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BIEE-016

B.Tech. IN ELECTRICAL ENGINEERING

01155

Term-End Examination

June, 2012

BIEE-016 : ELECTROMECHANICAL ENERGY CONVERSION-III

Time : 3 hours *Maximum Marks : 70*

Note : *Answer **any seven** questions and each carries equal marks*

1. What is Kron's primitive machine ? How are the various windings of a rotating electrical machine represented by the primitive machine ? **10**

2. Obtain an expression for the electrical torque of the Kron's primitive machine. Show that no torque is produced by interaction between the flux and current on the same axis. **10**

3. Deduce parks, transformations relating to the 3-phase currents of a synchronous machine to its corresponding d-q axes currents. Express 3phase currents interms of d - q axes currents and its inverse. Describe, from physical concepts how these transformations can be used for a poly phase induction motor. **10**

4. For a generalized DC machine, show that the motional inductance Md is **10**

$$Md = \frac{\phi Z}{\pi a} \frac{1}{I_f}$$

5. A separately excited DC generator running at **10**

$\frac{4500}{\pi}$ rpm has the following parameters :

$r_f = 80\Omega$, $L_f = 40H$, $r_a = 0.1\Omega$ $L_a = 0.3$ mH, motional inductance Md = 0.8H generated emf constant kg = Mdw_r = 120 volts per field ampere. (a) The field is unexcited and the armature open. Find the armature voltage as a function of a time and sketch it, if constant voltage of 160 volts is suddenly impressed across the field terminals. (b) Sketch the rise of armature current, if the armature terminals are initially short circuted.

6. Derive expressions armature mutual inductances of a salient pole synchronous machine from a consideration of its basic parameters. **10**

7. Draw the generalized mathematical model of a poly phase induction machine. Write down the voltage equations for this model and obtain these from the equivalent circuit for a polyphase induction motor. **10**

8. Explain the similarities between the induction motor and transformer equivalent circuit. **10**

9. Explain the principle of operation of Linear Induction Motor (LIM), and derive the expression for linear force interms of specific loadings and linear dimensions. **10**

10. Write short notes on ***any two*** topics **2x5=10**

(a) Steady state power angle characteristics of polyphase synchronous machine

(b) BLDC motor

(c) Scherage motor