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

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

SUBJECT : EE301 AC ROTATING MACHINES

TIME: 02 Hrs.   FULL MARKS: 25

INSTRUCTIONS:
1 The total marks of the questions are 25.
2. Candidates attempt for all 25 marks.
3. Before attempting the question paper, be sure that you have got the correct question paper.
4. The missing data, if any, may be assumed suitably.
5. Tables/Data hand book/Graph paper etc. to be supplied to the candidates in the examination hall.

			CO	BL
Q1 (a)	How will you define a synchronous machine?	[2]	1, 2	1
(b)	The armature coils of a 3-phase, 4-pole, 24-slot alternator are short pitched by one slot. Determine (i) distribution factor and (ii) pitch factor.	[3]	1, 2, 3	3
Q2 (a)	Why do we prefer short-pitched winding?	[2]	1, 2, 3, 4	5
(b)	Calculate the no-load terminal voltage of a 3-phase, 8-pole, star connected alternator running at 750 rpm having following data: Sinusoidally distributed flux per pole = 55 m Wb Total No. of armature slots = 72; Number of conductors/slot = 10 Distribution factor = 0·96; Assume full pitch windings.	[3]		3
Q3	Develop a double-lay, short-pitch (5/6), distributed lap-winding (for one-phase only) for a 3-phase, 4-pole, 48-slot armature of an alternator. Also, give the winding scheme for all three phases.	[5]	1, 3, 4, 5	6
Q4 (a)	What are the different methods by which excitation is provided in synchronous machines?	[2]	1, 2,	1
(b)	A three-phase, star connected, 20 MVA, 11 kV, 50 Hz alternator produces a short-circuit current equal to full-load current when a field current of 70A passes through its field winding. The same field current produces an emf of 1820V (line to line) on an open circuit. If the alternator has a resistance between each pair of terminals as measured by DC is 0.16 ohm, and the effective resistance is 1.5 times the ohmic resistance, what will be its full-load regulation at 0.707 pf lagging?	[3]	1, 2, 3, 4	3
Q5 (a)	The armature of a three-phase, star-connected, 10 kVA, 400 V, 50 Hz salient pole alternator has a resistance of 1 ohm per phase. Its direct and quadrature axis reactances are 15 ohm and 9 ohm respectively. The machine is delivering rated load at rated voltage and pf 0.8 lagging. If the load angle is 17°, draw the phasor diagram.	[2]	1, 2, 3	3
(b)	A 762 kVA, 2200 V, 50 Hz, three-phase, star connected alternator has an effective resistance of 0.6 ohm per phase. A field current of 30 A produces a full-load current on short circuit and a line to line emf of 1039 V on open circuit. Determine the power angle of the alternator when it delivers full load at 0.8 p.f. lagging.	[3]	1, 2, 3, 4	3

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