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06EE54

Fifth Semester B.E. Degree Examination, June-July 2009
D.C. Machines and Synchronous Machines

Time: 3 hrs. Max. Marks:100

Note: ***Answer any FIVE full questions choosing at least Two questions from each part.***

PART – A

1 a. What is Commutation? Explain. **(04 Marks)**

b. Derive expression for demagnetizing and cross magnetizing Ampere turns for a D.C. machine. **(06 Marks)**

c. What is meant by critical field resistance in a D.C. generator and method of determining it? **(05 Marks)**

d. Estimate the reduction in speed of a generator working with constant excitation on 500V bus bars to decrease its load from 500 kw to 250 kw. The resistance between the terminals is 0.015Ω. Neglect armature reaction. **(05 Marks)**

2 a. Derive the equation for the Torque of a D.C. Motor. **(04 Marks)**

b. What is Back e.m.f.? Explain its significance. **(04 Marks)**

c. Explain the various characteristics of D.C. shunt Motor with relevant equations. **(06 Marks)**

d. A 220 V shunt Motor has an armature resistance of 0.5Ω and takes a current 40 A on full load. By how much must the main flux be reduced to raise the speed by 50%, if the developed torque is constant? **(06 Marks)**

3 a. Explain the construction, working and application of permanent magnet D.C. Motors. **(06 Marks)**

b. Explain how the Efficiency of a D.C. Machine can be pre-determined for different loads. **(06 Marks)**

c. A 480 V, 25 H.P. shunt Motor took 2.5 A when running light. Taking armature resistance to be 0.6 Ω, field resistance 800 Ω and brush drop 2 V, find the full load efficiency. **(08 Marks)**

4 a. Explain the construction and operation of Brush less D.C. Motor. **(06 Marks)**

b. Discus the application of D.C. Motor. **(04 Marks)**

c. A retardation test on a D.C. Motor gave the following results. With field unexcited, the speed tell from 1525 RPM to 1475 RPM in 43sec. With field normally excited the speed drop occurred in 26sec. Determine the Moment of Inertia of the rotating parts at 1500 RPM. And the core loss for normal excitation at this speed. **(10 Marks)**

PART – B

5 a. With usual notations, derive the e.m.f. equation of an alternator with distributed and short pitched windings. **(04 Marks)**

b. Describe the M.M.F. method of determining regulation of an alternator for lagging and leading power factor. **(08 Marks)**

c. A 3 phase star connected alternator is rated at 1600 KVA, 13500 V. The armature effective resistance and synchronous reactance are 1.5 Ω and 30 Ω respectively per phase. Calculate the percentage regulation for a load of 1280 KW at power factor of i) 0.8 loading; ii) 0.8 lagging. **(08 Marks)**

6 a. Explain the two reaction theory of salient pole machines. Draw the phasor diagram. **(07 Marks)**

b. Explain what is hunting in synchronous Motors. **(05 Marks)**

c. Two 3 phase, Star connected alternators supply a load of 3000 kw at 0.8 power factor lagging and share the load equally. The excitation of second machine is so adjusted that it supplies 150 A at a lagging p.f. the synchronous impedances are (0.4 + J12) Ω + (0.5 + J10)Ω. Find current, power factor, induced E.m.f. and load angle of each machine the terminal voltage is 6.6kV. **(08 Marks)**

7 a. Why is the Synchronous Motor not self starting? Briefly explain the methods of starting. **(08 Marks)**

b. Show that an over excited machine has higher synchronous power than an under excited one. **(06 Marks)**

c. A 1500 KVA, 6600 V, 3 phase, star connected alternator with a resistance of 0.4 Ω and reactance of 6 Ω/ph, delivers full load current at power factor 0.8 lagging and normal rated voltage. Estimate the terminal voltage for the same excitation and load current at 0.8 p.f. leading. **(06 Marks)**

8 a. How are X_d and X_q determined from slip test? Explain. **(06 Marks)**

b. What are the different methods used to reduce Harmonics in 3 phase alternator? **(06 Marks)**

c. A 6600V, 3 phase, star connected synchronous motor works at constant voltage and constant excitation. Its synchronous impedance is (2 + J20) Ω/ph. When the Input is 1000KW, the p.f is 0.8 leading. Find the p.f when the input is increased to 1500 KW. **(08 Marks)**