Code No: 53012 **R09**

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
B. Tech II Year I Semester Examinations, August/September - 2022
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 expression for the energy developed in a multy excited magnetic field system.
b) Explain in detail about the electromechanical energy conversion principle. [7+8]

2.a) Explain the action of commutator in detail.
b) An armature has 33 slots and 165 commutator segments. Develop the winding diagram by selecting suitable type of winding and number of poles. [7+8]

3.a) Derive the expression for the de-magnetizing AT/pole in a DC generator.
b) A 4-pole, 30-kW, 250 V wave wound shunt generator has 200 armature conductors. Brushes are given a lead of 4 commutator segments. Calculate the de-magnetisation ampere turns per pole if shunt field resistance is 25Ω. [7+8]

4.a) Explain in detail about the features of self-exited DC generators.
b) The OCC of a shunt generator when separately excited and running at 1200 rpm is given by:

OCC volt	65	121	160	200	216	230	240
Field amp	0.5	1.0	1.5	2.0	2.5	3.0	3.5

If the generator is shunt-connected and runs at 1300 rpm with a total field resistance of 90Ω, determine the terminal voltage of the generator when giving the maximum output current. Neglect the effect of armature reaction and of brush contact drop [7+8]

5.a) Draw the load characteristics of DC compound generator and explain.
b) Discuss in detail about the parallel connection of DC series generators. [7+8]

6.a) Explain the principle of operation of DC motor in detail.
b) A 260-V DC shunt motor has armature and field resistances of 0.4Ω and 210Ω respectively. When loaded and taking a total input of 12 kW, it runs at 200 rpm. Find the speed at which it must be driven as a shunt generator to supply a power output of 10 kW at a terminal voltage of 260 V. [7+8]

7.a) Explain the armature voltage control method of speed control of DC motors.

b) A 220 V, DC shunt motor with an armature resistance of 0.5 Ω and a shunt field resistance of 190 Ω drives a load the torque of which remains constant. The motor draws from the supply a line current of 12 A when the speed is 500 rpm. If the speed is to be raised to 700 rpm, what change must be affected in the shunt field resistance? Assume that the magnetization curve of the motor is a straight line. [7+8]

8.a) With neat sketch, explain about Hopkinson's test conducted on d.c machines.

b) Calculate the shaft power of a DC series motor having the following data; overall efficiency 81%, speed 520 rpm when taking 50A; motor resistance 0.3 Ω, flux per pole 20 m Wb, armature winding is lap connected with 1000 conductor. [7+8]

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