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10EE54

Fifth Semester B.E. Degree Examination, Dec.2017/Jan.2018
DC Machines and Synchronous Machines

Time: 3 hrs. Max. Marks:100

Note: ***Answer any FIVE full questions, selecting atleast TWO questions from each part.***

PART – A

1 a. Derive the emf equation of DC generator. **(06 Marks)**

b. Define Commutations and explain in detail any one method of commutation. **(08 Marks)**

c. A 4 pole, dc shunt generator with a shunt field resistance of 100Ω and an armature resistance of 1Ω has 378 wane connected in its armature. The flux/pole is 0.02 web. If the load resistance of 10Ω is connected across the armature terminals and generator is driven at 1000 rpm. Calculate the power absorbed by load. **(06 Marks)**

2 a. Explain briefly the importance of Back - emf. **(04 Marks)**

b. Discuss in detail speed control of i) DC series ii) DC compound motors. **(08 Marks)**

c. A 460V, series motor runs at 500 rpm taking a current of 40A. Calculate the speed and percentage change in torque, if the load is reduced so that motor is taking 30A. Total resistance of the armature and field circuit is 0.8Ω. Assume the flux is proportional to the field current. **(08 Marks)**

3 a. Describe the various losses occur in DC machine. **(06 Marks)**

b. Derive the conditions for max efficiency in DC machines. **(08 Marks)**

c. A, 500V shunt generator has a full load current of 200A, Its armature resistance is 0.1Ω and field resistance 100Ω and constant losses including stray – load losses and field copper loss are 4000W. Calculate its efficiency at half – full load. **(06 Marks)**

4 a. Explain with a neat sketch Regeneration method of testing in case of DC machines. **(10 Marks)**

b. A 500V, DC shunt motor takes 4A on no load. The armature resistance including that of brushes is 0.2Ω and field current is 1.0A. Estimate the output and efficiency when the input current is 100A. **(10 Marks)**

PART – B

5 a. List out the differences between salient pole and non salient pole alternators. **(06 Marks)**

b. Derive the e.m.f equations of Alternator considering the winding factors. **(06 Marks)**

c. A 3 phase, 8 pole 50Hz star connected alternator has 4 slot/pole on it stator with 10 conductor/slot. The air gap flux is distributed sinusoidaly and equal to 0.04 web. The stator has a double layer windings with the full pitch coil. Calculate
i) Pitch factor ii) Distributer factor iii) emf genetared/phase iv) the line voltage at no load. **(08 Marks)**

6 a. Define the voltage regulation of Alternator and explain briefly A.S.A method of finding Regulation in Alternator. **(10 Marks)**

b. Define Short Circuit Ratio (S.C.R) and its importance in Alternators. **(04 Marks)**

c. A 3 phase alternator has a direct axis synchronous reactance of 0.7 PU and quadrature axis synchronous reactance of 0.4 PU. Calculate i) Load angle ii) No load per unit voltage, at full load at 0.8 p.f lag. **(06 Marks)**

7 a. Explain briefly i) Synchronizing current ii) Synchronizing power iii) Synchronizing torque. **(06 Marks)**

b. Derive the equation for power output / phase for a salient pole alternator. **(08 Marks)**

c. A 750 KVA, 11KV , 4 pole 3 phase star connected has a % resistance and % reactance of 1 and 15 ohms respectively. Calculate the synchronizing power per mechanical degree of displacement at i) No load ii) at full load of 0.8 p.f lag. The terminal voltage in each case is 11KV. **(06 Marks)**

8 a. Explain briefly the basic principle of operation of synchronous motor. **(06 Marks)**

b. A 3 phase, 400V 50Hz star connected synchronous motor has per phase synchronous impedance of $(0.5 + j4.0)\ \Omega$. It takes a current of 15A at unity power factor for a certain field current. Calculate the excitation voltage and power angle. **(06 Marks)**

c. Write short notes on any two :
i) V and A curves ii) Synchronous condenser iii) Damping. **(08 Marks)**

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