

Code No: 53012

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD**B.Tech II Year I Semester Examinations, March - 2021****ELECTRICAL MACHINES-I****(Electrical and Electronics Engineering)****Time: 3 hours****Max. Marks: 75**

Answer any five questions
All questions carry equal marks

- 1.a) Explain the electromechanical energy conversion principle in detail.
b) Explain the features of singly excited magnetic field systems. [7+8]
- 2.a) Write short notes lap, wave, simplex and multiplex windings.
b) An armature has 64 slots and 256 commutator segments. Develop the winding diagram by selecting suitable type of winding and number of poles. [7+8]
- 3.a) Define reactance voltage. Explain its significance in improving commutation process.
b) A 4-pole, wave wound generator has 320 armature conductors and carries an armature current of 300 A. If the pole arc/pole pitch ratio is 0.68, calculate the AT/pole for a compensating winding to give uniform flux density in the air gap. [7+8]
- 4.a) Define critical field resistance and critical speed. Explain their significance in detail.
b) Explain the build-up process of EMF in DC generators in detail. [7+8]
- 5.a) What is the purpose of load sharing? How load sharing is done in DC generators?
b) A 220-V compound generator is supplying a load of 80 A at 220 V. The resistance of its armature, shunt and series windings is 0.1Ω , 40Ω and 0.05Ω respectively. Find the induced EMF and the armature current when the machine is connected as long shunt. How will the series amp-turns be changed if a divertor of 0.14Ω is connected in parallel with the series winding? Neglect armature reaction and brush contact drop. [7+8]
- 6.a) Explain the principle of working of DC motors in detail.
b) A 500-V DC shunt motor has armature and field resistances of 0.6Ω and 250Ω respectively. When loaded and taking a total input of 20 kW, it runs at 400 rpm. Find the speed at which it must be driven as a shunt generator to supply a power output of 20 kW at a terminal voltage of 500 V. [7+8]
- 7.a) Discuss about various protective devices for DC motors in detail.
b) A 250 V DC shunt motor runs at 1000 rpm and takes an armature current of 20 A. Its armature resistance is 0.4Ω . Calculate the speed with increased load with the armature current of 40 A. Assume that the increased load results into flux-weakening by 4%, with respect to the flux in previous loading condition. [7+8]
- 8.a) What are the constant and variable losses in DC motors? Explain about them.
b) Calculate the shaft power of a series motor having the following data; overall efficiency 85%, speed 550 rpm when taking 60A; motor resistance 0.3Ω , flux per pole 25 m Wb, armature winding lap with 1200 conductor. [7+8]

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