Code No: 53012 **R09**

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
B.Tech II Year I Semester Examinations, May/June - 2019
ELECTRICAL MACHINES–I
(Electrical and Electronics Engineering)

Time: 3 hours **Max. Marks: 75**

Answer any five questions
All questions carry equal marks
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1.a) Derive the Force and Energy equations in a Single excited magnetic field system.
b) A 300 turns coil having an axial length of 8 cm and 2 cm radius is pivoted in a magnetic field of 1.1Wb/m^2 flux density. Find the Torque on the coil if I=2A. [7+8]

2.a) Derive the e.m.f. equation of a D.C. generator.
b) A D.C. shunt generator has an induced voltage on open circuit of 127 volts. When the machine is on load, the terminal voltage is 127 volts. Find the load current if the field circuit resistance is 15 ohms and the armature resistance is 0.02 ohms. Ignore armature reaction. [7+8]

3.a) Derive the expressions for demagnetizing and cross magnetizing AT/pole for a D.C. generator.
b) A 4-pole, 50 kW, 250 V wave wound generator has 400 armature conductors, brushes are given a lead of 4 commutator segments. Calculate the demagnetization and AT/pole if shunt field resistance is 50 ohm. Also calculate the extra shunt field turns/pole to neutralize demagnetization. [7+8]

4.a) Explain the OCC of a D.C. Shunt generator. Discuss about critical speed and critical field resistance.
b) The OCC of a D.C. shunt generator driven at rated speed is given as follows:

Field Amperes(A)	0.5	1.0	1.5	2.0	2.5	3.0	3.5
Induced voltage(V)	60	120	138	145	149	151	152

If the resistance of the critical field is adjusted to 53 ohm calculate the open circuit voltage and load current when the terminal voltage is 100 V. Neglect armature reaction and assume an armature resistance of 0.1 ohm. [7+8]

5.a) Explain the parallel operation of two D.C. series generators.
b) Two 220 V D.C. generators each having linear characteristics, operate in parallel. One machine has a terminal voltage of 270 V on no-load and 220 V at a load current of 35 A, while the other has a voltage of 280 V on no-load and 220 V at 50 A. Calculate the output current of each machine and the busbar voltage when the total load is 60 A . What is the kW output of each machine under this condition? [7+8]

6.a) Derive the condition for the maximum efficiency of a D.C. motor.
b) The input to 230 V D.C. shunt motor is 11 kW. Calculate the i) the torque developed ii) the efficiency iii) the speed at this load. No load current of the motor is 5 A and no load speed is 1150 r.p.m. [7+8]

7.a) Explain the speed control methods of a shunt motor.

b) A 230 V D.C. shunt motor runs at 800 r.p.m and takes armature current of 50 A. Find the resistance needed to be added to the field circuit to increases the speed up to 1000 r.p.m. at an armature current of 80A. Assume flux proportional to field current. Armature resistance is 0.15 ohm and field resistance is 250 ohm. [7+8]

8.a) Explain the retardation test conducted for D.C. shunt motors.

b) A retardation test is made on a separately exited D.C. machine as a motor. The induced voltage falls from 240 V to 225 V in 25 seconds on opening the armature circuit and 6 seconds on suddenly changing the armature connection from supply to a load resistance taking 10 A (average). Find the efficiency of the machines when running as a motor and taking a current of 25 A on a supply of 250 V. The resistance of its armature is 0.4 ohm and that of the field winding is 250 ohm. [7+8]

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