**BIRLA INSTITUTE OF TECHNOLOGY, MESRA, RANCHI**
**(MID SEMESTER EXAMINATION MO/2024)**

**CLASS: B.Tech** **SEMESTER : V**
**BRANCH: EEE** **SESSION : MO/2024**

**SUBJECT: EE301 AC ROTATING MACHINES**

**TIME: 02 Hours** **FULL MARKS: 25**

**INSTRUCTIONS:**
**1. The question paper contains 5 questions each of 5 marks and total 25 marks.**
**2. Attempt all questions.**
**3. The missing data, if any, may be assumed suitably.**
***4*. Tables/Data handbook/Graph paper etc., if applicable, will be supplied to the candidates**

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| Q.1(a) | Elaborate the statement "In synchronous machine why we keep AC on stator and DC on rotor" with proper diagram if needed. | [2] | 1 | 2 |
| Q.1(b) | Define and derive the expression for Distribution factor for the case of integral slot winding in synchronous machine. | [3] | 1 | 2 |
| Q.2(a) | Explain the effect of distribution of winding and use of short- pitch coil on the magnitude of generated voltage on an alternator. | [2] | 1 & 2 | 2 |
| Q.2(b) | A 4-pole, 3 phase, 50 Hz, star connected alternator has 60 slots in which a double layer distributed winding is housed. Each coil has 6 turns and coils are short pitched in such a way that if one coil side lies in slot number 1, the other lie on slot number 13. Determine the useful flux per pole required to generate a line voltage of 6000 V. | [3] | 2 & 3 | 3 |
| Q.3(a) | Discuss and develop the electrical equivalent model of a synchronous machine with the help of proper time phasor diagram. | [2] | 2 | 3 |
| Q.3(b) | A 5 MVA, 11kV (rated terminal voltage, L-L rms), 3-phase star connected alternator is synchronized to the bus bars and is operating with an induced EMF (per phase) of 125% of the rated voltage. If the load current is 500 A, what is the power factor of operation? The machine has a synchronous reactance of 5 Ω and resistance of 0.5 Ω per phase. | [3] | 2 & 3 | 4 |
| Q.4(a) | Discuss the effect on load angle, power factor, reactive power and stator current with increase in mechanical input under constant excitation condition for a synchronous machine connected to an infinite bus-bar with the help of time phasor diagram. | [2] | 2 | 2 |
| Q.4(b) | A 3-Phase, 10 kVA, 400 V, 50 Hz star connected alternator supplies the rated load of 0.8 pf lagging. If the armature resistance is 0.5 Ω and synchronous reactance is 10 Ω. Find the armature current and power angle. | [3] | 2 & 3 | 4 |
| Q.5(a) | Define armature reaction and analyze the impact of armature reaction in an alternator at 0.8 p.f leading with the help of time phasor diagram. | [2] | 2 | 4 |
| Q.5(b) | Perform the O.C and S.C test in a round rotor synchronous machine and determine the synchronous reactance in unsaturated and saturated zone. | [3] | 2 | 4 |

**:::::18/09/2024 M:::::**