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Total number of pages: [2]

Total number of questions: 06

B.TECH. / EE/ 6th Sem

SYNCHRONOUS MACHINES

Subject Code: BTEE-601A

(RG)

Paper ID: M/18
(2015 batch)

Time allowed: 3 Hrs

Max Marks: 60

Important Instructions:

- All questions are compulsory.
- Assume any missing data.

PART A (2×10)

Q.1. Short-Answer Questions:

All COs

- What is an exciter?
- Draw the phasor diagram of a cylindrical rotor alternator on lagging p.f. load.
- Why fractional pitch winding is preferred over full pitch winding?
- Explain the concept of transient stability in alternators.
- Derive the condition for maximum power flow in cylindrical rotor synchronous machines. Express P_{max} .
- Enumerate the sufficient conditions for parallel operation of alternators.
- Describe 'torque angle'.
- Compute synchronous speed of 6 pole alternator having frequency of 25 Hz.
- Distinguish between transient and sub transient reactance.
- State two applications of synchronous motors.

PART B (8×5)

Q.2.

Explain how the transient reactance and time constants can be calculated from the equivalent circuit in synchronous machines during fault conditions.

CO4

OR

Describe the experimental methods of determining V-curves and Inverted V-curves for synchronous machines.

Q. 3. Explain the excitation systems for a synchronous machine with neat diagrams. **CO3**

OR

What is voltage regulation? Mention the methods to calculate the voltage regulation. Explain any two methods in details with neat diagrams.

Q. 4. The following table gives the open ckt and full load zero p. f. saturation characteristics data for 40 KVA, 400 V, 3-phase, 50 Hz, star connected alternator:

Exciting Current (amp)	6	8	12	18	24	28
Open ckt line voltage(volts)	282	-	400	435	459	474
Zero p. f. line voltage (volts)	-	0	-	-	-	400

Find the values of armature reaction (in equivalent field current) and armature leakage reactance. Also determine the voltage regulation at 0.8 p f lagging. Neglect armature resistance.

CO2

OR

A 3-phase star connected 400 V synchronous motor takes a power input of 5472 watt at rated voltage. Its synchronous reactance is 10Ω per phase and resistance is negligible. If its excitation voltage is adjusted equal to the rated voltage of 400 V, compute the load angle, power factor and the armature current.

Q. 5. What is synchronizing? What conditions must be fulfilled before an alternator can be connected to infinite bus? **CO3**

OR

A 400V, 10 h.p., 3-phase synchronous motor has negligible armature resistance and synchronous reactance of 10 ohms per phase. Determine the minimum current and the corresponding induced e.m.f. for full load conditions. Assume an efficiency of 85%.

Q. 6. Write short notes on the following: **CO1**

- (a) Starting methods for synchronous motors.
- (b) Two reaction theory of salient pole machines.

OR

- (a) Hunting phenomena in synchronous machines & its remedies.
- (b) Reluctance motor and Hysteresis motor.