USN

10EE54

Fifth Semester B.E. Degree Examination, Dec.2018/Jan.2019

D.C Machines and Synchronous Machines

Time: 3 hrs. Max. Marks:100

Note: 1. ***Answer any FIVE full questions, selecting at least TWO questions from each part.***
2. ***Assumed missing data if any***

PART – A

1 a. Explain the various causes for the failure of D.C shunt generator to build up voltage. **(04 Marks)**

b. Derive the expression for demagnetizing Amps turns per pole and cross magnetizing Amp turns per pole. **(08 Marks)**

c. A 4 pole wave connected DC shunt generator runs at 1000 rpm when supplying 330 lamps each rated at 60W, 110V. If has a shunt field current of 2A. There are 90 commutator segments and brush width is equal to 1.1 commutator segments. The self inductance of each coil is 0.025mH. Determine the reactance voltage for a linear commutation. **(08 Marks)**

2 a. Explain the characteristics of D.C shunt and D.C series motor give two applications of each motor. **(06 Marks)**

b. Which are the types of speed control? Explain the speed control of D.C shunt motor. **(06 Marks)**

c. A six six, pole lap wound 400V series motor has the following data :

Number of armature conductors = 920
Flux/pole = 0.045wb
Total motor resistance = 0.6 ohm
Iron and friction losses = 2kW

If the current taken by the motor is 90A. Find

(i) Total torque
(ii) Use full torque at the shaft
(iii) Power output. **(08 Marks)**

3 a. List the various types of losses in a D.C machine. **(04 Marks)**

b. Explain the necessity of a starter in a D.C motor with neat diagram, explain the three point starter. **(08 Marks)**

c. A 250V shunt motor has an armature current of 20A when running at 1000rpm against full load torque. The armature resistance is 0.5Ω. What resistance must be inserted in series with the armature to reduce the speed to 500rpm at the same torque? What will be the speed if the load torque is halved with this resistance? **(08 Marks)**

4 a. With neat circuit diagram, explain the method of testing a DC motor by retardation.test. **(10 Marks)**

b. A 440V DC shunt motor takes 4A at no load. Its armature and field resistances are 0.4ohm and 220ohm respectively. Estimate the kW output and efficiency when the motor takes 60A on full load. Find also the percentage change in speed from no load to full load. **(10 Marks)**

PART – B

5 a. Mention the advantages of rotating field and stationary armature, in a three phase alternator. **(06 Marks)**

b. What are Harmonics? How are they minimized in three phase alternator? **(04 Marks)**

c. A 3 phase, 16 pole alternator has the following data :
Number of slots = 192, Conductor/slot = 8, Coil span = 160 electrical degree, speed of the alternator 375rpm, flux/pole = 55mWb. Calculate the phase and line voltages. **(10 Marks)**

6 a. Explain voltage regulation in a 3 phase Alternator with neat circuit diagram; explain how voltage regulation can be calculated by EMF method. **(10 Marks)**

b. A 3300V, 3 phase star connected alternator has a full load current of 100A. On short circuit a field current of 5Amp was necessary to produce full load current. The e.m.f on open circuit for the same excitation was 900 volts. The armature resistance was 0.8Ω/phase. Determine the full load voltage regulation for (i) 0.8p.f lagging (ii) 0.8p.f leading. **(10 Marks)**

7 a. List the conditions to be fulfilled to connect two alternators in parallel. **(02 Marks)**

b. Define X_d and X_q. Describe how slip test can be conducted in the laboratory, for measuring X_d and X_q. **(08 Marks)**

c. Two 1 phase alternator operate in parallel and supply a load impedance of (3 + j4) Ω. If the impedance of each machine is (0.2 + j2) and emf's are (200 +j0) and (220 + j0) volts respectively. Determine for each machine

(i) Terminal voltage
(ii) Power factor
(iii) Output. **(10 Marks)**

8 a. Write short notes on :

i) Starting of synchronous motors
ii) Synchronous motor as synchronous condenser **(10 Marks)**

b. A 6600V, 3 phase star connected synchronous motor draws a full loads current of 80A at 0.8pf leading. The armature resistance is 2.2Ω and reactance 22Ω per phase. If the stray losses of the machine are 3200W. Find

i) E.M.F induced
ii) Output power
iii) Efficiency of the machine. **(10 Marks)**

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