

Code: 9A02505

R9

B.Tech III Year I Semester (R09) Supplementary Examinations, May 2013

ELECTRICAL MACHINES - III
(Electrical and Electronics Engineering)

Time: 3 hours

Max Marks: 70

Answer any FIVE questions
All questions carry equal marks

- 1 (a) Obtain the expression for the RMS value of EMF induced in an alternator.
(b) An alternator is operating at no load has an induced EMF of 346.4 V/ph and a frequency of 60 Hz. If the pole flux is decreased by 15% and the speed is increased by 6.8%.
Determine: (i) The induced EMF. (ii) Frequency.
- 2 (a) Explain the effect of armature reaction in the induced voltage when the power factor is zero lagging and zero leading.
(b) Calculate the RMS value of EMF induced per phase of an 8-pole, 3-phase, 50 Hz, alternator has 120 slots and each slot has 10 conductors. The coil span is 12 slots. The flux per pole has a fundamental component of 0.12 Wb and a 20% of third harmonic component.
- 3 Sketch and explain the open circuit and short circuit characteristics of synchronous machine. How voltage regulation can be calculated by the use of their results?
- 4 (a) A 3-phase, 11 KV, 10 MW, 50 Hz star connected alternator has synchronous impedance of $(0.8 + j8)$ ohms /ph. If the excitation is such that OC voltage is 14 KV, determine:
(i) The maximum output of generator. (ii) The current and power factor at this output
(b) Explain the terms synchronizing power & synchronizing torque.
- 5 A 20-pole, 30 KW, 660 V, 50 Hz, star connected synchronous motor is operating with it's per phase generated voltage exactly equal to the phase voltage applied to armature. At loaded condition the motor is retarded by 5° mechanical from its synchronous position. Per phase synchronous reactance and the effective armature resistance are 10Ω and 1Ω respectively. Calculate:
(a) Armature current.
(b) The total power drawn by the motor from bus.
(c) The developed power.
- 6 (a) Explain the construction of 'excitation circle' for a synchronous motor.
(b) With neat diagram and explanation, show how damper winding prevents oscillations.
- 7 A 230 V, 50 Hz, 4-pole single phase Induction motor has following parameters:
Stator resistance = 2.51Ω , Rotor resistance referred to stator = 7.81Ω ,
Magnetizing reactance = 150.88Ω ; Stator reactance = 4.62Ω ,
Rotor reactance referred to stator = 4.62Ω . Determine the main winding current and power factor when the motor is running at a slip of 5%.
- 8 (a) Explain the construction of permanent magnet stepper motor.
(b) With neat diagram explain the vector diagram of AC series motor.
