

Code: 9A02505

**R09**

B.Tech III Year I Semester (R09) Supplementary Examinations June 2016

**ELECTRICAL MACHINES – III**

(Electrical and Electronics Engineering)

Time: 3 hours

Max Marks: 70

Answer any FIVE questions  
All questions carry equal marks

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- 1 (a) Explain the construction and working principle of alternators with a neat diagram.  
(b) A 4 pole, 3-phase, 50 Hz, star connected alternator has 60 slots with 4 conductors per slot. Coils are short pitched by 3 slots. If the phase spread is  $60^\circ$ , find the line voltage induced for a flux per pole of 0.0943 Wb, distributed sinusoidally in space. All the turns in phase are in series.
- 2 (a) Explain the sources of harmonics. What are the various effects of harmonics on generated emf in an alternator?  
(b) Determine the breadth and pitch factors for a 3-phase winding with 2 slots per pole per phase. The coil span is 5 slot-pitches. If the flux density wave of the fundamental and a 24% third harmonic, calculate the percentage increase in the phase voltage due to the harmonic.
- 3 (a) Explain the AT method of finding voltage regulation.  
(b) A 70 MVA, 13.8 kV, 3-phase star connected salient pole alternator having  $X_d = 1.83$  ohm and  $X_q = 1.2$  ohm delivers at 0.8 p.f lagging. Neglecting the armature resistance, calculate: (i) The excitation voltage. (ii) The voltage regulation.
- 4 (a) Explain all the necessary conditions for successful parallel operation of alternators.  
(b) A 22 MVA, 3-phase, star connected, 4-pole, 750 r.p.m alternator is operating on 6000 V bus bars,  $X_s$  is 6  $\Omega$ /ph. Find synchronizing power torque for full load 0.8 power factor lagging.
- 5 (a) Explain the construction and working principle of synchronous motor.  
(b) A 400 V, 3-phase synchronous motor takes 52.5 A at a power factor 0.8 leading. Calculate the power supplied and induced e.m.f. The impedance per phase is  $(0.25 + j3.2)$  ohm.
- 6 (a) Explain the construction of damper winding. Clearly show the location of damper winding.  
(b) With neat diagram & explanation, show how damper winding prevents oscillations.
- 7 Explain the various types of single-phase induction motor.
- 8 (a) Explain why single phase induction motors are not self starting motors.  
(b) With suitable diagrams, explain the construction and working principle of AC series motor.

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