

Code No: 133AM

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) Discuss the process of self-excitation in a DC machine. What conditions must be satisfied for self-excitation?
b) Explain the process of buildup of EMF in a DC generator. [7+8]
- 2.a) A 4-pole wave-wound motor armature has 880 conductors and delivers 120A. The brushes have been displaced through 3 angular degrees from the geometrical axis. Calculate:
i) Demagnetising amp-turns/pole.
ii) Cross-magnetising amp-turns/pole.
iii) The additional field current for neutralizing the demagnetisation of the field winding has 1100 turns/pole.
b) Explain the methods of improving commutation in dc machine. [7+8]
- 3.a) Explain the basic principle of operation of dc motor and derive an expression for torque of a dc-motor.
b) A 500 V, 37.3 kW, 1000 r.p.m. dc. Shunt motor has on full-load an efficiency of 90%. The armature circuit resistance is 0.24 Ohm and there is total voltage drop of 2 V at the brushes. The field current is 1.8 A. Determine
i) Full-load line current
ii) Full-load shaft torque in N-m and
iii) Total resistance in motor starter to limit the starting current to 1.5 times the full-load current. [8+7]
- 4.a) How can you control the speed of a dc-motor using different field control methods?
b) Draw and explain the working principle of four-point starter and give a difference to 3-point starter. [8+7]
5. Explain the procedure of conducting Hopkinson's Test in a D.C. machines. [15]
6. With the help of a circuit diagram explain the conduction of Field's test on DC Machine. List out its merits and demerits. [15]
- 7.a) Derive the condition for zero regulation in 1- ϕ Transformer.
b) The efficiency of a 20 kVA, 2500/250 V 1- ϕ transformer at unity power factor is 96% at rated load and also at half load. Determine (i) the transformer core loss (ii) full load copper loss (iii) per unit value of equivalent resistance of the transformer. [6+9]
- 8.a) Compare auto transformer with two winding transformer. Deduce the relation for saving of copper using auto transformer.
b) In a transformer, the core loss is 90 W at 40 Hz and 65 W at 30 Hz. Find the hysteresis and eddy current losses at 50 Hz. [8+7]

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