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NEW SCHEME

Fifth Semester B.E. Degree Examination, Dec.06/Jan. 07
Electrical & Electronics Engineering
D.C. Machines and Synchronous Machines

Time: 3 hrs.]   [Max. Marks:100

Note: *Answer any FIVE questions.*

1 a. Explain what is meant by critical field resistance in a d.c. shunt generator? **(05 Marks)**
   b. Explain the process of commutation and explain any one of the methods for improving the commutation.   **(10 Marks)**
   c. An 8 pole wave wound d.c. generator has 480 armature conductors. The armature current is 200A. Find the armature reaction demagnetizing and cross magnetizing ampere turns per pole if i) brushes are on G.N.A and ii) brushes are shifted 6^0 electrical from G.N.A.   **(05 Marks)**

2 a. Sketch and explain the speed current, speed torque and torque – current characteristics of a d.c. shunt motor, d.c. series motor and d.c. compound motor. **(10 Marks)**
   b. What is back e.m.f? Explain the significance of back e.m.f.   **(05 Marks)**
   c. A separately excited generator when running at 1200 rpm supplies 200A at 125v to a circuit of constant resistance. What will be the current when the speed is dropped to 1000 rpm if the field current is unaltered : $Ra = 0.04 \, \Omega$. Total drop at brushes is 2V, ignore changes in armature reaction.   **(05 Marks)**

3 a. Explain the working and performance, characteristics, advantages, disadvantages and applications of permanent magnet d.c. motors.   **(10 Marks)**
   b. Derive the torque equation of a d.c. motor.   **(05 Marks)**
   c. A 220V shunt motor with an armature resistance of $0.5 \, \Omega$ is excited to give constant main field. At full load the motor runs at 500 rpm and takes an armature current of 30A. If a resistance of $1 \, \Omega$ is placed in the armature circuit, find the speed at :
   i) Full load torque   ii) double full load torque   iii) Find also the stalling torque.
                                                                           (05 Marks)

4 a. Briefly describe the field test applied to two similar d.c. series motors. **(10 Marks)**
   b. Discuss the advantages and disadvantages of Swinburne's test.   **(05 Marks)**
   c. In a differential test of two series motors, the readings were :
   motor supply voltage   = 500V, generator e.m.f = 427V; circulating current = 75A; make up current = 9A. Find the friction and coreloss per machine, also the motor efficiency. Its resistance to be given as $0.975 \, \Omega$.   **(05 Marks)**

5 a. Explain the advantages of distributing and chording of armature coils in synchronous generator. Derive an expression for distribution factor.   **(10 Marks)**
   b. Write a brief note on the advantages of stationary armature over rotating armature .
                                                                           (05 Marks)
   c. A 3 phase, 16 pole alternator has a star connected winding with 144 slots and 10 conductors per slot. The flux per pole is 0.03 Wb; sine distributed, and the speed is 375 r.p.m. Find the frequency and phase and line e.m.fs.?   **(05 Marks)**

6 a. Describe synchronous impedance method to determine regulation of an alternator for lagging and leading p.f.s. **(10 Marks)**

b. Why is alternator terminal voltage, when loading is not equal to the no load voltage? **(05 Marks)**

c. A 3300 V, 200 KVA, 3 phase star connected alternator has an armature resistance of 0.6 Ω/ph and synchronous reactance of 6 Ω /ph. Calculate the percentage regulation when the rated output at 0.8 lagging p.f. switched off. **(05 Marks)**

7 a. Derive an expression for the mechanical power developed by a salient pole synchronous motor. Hence explain what is meant by reluctance torque. **(10 Marks)**

b. Explain how two or more alternators are made to share the load in propagation to their ratings. **(05 Marks)**

c. Two single phase alternators operating in parallel have induced e.m.fs on open circuit of 230 $\angle 0^0$ and 230 $\angle 10^0$ V and re spectrum respective of j2 Ω and j3Ωs. Calculate i) terminal voltage ii) current iii) power delivered by each of the alternators to a bad impedance of 6 Ω resistive. **(05 Marks)**

8 a. Explain the phenomenon of hunting in synchronous machine and the method of reducing the same.

b. Write a note on V and inverted V curves of synchronous motor.

c. A 6.6 K. V 3 phase star connected synchronous motor takes a line current of 50A. The effective resistance and synchronous reactance perphase are 1.5 Ω. and 8 Ω respectively. Find
i) the power supplied to the motor and
ii) the induced e.m.f. for a p.f. of 0.8 lag and lead.

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