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Total No. of Pages : 02

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M.Tech.(EE) (2013 Batch) (Sem.-2)
MODELING AND DYNAMICS OF ELECTRICAL MACHINES
Subject Code : MTEE-203
M.Code : 71358

Time : 3 Hrs.

Max. Marks : 100

INSTRUCTION TO CANDIDATES :

1. Attempt any FIVE questions out of EIGHT questions.
2. Each question carries TWENTY marks.

1.
 - a) What is generalized machine theory? What are the restrictions of generalized machine theory?
 - b) Obtain the transfer function of a D.C. separately excited machine. Neglect only frictional torque and also write the formulae for undamped natural angular frequency and damping factor.
2.
 - a) Develop machine model for a D.C. compound machine, with the help of neat schematic diagram and primitive diagram. Arrange the final equations in state space form.
 - b) For a voltage-fed synchronous motor develop the relevant voltages in state variable form.
3.
 - a) What do you understand by the term 'Linear Transformation' as used in electrical machines?
 - b) Obtain the expressions for a 3-phase induction motor (Voltage and current) in state variable form in:
 - i) Stator reference frame
 - ii) Synchronously rotating frame.
4.
 - a) Derive and obtain expressions for flux linkages in the two-axis model for a 3-phase induction motor from ϕ_a and ϕ_b and ϕ_c values.
 - b) Discuss linearized and non-linearized analysis of induction machine?

5.
 - a) Derive torque equation for a 3-phase synchronous motor model and obtain steady state power angle characteristics based on its torque expression.
 - b) Explain phase transformation and Active transformation used in a.c. machines.
6.
 - a) Derive the circuit model of a 3-phase synchronous motor and mention few salient features from its model.
 - b) Derive expressions for armature to field mutual inductances and armature self-inductances for a salient-pole synchronous machine. How are these inductance expressions modified for a cylindrical rotor synchronous machine?
7. A 3-phase, 50Hz cylindrical rotor synchronous machine has the following parameters :

Self-inductance for phase 'a' = 3.15 mH.

Armature leakage inductance = 0.35 mH.

For this machine, calculate the mutual inductance between armature phases and its synchronous reactance.
8. Write notes on the followings :
 - a) Transient stability of synchronous machines
 - b) Basic challenges in computer simulations
 - c) Circuit oriented simulator Pspice
 - d) Surge voltage transients in transformers.

NOTE : Disclosure of Identity by writing Mobile No. or Making of passing request on any page of Answer Sheet will lead to UMC against the Student.