

Code No: 153AQ

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) Explain the effect of armature reaction on the performance of DC generator.
b) A dc shunt generator has the following open circuit magnetization curve running at 800 rpm
- | | | | | | | | |
|--------------------|------|-----|-----|-----|-----|-----|-----|
| Field current (A): | 0 | 0.5 | 1.0 | 2.0 | 3.0 | 4.0 | 5.0 |
| EMF (V) | : 10 | 50 | 100 | 175 | 220 | 245 | 262 |
- Find graphically the critical resistance of shunt field circuit. If the field resistance is changed to 75 ohms, what will be the critical speed for the machine to build up? [7+8]
- 2.a) How demagnetizing and cross magnetizing ampere turns per pole are calculated in a DC machine?
b) A d.c. shunt generator is supplying load connected to a bus - bar voltage of 220 V. It has an armature resistance of 0.025 Ω and field resistance of 110 Ω . Calculate the value of load current and load power when it generates an emf of 230 V. Neglect the effect of armature reaction. Draw circuit diagram. [8+7]
- 3.a) Derive the torque equation of DC Motor.
b) A 6-pole DC motor has a wave connected armature with 87 slots, each slot containing 6 conductors. The flux per pole is 20 mwb and the armature has a resistance of 0.13 ohm when the motor is connected to 240V supply and the armature draws a current of 80A driving a load of 15KW. Calculate i) Speed ii) Armature Torque and iii) Shaft Torque. [8+7]
- 4.a) With the help of a neat sketch, explain the construction and working of 3-point starter?
b) A 250V dc series motor has armature and series field resistance of 0.25 and 0.15 ohms respectively. (i) Calculate the current for developing a torque of 80 Nm at 1200 rpm. (ii) Calculate the percentage reduction in flux when the motor runs at 1800 rpm at half the current obtained in part (i). [8+7]
- 5.a) Briefly explain the procedure to conduct Swinburne's test on DC machine and explain its significance?
b) In a brake test on a DC shunt motor, the load on one side of the brake band was 35 kg and the other side 5kg. The motor was running at 1300 rpm; its input being 70 A at 420 V DC. The pulley diameter is 1 m. Determine the torque, output of the motor and the efficiency of the motor. [8+7]

- 6.a) Explain the Direct method of testing a dc machine.
- b) Hopkinson's test on two similar DC shunt machines gave the following data: Line voltage 230 V, line current excluding both the field currents is 40 A, motor armature current 350 A, field currents 5 A and 4.2 A. Calculate the efficiency of each machine. Armature resistance of each machine is 0.02Ω . [8+7]
- 7.a) Draw and explain the phasor diagram of a single-phase transformer with lagging p.f. load and leading p.f. load.
- b) A single-phase transformer is rated at 120 kVA, 5000/250V. The full – load copper losses are 2200W and iron losses are 1400 W. Find efficiency at i) full load 0.8 power factor leading ii) full – load 0.6 power factor lagging. [8+7]
- 8.a) With neat diagram, explain the various tests conducted on transformer to predetermine the efficiency of the transformer without directly loading the transformer?
- b) In a Sumpner's test on two identical single-phase transformers rated 750 kVA, 11/0.5 kV, 50 Hz the wattmeter reading on h.v side is 8000 W and on the l.v side is 16000W. Find the efficiency of each transformer on half full load and 0.78 power factor. What will be its maximum efficiency? [8+7]

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