Total No. of Questions :8] *[Total No. of Printed Pages :3*

Roll No .....

MEPS-105

M.E./M.Tech., I Semester

Examination, June 2017

Advance Course in Electrical Machines

Time : Three Hours

Maximum Marks : 70

Note: i) Attempt any Five questions.
ii) All questions carry equal marks.

1. a) What is generalized model of rotating electrical machines? How are the various windings of a machine represented by the primitive machine?
   b) Derive the voltage equations and expression for the electrical torque of the Kron's primitive machine.

2. a) Explain the basic reason of using transformations in electrical machines. Obtain identical transformations for currents and voltages from rotating balanced 3-phase (a, b, c) winding to a rotating balanced 2-phase (α, β) winding.
   b) Write the general voltage equations for a metadyne generator with zero compensation. If a load impedance of ($R_L + L_{LP}$) is connected across the output terminals, then derive the transient and steady-state expression for the load voltage.

3. a) Draw the generalized Mathematical Model of a polyphase induction machine. Write down voltage equations for this model obtain there from the equivalent circuit for a poly-phase induction motor.

217

   b) Enumerate the most common problems concerning the dynamics of induction motors.

4. a) A 230V, 4-pole, 50Hz, single phase induction motor has the following constraints and losses:
   Stator resistance and leakage reactance:
   2.3 Ω, 3.2 Ω. Rotor resistance and leakage
   reactance: 4.2 Ω, 3.2 Ω (referred to stator).
   Magnetizing reactance : 74 Ω
   Core loss = 98 Watts.
   Friction and windage
   loss = 30 Watts.
   Determine the stator current, p.f. power output, torque and efficiency at a slip of 0.05, with the auxiliary winding open.
   b) Explain the constructional features and principle of working of schrage motor.

5. a) Explain how Park's transformations transform equations in a, b, c variables to *d*, *q*, *o* variables.
   b) From the phasor diagram of a salient pole alternator working at a leading pf, but with pf angle θ less than load angle δ, obtain the following relation:

$$E_f = V_t \cos\delta + I_a r_a \cos(\delta - \theta) + I_d X_d$$

6. a) Explain the various reactances and time constants from the 9-axis equivalent circuit of a 3-phase synchronous machine.
   b) During the balanced 3-phase short-circuit analysis, explain why ∂-axis parameters are mainly involved.

7. a) What are the approximate methods to analyse the problems of generator? Explain.
   b) State and explain the application of approximate methods to power system analysis.

8. Write short notes on any two of the following:
   a) Torque equation for steady-state operation of 1-ϕ induction motor.
   b) Dynamic performance of induction machine during sudden change in load torque.
   c) Simplified equations of synchronous machine with two damper coils.
   d) Operational impedances for synchronous machine with four rotor windings.

******