A

B.Tech. Degree IV Semester Examination April 2014

EE 1403 ELECTRICAL MACHINES I
(2012 Scheme)

Time : 3 Hours

Maximum Marks : 100

PART A
(Answer *ALL* questions)

(8 × 5 = 40)

I. (a) Explain the function of equalizer ring connections in lap windings.

(b) Explain in brief the constructional details of a DC machine.

(c) Explain the process of paralleling two DC shunt generators.

(d) Describe the open circuit characteristics of DC generators.

(e) How is back emf produced in a DC motor? Also derive and expression for it.

(f) Write short note on Hopkinsons test on DC machines.

(g) Derive the emf equation of a single phase transformer and explain voltage transformation ratio.

(h) Draw the phasor diagram of an ideal transformer for lagging pf load.

PART B

(4 × 15 = 60)

II. (a) What do you understand by armature reaction? Explain the concept of demagnetizing and cross magnetizing armature ampere turns and also explain how they are calculated. (10)

(b) An 8 pole DC shunt generator with 778 wave connected armature conductors and running at 500 rpm supplies a load of 12.5 ohm resistance at terminal voltage of 50V. The armature resistance is 0.24 ohm and the field resistance is 250 ohm. Find the armature current, induced emf and the flux/pole. (5)

OR

III. (a) Describe the main construction and working principle of a DC generator with the help of sketches. (7)

(b) Determine per pole the number (i) of cross magnetizing ampere turn (ii) of demagnetizing ampere turns and (iii) extra turns to balance the demagnetizing ampere turns in the case of a DC generator having the following data.
500 conductors, total current 200A, 6 poles, 2 circuit wave winding, angle of lead = 10 degrees and leakage coefficient = 1.3. (8)

(P.T.O.)
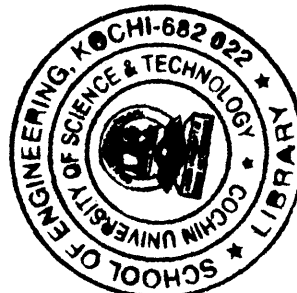
IV.	(a)	Define the terms critical speed and critical field resistance relating to DC shunt generator. Also explain the voltage build up process when the generator is driven at constant speed.	(8)
	(b)	Draw and explain the external and internal characteristics of shunt and series generators.	(7)

OR

V.	(a)	Explain the process of commutation in DC generators.	(7)
	(b)	Two shunt generators operating in parallel deliver a total current of 250A. One of the generators is rated 50KW and the other 100KW. The voltage rating of both machine is 500V and have regulations of 6 percent and 4 percent. Assuming linear characteristics determine (i) the current delivered by each machine (ii) terminal voltage.	(8)

VI.	(a)	Explain the working of a three point starter of a DC shunt motor.	(8)
	(b)	A 250 V dc shunt motor having an armature resistance of 0.25 ohm carries an armature current of 50A and runs at 750rpm. If the flux is reduced by 10%, find the speed. Assume that the torque remains the same.	(7)

OR

VII.	(a)	Explain the Swinburnes test to determine no load losses of a DC machine? What are the limitations of this test.	(7)
	(b)	What are the factors that affect the speed of a DC motor? Also explain how the speed can be controlled above and below the normal speed.	(8)

VIII.	(a)	Discuss the procedure for conducting OC and SC test on a single phase transformer. How can the parameters be found from these tests?	(9)
	(b)	A 200 KVA transformer has an efficiency of 98% at full load. If the maximum efficiency occurs at three quarters of full load, calculate the efficiency at half load. Assume negligible magnetizing current and pf of 0.8 at all loads.	(6)

OR

IX.	(a)	Write short note on (i) scott connection (ii) open delta connection (iii) parallel operation of transformers.	(9)
	(b)	Find all day efficiency of a transformer having maximum efficiency of 98% at 15 KVA at upf and loaded as follows: 12 hrs – 2KW at 0.5 pf lag 6 hrs – 12 KW at 0.8 pf lag 6 hrs - no load	(6)

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