BIRLA INSTITUTE OF TECHNOLOGY, MESRA, RANCHI
(END SEMESTER EXAMINATION)

CLASS: BTECH **SEMESTER : V/ADD**
BRANCH: EEE **SESSION : MO/2025**

SUBJECT: EE301 AC ROTATING MACHINES

TIME: 3 Hours **FULL MARKS: 50**

INSTRUCTIONS:
1. The question paper contains 5 questions each of 10 marks and total 50 marks.
2. Attempt all questions.
3. The missing data, if any, may be assumed suitably.
***4*. Before attempting the question paper, be sure that you have got the correct question paper.**
5. Tables/Data hand book/Graph paper etc. to be supplied to the candidates in the examination hall.

			CO	BL
Q.1(a)	Explain why a rotating magnetic field system is used in preference to a stationary field in alternators or any AC rotating machines? Also, state the important points which are required for any machine to rotate.	[5]	1	2
Q.1(b)	Explain armature reaction in a synchronous generator and draw phasor diagrams for: • (a) Unity power factor • (b) Lagging power factor • (c) Leading power factor and also explain how does the armature reaction affect the terminal voltage?	[5]	1	2 & 3
Q.2(a)	How is load sharing achieved between alternators running in parallel? Explain the concepts of active and reactive power sharing.	[5]	2	2
Q.2(b)	For a salient pole synchronous machine, determine the load angle in electrical degrees, at which the developed reluctance torque attains the maximum value and also state the reason, why the salient pole machine provides more power than the round rotor machine in the stable operating region.	[5]	2	5
Q.3(a)	Discuss the effect on load angle, power factor, reactive power and stator current with change in MW under constant excitation condition for a synchronous motor connected to an infinite bus-bar with the help of proper phasor diagram.	[5]	3	3
Q.3(b)	A star-connected 3-phase, 400 V, 50 kVA, 50 Hz synchronous motor has a synchronous reactance of 1 ohm per phase with negligible armature resistance. The shaft load on the motor is 10 kW while the power factor is 0.8 leading. The loss in the motor is 2 kW. Determine the magnitude of the per phase excitation emf of the motor, in volts, internal power factor angle and load angle.	[5]	3	5
Q.4(a)	Derive the torque–slip characteristic of a three-phase induction motor from its equivalent circuit, and discuss the effect of supply voltage and frequency on the torque developed.	[5]	4	4
Q.4(b)	The speed of 8-pole induction motor is controlled by varying the supply frequency while maintaining the V/f constant. At rated frequency of 50 Hz and rated voltage of 400 V its speed is 720 rpm, evaluate the speed at 40 Hz, if the load torque is assumed to be constant.	[5]	4	5
Q.5(a)	Discuss the effect of Cogging, Crawling and regenerative braking phenomena in Induction Motor.	[5]	4	2
Q.5(b)	Discuss in detail the resistance start and capacitor start split phase Induction motors and draw their torque slip characteristics.	[5]	5	2

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