Name : .....

Roll No. : .....

Invigilator's Signature : .....

CS/M.Tech (EDPS)/SEM-1/EDPM-103/2010-11

2010-11

ELECTRICAL MACHINE ANALYSIS

Time Allotted : 3 Hours Full Marks : 70

The figures in the margin indicate full marks.

Candidates are required to give their answers in their own words as far as practicable.

Answer any *five* questions. 5 × 14 = 70

1. "The division of voltage vector into the induced and generated voltages is a relative concept that depends entirely on the reference frame. A certain voltage vector may be entirely induced or entirely generated voltage or partly induced and partly generated depending on the relative velocities of the reference frames, the fluxes and the conductors. However the sum of the induced and generated voltages is a constant no matter whatever may be the reference frame selected."

   Explain the statement with reference to the quasi-holonomic and non-holonomic reference frames. 14

2. a) Develop the relationship between the torque matrix and inductance matrix of the generalised machine in non-holonomic reference frame. 7

   b) Deduce the Maxwell's equation of torque in holonomic reference frame. 7

3. a) Develop the connection matrix connecting the quasi-holonomic reference frame to the two phase symmetrical component reference frame for a two phase induction motor. 6

   b) Hence develop the impedance matrix of the two-phase induction motor in two-phase symmetrical compound reference frame. 8

4. a) Write down the motional impedance matrix of a generalised machine explaining the elements of the same. 4

   b) Hence develop the motional impedance matrix of the generalised machine of the first kind. 10

5. a) Develop the impedance matrix of a compound wound *dc* motor. 6

   b) Hence calculate the armature and field currents of the same under transient as well as steady state conditions. 8

6. a) Write down the impedance and torque matrices of the generalised machine of the fist kind. Hence develop the flux linkage and current density matrices of the same in quasi-holonomic reference frame. 7

   b) Show that the flux density wave is at right angles in space with reference to the flux linkage wave under certain assumptions. State the assumptions. 7

7. Write short notes on any *two* of the following : 7 + 7

   a) Rotation matrix

   b) Christoffel voltage

   c) Low impedance and high impedance positions in a repulsion motor.

   d) Method of measuring leackage impedance between two transformer coils on the same limb.