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

CLASS: B.TECH. **SEMESTER : V**
BRANCH: EEE **SESSION : MO/2022**

SUBJECT: EE301 AC ROTATING MACHINES

TIME: 3:00 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.

Q.1(a)	Calculate the highest speed at which a 50Hz and a 60Hz alternator can be operated.	[2]
Q.1(b)	Define distribution factor.	[3]
Q.1(c)	The armature of a 6600 volt, three-phase, 20-pole, 300 rpm star-connected alternator has 180 slots. The flux per pole is 80 mWb, and the coil span is 160° electrical. Determine the number of conductors in series per phase.	[5]
Q.2(a)	Why is a rotating field system used in preference to a stationary field?	[2]
Q.2(b)	Define leakage reactance, synchronous reactance, and synchronous impedance.	[3]
Q.2(c)	A three-phase, 3300 V, 50 Hz, the star-connected alternator has an effective resistance of 0.5 ohms per phase. A field current of 30 A produces a full-load current of 180 A on short-circuit and a line-to-line emf of 1000 V on open circuit. Determine (i) the power angle of the alternator when it delivers a full load at 0.8 pf (lag) (ii) the SCR of the alternator.	[5]
Q.3(a)	What is the purpose of damper winding in a synchronous machine?	[2]
Q.3(b)	What are V- curves and inverted V-curves of a 3-phase synchronous motor?	[3]
Q.3(c)	Draw the phasor diagrams of the synchronous motor for lagging, leading, and unity power factor conditions. Name all the phasors.	[5]
Q.4(a)	Define slip.	[2]
Q.4(b)	Why cannot an induction motor run at synchronous speed?	[3]
Q.4(c)	The resistance and stand-still reactance per phase of a 3-phase induction motor is 0.1 ohm and 0.4 ohms, respectively. If 100 V per phase is induced in the rotor circuit at the start, calculate rotor current and rotor p.f. (i) when the rotor is stationary and (ii) when running with a slip of 5%.	[5]
Q.5(a)	Why are starters necessary for starting induction motors?	[2]
Q.5(b)	Draw and explain the complete torque-speed characteristic of a 3- phase induction machine for all ranges of speed.	[3]
Q.5(c)	A single-phase induction motor draws a current of 0.5 A at 230 V and 0.6 lagging p.f. If it runs at a speed of 100 radians per second and develops an output torque of 0.3 Nm, find its output power and efficiency.	[5]

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