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**INSTITUTE OF AERONAUTICAL ENGINEERING**

(Autonomous)

B.Tech IV Semester End Examinations (Supplementary) - June, 2018

Regulation: IARE – R16

AC MACHINES

Time: 3 Hours

(EEE)

Max Marks: 70

Answer ONE Question from each Unit

All Questions Carry Equal Marks

All parts of the question must be answered in one place only

UNIT – I

1. (a) Explain the constructional details and working principle of three phase induction motor with neat sketch. [7M]
- (b) A three phase, 50Hz, 8 pole, induction motor has full load slip of 2%. The rotor resistance and stand still rotor reactance per phase are 0.001ohm and 0.005 ohm respectively. Find the ratio of the maximum to the full load torque and speed at which the maximum torque occurs. [7M]
2. (a) Draw and explain the torque-slip characteristics of the three phase induction motor with different modes of operation. [7M]
- (b) A three phase star connected 400V, 50Hz four pole induction motor has the following per phase parameters in ohms, refer to the stator. $R_1=0.15$, $X_1=0.45$ $R_{21}=0.12$, $X_{21}=0.45$ $X_m=28.5$ compute the stator current and power factor when the motor is operated at rated voltage and frequency with $s=0.04$. [7M]

UNIT – II

3. (a) What are the different starting methods for induction motor and explain the auto transformer starting method for three phase induction motor? [7M]
- (b) A six pole, 50Hz three phase induction motor running at 960rpm on full load 4% slip develops a torque of 149.3N-m at its pulley rim. The friction and windage losses are 200W and stator copper and iron losses equal 1,620W. Calculate the [7M]
 - i. Output power
 - ii. The rotor Copper losses
 - iii. The efficiency at full load.
4. (a) With the neat circuit diagram explain indirect method to determine the efficiency of three phase induction motor. [7M]
- (b) With the aid of torque-speed characteristic explain the operation of induction generator. [7M]

UNIT – III

5. (a) Describe the difference in construction of rotors of alternators used in hydroelectric plants and steam plants. Draw neat sketch of two types of rotors. [7M]
- (b) A three phase, 6 pole synchronous generator has a resultant air gap flux of 0.06wb per pole. The flux is distributed sinusoidally over the pole. The stator has 2 slots per pole per phase and 4 conductors per slot are accommodated. The coil span is 150° electrical. Calculate the phase and line induced voltages when the machine runs at 375 rpm. [7M]
6. (a) What do you mean by synchronizing of alternator? Describe any one method of synchronizing.
- (b) With the aid of circuit diagram for inductive impedance between two voltages sources and its associated phasor diagram and derive the expression for power developed. [7M]

UNIT – IV

7. (a) Explain different methods of starting synchronous motor. [7M]
- (b) A 2000V, three phase, star connected synchronous motor has an effective resistance and synchronous reactance of 0.2 ohms and 2.2 ohms per phase respectively. The input is 800KW at nominal voltage and the induced line emf is 2500V. Calculate the line current and PF. [7M]
8. (a) Explain the effect of excitation on armature control and power factor for synchronous motor. [7M]
- (b) A 6600V, star connected three phase synchronous motor works at constant voltage and constant excitation. Its synchronous reactance is 20 ohm per phase and armature resistance is negligible. When the input power is 1000KW, the power factor is 0.8 leading. Find the power angle and power factor when the input is increased to 1500kW. [7M]

UNIT – V

9. (a) Explain the principle of operation of the single phase induction motor by the double field revolving theory. [7M]
- (b) Explain the operation of capacitor start-run induction motor. [7M]
10. (a) Draw and explain the equivalent circuit of a single phase induction motor without core losses? [7M]
- (b) Find the mechanical power output of 185W, 4 pole, 110V, 50Hz single phase induction motor, whose constants are given below at a slip of 0.05. $R_1=1.86$ ohm, $X_1=2.56$ ohm, $R_2=3.56$ ohm, $X_2^1=0.45$ ohm, $X_2=2.56$ ohm, $X_m=53.5$ ohm, friction and windage losses are 13.5W. [7M]

