Hall Ticket No | | | | | | | | | | | Question Paper Code: AEEB15

# INSTITUTE OF AERONAUTICAL ENGINEERING
(Autonomous)

B.Tech IV Semester End Examinations (Regular/Supplementary) - July, 2021

**Regulation: R18**

## ELECTRICAL MACHINES-II

**Time: 3 Hours** **(EEE)** **Max Marks: 70**

**Answer FIVE Questions choosing ONE question from each module**
**(NOTE: Provision is given to answer TWO questions from any ONE module)**
**All Questions Carry Equal Marks**
**All parts of the question must be answered in one place only**

### UNIT – I

1. (a) Why is it impossible for the rotor of an induction motor to rotate at the same speed as that of the magnetic field? Explain in detail. **[7M]**
   (b) Briefly discuss the principle of constant magnetic field and pulsating magnetic fields. **[7M]**
2. (a) Describe how the rotating magnetic field is produced by three-phase currents with suitable phasor diagrams.. **[7M]**
   (b) Explain the construction and principle of operation of 3-phase induction motor with neat diagrams. **[7M]**

### UNIT – II

3. (a) Explain auto-transformer and rotor resistance starting methods for starting slip ring induction motor. **[7M]**
   (b) An 8 pole, three phase alternator is coupled to a prime mover running at 750 rpm. It supplies an induction motor which has a full load speed of 960 rpm. Find the number of poles of induction motor and slip. **[7M]**
4. (a) Derive torque equation of induction motor and find the relation between full load torque to maximum torque and starting torque to full load torque. **[7M]**
   (b) Two 50Hz 3 phase induction motor having 6 and 4 pole respectively are cumulative cascaded, the 6 pole motor being connected to main supply. Determine the frequency of the rotor currents and slips referred to each stator field if the set has a slip of 2%. **[7M]**

### UNIT – III

5. (a) Define armature reaction and explain the effect of armature reaction on different power factor loads of synchronous generators. **[7M]**
   (b) Derive an expression for induced emf in an alternator, distribution factor and coil span factor. **[7M]**
6. (a) What is voltage regulation of an alternator? Describe synchronous impedance method of determing regulation of the alternator. **[7M]**
   (b) A 2200V 50Hz 3 phase star connected alternator has an effective resistance of 0.5 ohm per phase. A field current of 30A, full load current of 200A on short circuit and a line-to-line emf of 1100V on open circuit. Determine the power angle of the alternator when it delivers full-load at 0.8pf lagging. **[7M]**

## UNIT – IV

7. (a) Derive the expression for power developed in a synchronous motor. Also find the condition for maximum power developed. **[7M]**

   (b) A 6600V 3 phase star connected synchronous motor draws a full load current of 80A at 0.8 pf leading. The armature resistance is 2.2 ohm and reactance 22 ohm per phase. If the stray loss are 3200W, calculate emf induced , output power and efficiency of the machine. **[7M]**

8. (a) Explain the construction and working principle of synchronous motor. **[7M]**

   (b) The excitation of a 400V, 3 phase mesh connected synchronous motor is such that the induced emf is 510V. The impedance per phase is (0.6+j4.5) If the friction and iron loss 800W, calculate line current, output power, power factor and efficiency at maximum power output. **[7M]**

## UNIT – V

9. (a) Why is a single phase induction motor unable to start itself without special auxillary windings? Justify your answer with double revolving field theory. **[7M]**

   (b) The following test result was obtained in case of a 220V single phase induction motor. No load test : 220V, 5.8A, 310W Locked rotor test 120V, 13.8A, 530W. Determine the approximate equivalent circuit parameters of the motor. **[7M]**

10. (a) Explain what is meant by capacitor start and split phase method of starting a single phase induction motor. **[7M]**

    (b) The following data pertains to a single phase induction motor. No of poles 4, supply voltage 110V, rated output 140W, slip at rated output is 5%, total copper loss at full load 28W, rotational loss is 28W. Calculate the efficiency and rotor copper loss caused by the backward field. Neglect stator copper loss. **[7M]**

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