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MEPS–105

M. E. (First Semester) EXAMINATION, Dec., 2010

ADVANCE COURSE IN ELECTRICAL MACHINES

(MEPS—105)

Time : Three Hours

Maximum Marks : 100

Minimum Pass Marks : 40

Note : Attempt any *five* questions. All questions carry equal marks.

1. (a) Explain Krons primitive machine and derive the voltage equation. 10

   (b) Derive an expression for transformer and speed voltages in a rotating machine. 10

2. (a) Prove that to insure power invariance in transforming one set of variables to another, the transpose of the transformation matrix should be equal to its inverse. 10

   (b) Deduce the voltage and current equation of separately excited D. C. generator when it is subjected to sudden application of step field excitation with zero armature current. 10

3. Describe the mathematical model of poly-phase induction motor and develop the equivalent circuit of it from generalised theory concept. 20

4. (a) Derive the expresssion for electromagnetic torque of a 3-phase salient pole synchronous machine without ammortisseurs. 10

   (b) Discuss the various inductances of a 3-phase synchronous machine. 10

5. (a) Discuss the various reactances and time constants of a 3-phase synchronous machine. 10

   (b) Discuss the operational parameters of the synchronous machine. 10

6. (a) From the concept of cross field theory discuss the operation of single phase induction motor. 10

   (b) Give the transformation equations for rotating three-phase windings in a synchronous machine. 10

7. (a) Develop a simplified phasor diagram of a synchronous machine for load flow analysis in power systems. 10

   (b) A symmetrical sudden 3-phase short circuit is applied to the terminals of an excited salient pole synchronous generator (without damper bars) running at rated speed. Develop an expression for the armature current at any instant of time following the short circuit. 10

8. Write short notes on any *three* of the following : 20

   (a) Schrage motor

   (b) Limitations of generalised theory of machines

   (c) Slip test on synchronous machine

   (d) Commutator machine

   (e) Parics and clausius transformation