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BIEE-016

B.Tech. – VIEP – ELECTRICAL ENGINEERING (BTELVI)

Term-End Examination

00445

June, 2016

BIEE-016 : ELECTRO-MECHANICAL ENERGY CONVERSION – III

Time : 3 hours *Maximum Marks : 70*

Note : *Attempt any* ***seven*** *questions. Use of scientific calculator is allowed. Each question carries equal marks.*

1. Explain the Kron's primitive machine with its two-pole representation. How is Kron's primitive machine equivalent to any rotating electrical machine ? *10*

2. What is the physical significance of Park's transformation ? Deduce Park's transformations relating the 3-phase currents of a machine to its corresponding d-q axes currents. *10*

3. Derive the transfer functions of a separately excited DC generator for (a) no load operation, and (b) on load operation. *10*

4. A separately excited DC generator running at $\frac{4500}{\pi}$ rpm has the following parameters :

$r_f = 80\ \Omega$; $L_f = 40$ H; $r_a = 0{\cdot}1\ \Omega$; $L_a = 0{\cdot}3$ mH and $K_g = 120$ volts/field amp.

The field is unexcited with open armature. Determine the armature voltage as a function of time, if a constant voltage of 160 V is suddenly impressed across the field terminals. *10*

5. Starting from the impedance matrix of a 3-phase salient pole synchronous machine, derive the phasor voltage equation under balanced steady state operation. *10*

6. Explain the various reactances and time constants from the d-axis equivalent circuit of a 3-phase synchronous machine. *10*

7. A 400 V, 4-pole, 50 Hz, 3-phase squirrel cage induction motor develops full load torque at 1470 rpm and has full load p.f. of 0·85. If the supply voltage reduces to 340 V, with the load torque remaining constant, calculate the motor speed. *10*

8. Discuss the constructional features and working principle of the following motors : *2×5=10*

   (a) Single phase series motor

   (b) Hysteresis motor

9. Write short notes on any ***two*** of the following : *2×5=10*

(a) Steady state behaviours of a DC machine

(b) Power angle characteristics of a synchronous machine

(c) Single phase reluctance motor