Total No. of Questions : 8] *[Total No. of Printed Pages : 3*

Roll No .....

EE/EX-5002 (CBGS)

B.E. V Semester

Examination, December 2017

Choice Based Grading System (CBGS)

Electrical Machine - II

Time : Three Hours

Maximum Marks : 70

Note: i) Attempt any five questions.
ii) All questions carry equal marks.

1. a) What is armature reaction in DC machine? Describe the effects of armature reaction on the operation of DC machines. How the armature reaction is minimized.

   b) In a 110 V DC compound generator, the resistance of armature, shunt and series windings are 0.06Ω, 25Ω and 0.04Ω respectively, supplying the load consists of 200 lamps each rated 55W, 110V. Find the total EMF generated and armature current, when the machine is connected for

   i) Long shunt

   ii) Short shunt

2. a) Why is the starting current very high in a DC motor? How does the starter reduce the starting current to a safe value?

   b) What are the drawbacks of three-point starter? Describe a four-point starter with a neat sketch.

297

3. a) Explain the Hopkinson's test for determination of efficiency of DC shunt machines. What are the main advantages and limitations of this test?

   b) A 250V shunt motor on No-Load runs at 1000rpm and takes 5A current. The armature and shunt field resistances are 0.2Ω and 250Ω respectively. Calculate the speed when motor is loaded and taking current of 50A. The armature reaction weakens the field by 3%.

4. a) Describe the various excitation systems arrangements of synchronous alternators.

   b) A 10MVA, 1kV, 50Hz, 3-phase, star-connected synchronous generator is driven at 300 rpm. The armature winding is housed in 360 slots with 6 conductors per slot. The coil span is five-sixth of a pole pitch. Calculate the flux per pole required to give 11kV line voltage on open-circuit voltage.

5. a) Describe the slip test conducted in laboratory for the measurement of X_d and X_q of synchronous machines.

   b) Draw the phasor diagrams of salient-pole synchronous generator supplying lagging, leading and unity power factor loads.

6. a) A salient-pole synchronous generator supplying lagging power factor loads, show that the power output per phase is given by:

$$P = \frac{VE_f}{X_d}\sin\delta + \frac{V^2}{2}\left[\frac{1}{X_q} - \frac{1}{X_d}\right]\sin 2\delta$$

298

b) Two identical 2000kVA alternators operate in parallel. The governor of first machine is such that the frequency drops uniformly from 50Hz on No-Load to 48 Hz on Full-Load. The corresponding uniform speed drop of the second machine is 50Hz to 47.5Hz

i) How will the two machines share a load of 3000kW,

ii) What is the maximum load at unity power factor that can be delivered without overloading either machine.

7. a) Explain the effect of varying excitation on armature current and power factor on synchronous generator.

b) A 3 MVA, 6-pole alternator runs at 1000rpm in parallel with other machine on 3.3kV bus-bar. The synchronous reactance is 1.0Ω. Calculate the synchronizing power per mechanical degree at no-load and corresponding synchronizing torque.

8. a) Why is synchronous motor non-self starting? Discuss the various starting methods of synchronous motors.

b) Explain the working principle of reluctance motor. Draw and explain the torque-speed characteristics of reluctance motor.

******