

Code No: 154AU

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JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

B. Tech II Year II Semester Examinations, March - 2022

ELECTRICAL MACHINES – II
(Electrical and Electronics Engineering)

Time: 3 Hours

Max. Marks: 75

Answer any five questions
All questions carry equal marks

1. a) Derive and explain rotating field in a 3-phase induction motor.
b) A 4 pole, 3- ϕ induction motor is supplied from 3-phase, 50-Hz supply. Calculate:
i) Speed at which the magnetic field of the stator is rotating
ii) Speed of the rotor when the slip is 0.04
iii) Frequency of the rotor currents when slip is 0.03
iv) Frequency of rotor currents at stand still. [7+8]

2. a) Explain the working of 3-phase induction motor.
b) The star connected rotor of an induction motor has a standstill impedance of $(0.4+j4)\Omega$ per phase. The motor has an induced voltage of 80V between sliprings at standstill when connected to its normal supply voltage. Find rotor current and power factor at standstill when external impedance of $(6+j2)\Omega$ per phase is connected in the rotor circuit. [8+7]

3. A three phase 15kW, 400V, 50Hz, 4 pole delta connected squirrel cage induction motor has the following data:
No Load: 400V, 5A and power factor of 0.2
Blocked rotor: 120V, 20A and power factor of 0.6
The ratio of stator to rotor copper loss on short circuit is assumed to be unity. Draw the circle diagram and determine (a) the full load current and power factor (b) the maximum power developed and (c) starting torque. [15]

4. a) Derive an expression for torque developed by an induction motor under running conditions.
b) The power supplied to a 3 phase induction motor is 40-KW, and the corresponding stator copper losses are 1.5 KW. Calculate the total mechanical power developed and the rotor copper loss when the slip is 0.04. [8+7]

5. a) Explain clearly the ZPF method of determining the regulation of the alternator.
b) The stator of a 3-phase, 8-pole, 750 r.p.m. alternator has 72 slots, each of which contains 10 conductors. Calculate the r.m.s. value of the e.m.f. per phase if the flux per pole is 0.1 Wb sinusoidally distributed. Assume full-pitch coils and a winding distribution factor of 0.96. [8+7]

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6.a) What are the applications of synchronous generators. Brief the constructional details of salient pole synchronous generator.

b) A 60 KVA, 220V, 50 Hz, single-phase alternator, the effective armature resistance and leakage reactance are 0.016Ω and 0.07Ω respectively. Calculate the voltage induced in the armature when the alternator is delivering rated current at a load power factor of i) 0.7 lagging and ii) 0.7 leading. [7+8]

7.a) Discuss the need and conditions of parallel operation of alternators.

b) Discuss any two methods of starting of synchronous motors. [7+8]

8. With neat sketches, explain the construction and working of single phase induction motor. [15]

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