Roll No .....

MEPS - 105

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

Examination, December 2015

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) Draw the primitive machine diagrams for the following machines.
   i) DC machine
   ii) Commutator machine
   Describe briefly how these are obtained.
   b) Obtain identical transformations for voltages from a rotating balanced 3-phase (a, b, c) winding to a rotating balanced 2-phase (α, β) winding.

2. a) Draw the equivalent circuit for a polyphase induction motor and state what is represented by the various parameters involved in this circuit.
   b) From the equivalent circuit for a polyphase induction motor, derive an expression for the air-gap power in terms of rotor resistance, slip etc.

3. A 3-phase, 4-pole, 50Hz induction motor develops an electrical torque of 50Nm at a slip of 0.10. Under no load the motor is running with a slip of 0.01.
   a) If a load torque 30Nm is suddenly applied to the motor shaft, find the speed as a function of time. The total inertia of motor and connected load is 6 kg m^2.

   b) After steady state has reached inpart (a), the supply voltage decreases suddenly to 90% of its previous value. Find how the speed varies with time.

4. a) Explain the constructional features and principle of working of a schrage motor.
   b) A single-phase, 4-pole induction motor takes a line current of $60\angle -70°$A at standstill with its main winding excited from 230V, 50Hz source. Neglecting stator impedance, magnetizing current and rotational loss, compute the torque at a slip of 0.05.

5. a) Write the impedance matrix for a 3-phase salient pole synchronous machine fitted with amortisseurs.
   b) Obtain an expression for the instantaneous electromagnetic torque of synchronous machine.
   c) Draw the phasor diagrams for both synchronous motor and generator.

6. Explain the various reactances and time constants from the d-axis and q-axis equivalent circuits of a 3-phase synchronous machine.

7. a) Enumerate and explain the application of approximate methods for power system analysis.
   b) Discuss the importance of synchronous machine representation in a power system network.

8. Write a short notes on any two of the following:
   a) Cross field commutator machine.
   b) Restrictions of generalized theory of machines.
   c) Analysis of line to line short circuit.
   d) Concepts of synchronous machine reactances.

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