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

00764

Term-End Examination

June, 2017

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. (a) What do you understand by the term 'linear transformation' as used in electrical machines ?   5

   (b) Explain the basic reason of using transformations in electrical machines.   5

2. A 10 kW, 230 V, 1500 rpm DC motor has the following constants :

$$r_a = 1 \cdot 00 \ \Omega \quad L_A = 0 \cdot 10 \ H$$

$$K_m = M_d \quad I_A = 4 \cdot 00 \ \text{N-m/armature amp}$$

$$J = 1 \cdot 00 \ \text{kg-m}^2$$

The load coupled with the motor has its inertia equal to 1.00 kg-m^2. If load torque varies linearly with speed, then calculate ω_n, ξ and investigate its dynamic behaviour. Neglect rotational losses.   *10*

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

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

5. Discuss the constructional features and working principle of a single-phase series motor.   *10*

6. Explain the constructional features of a Schrage motor. How does it differ from an ordinary induction motor ?   *10*

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

    (a) Brushless DC Motor

    (b) Stepper Motor

    (c) Hysteresis Motor

8. Draw the generalised mathematical model of a polyphase induction machine. Write down the voltage equations for this model and obtain the equivalent circuit for a polyphase induction motor. *10*

9. If the stator resistance of a polyphase induction motor is neglected, show that its torque can be expressed as

$$T_e = T_m \frac{2}{\dfrac{S_{mT}}{S} + \dfrac{S}{S_{mT}}}.$$

10

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