12 NOV 2025 TE SEM-V C SCHEME ELECTRICAL EAM-II QP CODE: 10095787

(3 Hours) **[Total Marks: 80]**

N.B. 1) Question No. 1 is compulsory
2) Attempt any three of the remaining Questions No. 2 to No. 6.
3) Illustrate answers with diagrams wherever necessary.
4) Assumptions made should be clearly stated.

Q 1. **Solve any four**

a) Explain the constructional features of a synchronous generator. **05**

b) Draw and explain the phasor diagram of an alternator at lagging and leading power factor. **05**

c) Explain the method of synchronization of the alternator with the infinite bus. **05**

d) Write a note on Steady-state analysis of synchronous machines. **05**

e) Explain the hunting phenomenon in synchronous motor and its prevention. **05**

Q 2. a) Derive the EMF equation of an alternator. **10**

b) A 3-phase, 10 KVA, 400 V, 50 Hz star-connected alternator supplies the rated load at 0.8 power factor lagging. If the armature resistance is 0.5 ohms and the synchronous reactance is 10 ohms, find the torque angle and voltage regulation. **10**

Q 3. a) State the applications of synchronous motors. Draw and explain the phasor diagram of a synchronous motor at different leading and lagging power factors. **10**

b) Two station generators A and B operate in parallel. Station capacity of A is 40 MW, and that of B is 80 MW. The full-load speed regulation of stations A and B is 5%. Calculate the load shared by each generator if the total load is 90 MW. The no-load frequency is 50 Hz. **10**

Q 4. a) Explain the effect of varying excitation on armature current and power factor in a synchronous motor. Draw V-curves and state their significance. **10**

b) Describe the slip test method for the measurement of Xd and Xq of a synchronous machine. **10**

Q 5. a) Explain Blondel's two-reaction theory of salient-pole synchronous machines. **10**

b) Derive the expression for synchronizing power and synchronizing torque. **10**

Q 6. Solve **any two.** **20**

a) Explain the need and method of transforming synchronous machine equations into dq0 variables.

b) Explain the starting methods of a synchronous motor.

c) What is an infinite bus? State the characteristics of an infinite bus.

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