BTS (C) – IV– 09 – 014 – S

B. Tech Degree IV Semester Examination, April 2009

EE 403 ELECTRICAL MACHINES I

(2006 Scheme)

Time : 3 Hours | Maximum Marks : 100

PART - A

(8 x 5 = 40)

I. (a) Explain the working principle and two essential parts of d.c. generator.
(b) Derive the e.m.f equation of d.c. generator.
(c) Explain Resistance Commutation method.
(d) What are the conditions to be satisfied for running two or more d.c. shunt generators in parallel?
(e) Derive the expression for torque produced in d.c. motor.
(f) Explain the advantage and disadvantage of Swinburne's test.
(g) 'Transformer is a constant flux device'. Explain.
(h) Write a note on scott connection and open delta connection.

PART – B

(4 x 15 = 60)

II. (a) Define the following terms :
(i) Pole pitch (ii) Coil span
(iii) Winding pitch (iv) Commutator pitch. (8)

(b) A 4 pole d.c. generator has 500 armature conductors and useful flex of 0.05 Wb/pole. What will be the e.m.f. generated if it is lap connected and runs at 1200 rpm ? What must be the speed at which it is to be driven to produce the same e.m.f., if it is wave wound? (7)

OR

III. (a) Explain the armature reaction of d.c. generator. Enumerate and explain the methods to overcome the adverse effects of armature reaction. (7)

(b) Determine per pole, the number (i) of Cross magnetizing ampere-turns (ii) of De magnetizing ampere turns and (iii) of series turns to balance the back ampere turns in case of a d.c. generator having the following data :
500 conductors, total current 200 A, 6 poles, 2 circuit wave winding, angle of lead = 10° (Mech), leakage coefficient = 1.3. (8)

IV. (a) Explain the external characteristics of d.c. shunt generator. (5)

(b) The open circuit characteristics of d.c. shunt generator is given below :

Emf (Volts)	: 22	44	66	84	99	111	120	125
Field current (A)	: 1.0	2.0	3.0	4.0	5.0	6.0	7.0	8.0

Determine the load current when the terminal potential difference is 120 V, the field resistance 15 Ω at a speed of 600 rpm. Armature resistance is 0.025 Ω (Use graph). (10)

OR

(Turn Over)

V. (a) Explain the advantages of parallel operation of two generators. With a neat circuit diagram, explain procedure for connecting two shunt generators in parallel. (8)

(b) Two shunt generators each with armature resistance of 0.02 Ω and field resistance of 25 Ω run parallel and supply a total load of 3900 A. The emfs are respectively 200V and 210 V. Calculate bus bar voltage and output of each machine. (7)

VI. (a) Draw the electrical and mechanical characteristics of d.c. series motor. (5)

(b) Explain the necessity of starters in d.c. motor and describe three point starter with neat sketch. (10)

OR

VII. (a) With a neat circuit explain the Hopkinson's test on two identical d.c. machines. What are the advantages of this test over other methods? (10)

(b) A 200 V d.c. series motor drawn full load current of 38 A at the rated speed of 600 rpm. The motor has armature resistance of 0.4 Ω and series field resistance is 0.2 Ω. The voltage drop irrespective of load is 3 V. Find the speed of motor when the load current drops to 19 A. (5)

VIII. (a) A single phase transformer has 1000 turns on the primary and 200 turns on the secondary. The no load current is 3 A at a p.f of 0.2 lag. Calculate the primary current and power factor when secondary current is 280 A at p.f. of 0.8 lag. (5)

(b) What are the losses in transformer? Derive the condition for maximum efficiency. (10)

OR

IX. (a) Consider a 4 KVA, 200/400 V single phase transformer supply full load current at 0.8 lagging power factor. The O and SC tests are as follows :

OS test : 200 V, 0.8 A, 70 W (on L.V side)

SC test : 20 V, 10 A, 60 W (on H.V side)

Calculate full load efficiency at unity p.f and draw the equivalent circuit referred to H.V side. (10)

(b) What are the conditions under which parallel operation of transformers is permissible? (5)

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