NR/R09

Code No: A4301/ C4201, C4301, C5401

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
M.Tech I Semester Examinations, October/November 2011
MACHINE MODELLING AND ANALYSIS
(COMMON TO POWER ELECTRONICS, POWER AND INDUSTRIAL DRIVES, POWER ELECTRONICS AND ELECTRIC DRIVES)

Time: 3hours **Max. Marks: 60**

Answer any five questions
All questions carry equal marks

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1. a. Discuss how Generalized Machine theory supports a primitive 2-axis machine. Mention its limitations.
   b. From the fundamental equations, derive the expressions for voltage and force/torque of
   (i) A solenoid with fixed armature
   (ii) A solenoid with linear movement. [12]

2. a. Derive the mathematical model of a separately excited DC motor by considering Generalized Machine theory.
   b. Obtain the transfer function of a separately excited DC motor by considering armature inductance La & load torque TL. [12]

3. a. Derive the mathematical model of a cumulatively compounded DC motor in matrix form.
   b. Derive the mathematical model of a DC shunt motor in state variable form. [12]

4. Obtain identical transformations for currents and voltages from a rotating balanced 3-phase (a, b, c) winding to a rotating balanced 2-phase (α, β) winding. Show that the power invariance is maintained under this transformation. [12]

5. Draw the basic circuit model of 3-φ induction motor as well as rotor. Obtain expressions for flux linkages Ψa, Ψb and Ψc of a 3-φ induction motor from fundamental equations. [12]

6. Obtain the dynamic model of a 3-φ induction motor in synchronizing rotating reference frame in state variable form and represent them in matrix form. [12]

7. Derive the expression for armature mutual inductances of a salient pole synchronous machine from a consideration of its basic parameters. [12]

8. Obtain the voltage equations of 3-φ synchronous motor in state variable form with reference to stator reference frame. And also write the torque equation of this motor. [12]

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