Code No: 113BZ

R13

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
B.Tech II Year I Semester Examinations, November - 2015
ELECTRICAL MACHINES-I
(Electrical and Electronics Engineering)

Time: 3 Hours Max. Marks: 75

Note: This question paper contains two parts A and B.
Part A is compulsory which carries 25 marks. Answer all questions in Part A.
Part B consists of 5 Units. Answer any one full question from each unit.
Each question carries 10 marks and may have a. b, c as sub questions.

PART- A

(25 Marks)

1.a) What is co-energy? Explain its co-energy concept. [2M]
b) What do you understand by energy balance? [3M]
c) What is GNA (Geometrically neutral axis)? [2M]
d) Differentiate lap and wave windings. [3M]
e) What is critical field resistance and critical speed of a d.c generator? [2M]
f) State the conditions required for parallel operation of D.C generators. [3M]
g) Explain the significance of back e.m.f in a d.c motor. [2M]
h) What are the functions of OLR and NVR in a 3-point starter? [3M]
i) Differentiate the indirect and direct loading tests to be conducted on d.c machine. [2M]
j) Derive an expression for condition of maximum efficiency of a d.c machine. [3M]

PART-B

(50 Marks)

2.a) Obtain an expression of torque produced by a multi excited system.
b) Why electrical energy conversion is required? [7+3]

OR

3.a) Obtain an expression of torque produced by a singly excited system.
b) Two magnetic surfaces separated by distance g have a flux density of 1.5 T in between them. This value is usually the saturation level for ferromagnetic materials. Find the force between these two surfaces for area A=4 m^2. [6+4]

4.a) Explain how the commutator keeps the armature mmf stationary in space along the interpolar axis, even though the armature rotates.
b) A 200 kW, 400 V, 6 pole d.c generator has 740 lap wound conductors. It is given a brush lead of 2.6 angular degrees (mech.) from the geometric neutral. Calculate the cross and demagnetizing turns per pole. Neglect the shunt field current. [5+5]

OR

5.a) What is armature reaction? What are the effects of armature reaction? How the armature reaction minimized?
b) Explain the principle of operation of D.C. Generator with a neat sketch. Also, specify its constructional details. [5+5]

6.a) What are the different types of D.C. Generators according to the ways in which fields are excited? Show the connection diagram of each type and obtain voltage and current relationship in each case.

b) The open circuit characteristics of a d.c shunt generator at 600 r.p.m are given by the following data:

I_f (A)	0	0.2	0.4	0.7	1.2	1.8	3.2	5.4
E_a (V)	12	45	85	125	165	210	250	270

Determine the critical field resistance at 600 r.p.m. [5+5]

OR

7.a) Explain the different characteristics of (i) D.C. series generator (both) (ii) d.c shunt generator.

b) Two d.c shunt generators are rated 250 kW and 200kW, 400 V. Their full load drops are 3% and 6% respectively. They are excited to no load voltages of 410 V and 420 V respectively. How will they share load of 800A and the corresponding bus voltage? [5+5]

8.a) Explain the working of a 4-point starter with a neat sketch.

b) A 4 pole D.C. Motor is connected to a 400V D.C. supply and takes an armature current of 80A. The resistance of the armature circuit is 0.2Ω. The armature is wave wound with 450 conductors and the useful flux per pole is 0.03Wb. Calculate (i) the back e.m.f of the motor (ii) the speed of the motor and (iii) the torque developed by the armature. [5+5]

OR

9.a) Explain Ward-Leonard of speed control method used in d.c motors.

b) A 220 D.C shunt motor has an armature resistance of 0.8 Ω and takes a current of 25 A on full load. By how much must the main flux be reduced to raise the speed by 30% if the developed torque is constant? [6+4]

10.a) Explain the procedure of conducting a Swinburne's test to be conducted on a d.c shunt machine.

b) A 480V, 20 kW d.c shunt motor took 2.5A, when running light. Taking the armature resistance to be 0.6Ω, field resistance to be 800Ω and brush drop 2 V, find the full load efficiency. [5+5]

OR

11.a) Two identical d.c machines when tested by Hopkinson's method gave the following test results: Field currents are 5A and 4.2A. Line voltage is 250V. Line current excluding both the field currents is 40A. Motor armature current is 350A.The armature resistance of each machine is 0.03Ω. Calculate the efficiency of both machines.

b) Explain the procedure of conducting a suitable test to separate stray losses in a d.c motor. [5+5]

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