

B.Tech Degree IV Semester Examination April 2011

EE 403 ELECTRICAL MACHINES I (2006 Scheme)

Time : 3 Hours

Maximum Marks : 100

PART - A

(Answer ALL questions)

(8 x 5 = 40)

- I.
- (a) What is Reactance voltage? How does it affect commutation in D.C machines?
 - (b) What are interpoles? How is it connected in D.C machines?
 - (c) What are Equalizer rings? Where is it used?
 - (d) What are compensating windings? How is it connected in D.C machines?
 - (e) Why series motor is never started on no load? Explain with necessary equations.
 - (f) Derive the condition for maximum efficiency in a D.C machine.
 - (g) What is meant by voltage regulation of a transformer? Derive the condition for zero regulation and maximum regulation.
 - (h) What are the conditions for satisfactory parallel operation of two transformers?

PART - B

(4 x 15 = 60)

- II.
- (a) Explain the main parts in a D.C machine.
 - (b) A 6 pole machine has an armature with 90 slots and 8 conductors per slot and runs at 1000 rpm and the flux per pole is 0.05 wb. Determine the induced emf if winding is (i) lap connected (ii) wave connected.

OR

- III.
- (a) What is armature reaction in D.C machines? What are the effects of armature reaction?
 - (b) A 250 V, 14.9 KW, 8 pole D.C motor has single turn coils. The armature is wave wound with 94 commutator segments. If the brushes are shifted by 2 commutator segments at full load, calculate (i) total armature reaction ampere turns (ii) demagnetizing ampere turns (iii) cross magnetizing ampere turns. Assume motor efficiency to be 80% and motor input current is equal to armature current.

- IV.
- (a) What are the conditions for voltage build up in D.C generators?
 - (b) A 4 pole long shunt lap wound generator supplies 25 KW at a terminal voltage of 500 V. The armature resistance is 0.03Ω , series field resistance is 0.04Ω and shunt field resistance is 200Ω . The brush drop may be taken as 1 V. Determine the emf generated.

OR

(P.T.O.)

- V. (a) What is critical resistance and critical speed for a D.C generator? How are they determined from open circuit characteristics?
- (b) Two shunt wound generators running in parallel have each an armature resistance of 0.02Ω and a field resistance of 50Ω . The combined external load current is 5000 A. The fields are excited so that the emf induced in one machine is 600 V and in the second machine is 610 V. Calculate the bus bar voltage and the output of each machine.
- VI. (a) Draw and explain the following characteristics for D.C series motor.
(i) Speed – Current (ii) Torque – Current (iii) Speed – Torque.
- (b) A 250 V d.c shunt motor having an armature resistance of 0.25Ω carries an armature current of 50 A and runs at 750 rpm. If the flux is reduced by 10%, find the speed. Assume that torque remains the same.
- OR**
- VII. (a) Why Hopkinson's test is known as Regenerative test? Explain how efficiency of the d.c machine is determined using this test.
- (b) A shunt generator has a full load current of 195 A at 250 V. The stray losses are 720 W and the shunt field resistance is 50Ω . It has a full load efficiency of 90%. Find the armature resistance. Also find the current corresponding to maximum efficiency.
- OR**
- VIII. (a) Draw the Approximate Equivalent circuit of a transformer. Explain how equivalent circuit parameters are determined from O.C and S.C tests.
- (b) The primary and secondary windings of a 40 KVA, 6600/250 V single phase transformer have resistances of 10Ω and 0.02Ω respectively. The total leakage reactance is 35Ω as referred to the primary winding. Find the full load regulation at a pf of 0.8 lagging.
- OR**
- IX. (a) Explain any one method for the transformation of 3 phase power using two single phase transformers.
- (b) Two single phase transformers with equal turns have impedances of $(0.5 + j3) \Omega$ and $(0.6 + j10) \Omega$ with respect to the secondary. If they operate in parallel, determine how they will share a load of 100 KW at pf 0.8 lagging?