2.6	3.0	3.4
O.C. Voltage/ph (V)	16.7	33.5	50.2	67	84.3	99.3	112	134	151	164	173.2	179
S.C Current (A)	6.6	13.2	20	26.5	32.4	40	46.3	59.0	--	--	--	--

5 a) Derive the expression for synchronizing power developed by an alternator.

b) Two identical 3-phase alternators running in parallel supply load demand of 1500 kW at 11 kV and power factor 0.867 (lag). Each alternator supplies half the demand has a reactance (synchronous) of 50 ohms/phase and a resistance of 4 ohms/phase. The field excitation of first alternator is so adjusted that its armature current is 50 A (lag). Determine the armature current of second alternator and the generated voltage of first alternator.

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6 a) Derive the expression for the input and output power developed by synchronous motor. Also derive the maximum input and output power developed by synchronous motor.

b) Draw the phasor diagram of synchronous motor and explain.

7 a) Why synchronous motor is not self starting? Explain the methods of starting of synchronous motor.

b) What is meant by constant power circle for synchronous motor? Explain.

8 a) Explain about single phase AC series motor with neat diagrams.

b) A 120 V, 60 Hz, 0.25 Hp universal motor runs at 2000 rpm and takes 0.4 A when connected to a 120 V DC source. Determine the speed, torque and power factor of the motor when it is connected to a 120 V, 60 Hz supply and is loaded to take 0.6 A (r.m.s) of current. The resistance and inductance measured at the terminals of the machine are 20 ohms and 0.25 H respectively.

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