Registration No: | | | | | | | | | | | **M.TECH**

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M.TECH 1ST SEMESTER REGULAR EXAMINATIONS, DECEMBER 2018
MODELING AND ANALYSIS OF ELECTRICAL MACHINES
Branch: PE, Subject Code:MPEPC1020
(Regulations 2018)

Time: 3 Hours   **Max Marks : 70**   **Question Code: RD18002026**

PART-A (10 X 2=20 Marks)

1. Answer the following questions.
    a. Write down voltage equation of separately excited DC machine.
    b. State at least two different conditions when asymmetry exists in induction machine.
    c. What is co-alignment torque?
    d. Define critical time.
    e. Write torque equation of DC shunt motor?
    f. Write down application of reluctance motor.
    g. Why synchronous motor is constant speed motor?
    h. What is hunting & how it can be prevented?
    i. List the types of single phase IM?
    j. State the need of computer simulation.

PART-B (5 X 10=50 Marks)
Answer any five questions from the following.

2 a) Explain the reference frame theory, with suitable illustration.   [5]
  b) Discuss significance of voltage & torque equation of synchronous machine.   [5]

3 a) Two coupled coils have self and mutual inductance of   [5]

$$L_{11} = 2 + \frac{1}{2x} \quad L_{22} = 1 + \frac{1}{2x} \quad L_{12} = L_{21} = \frac{1}{2x}$$

   Over a certain range of linear displacement x. The first coil is excited by a constant current of 20 A and the second by a constant current of -10 A. Find Mechanical work done if x changes from 0.5 to 1meter

  b) Derive the general expression for force in terms of energy and co-energy of a singly excited linear actuator   [5]

4 a) The stator current of a three phase rotating electric machine with symmetrical stator winding are   [5]

$$I_{as} = \sqrt{2}I_a \cos \omega_e t, I_{bs} = \sqrt{2}I_b \cos\left(\omega_e t - \frac{2\pi}{3}\right), I_{cs} = \sqrt{2}I_c \cos\left(\omega_e t + \frac{2\pi}{3}\right)$$

   Where the currents I_a, I_b and I_c are unbalanced. Comment on the total air gap mmf due to stator currents.

  b) Explain Construction and operating principle of permanent magnet synchronous machine.   [5]

5a)Describe some applications where two phase to three phase transformation is required   [5]
  b) Differentiate Concentrated and distributed winding. Explain why distributed winding is preferred.   [5]

6 a) Derive the voltage equations of a synchronous machine in rotor reference frame.   [5]
  b) What a Transducer? Explain different types of transducers with suitable examples.   [5]

7. a) Derive general expression for force in terms of co-energy of a double excited   [5]
   electromagnetic system.
   b) A four pole generator having wave-wound armature winding has 51 slots, each slot   [5]
   containing 20 conductors. What will be the voltage generated in the machine when driven at
   1500 rpm assuming the flux per pole to be 7.0 mWb ?

8. Write short notes on

   a) Field energy and Co energy   [5]

   b) Different types of transducers with examples   [5]

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