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

Term-End Examination

June, 2017

BIEE-008 : ELECTRO-MECHANICAL ENERGY CONVERSION – I

Time : 3 hours   *Maximum Marks : 70*

Note : *Attempt any **seven** questions. Use of scientific calculator is permitted. Missing data, if any, may be assumed.*

1. Define energy and co-energy for a linear magnetic field system. Also, derive the corresponding expressions.   *10*

2. A doubly excited rotating machine has the following self and mutual inductances :

$$r_s = 40 \ \Omega, \ L_s = 0.16 \text{ H}$$

$$r_r = 2 \ \Omega, \ L_r = 0.04 + 0.02 \cos 2\theta$$

$$M_{sr} = 0.08 \cos \theta$$

where θ is the space-angle between the axes of rotor coil and stator coil. The rotor is revolving at a speed of 100 rad/sec. For $i_s = 10$ A dc and $i_r = 2$ A dc, obtain an expression for torque and electrical power. **10**

3. Draw a neat sketch of a DC generator indicating all the constructional features. Explain the function of commutator in detail. **10**

4. Explain the following characteristics of a DC generator : **4+3+3**

   (a) No-load saturation characteristics

   (b) Internal characteristics

   (c) External characteristics

5. What are the functions of a starter in a DC motor ? Explain the construction and operation of a 3-point starter. **10**

6. Discuss the Ward Leonard method of speed control for a DC motor, in detail. **10**

7. Draw the phasor diagram of a single-phase transformer connected to inductive load. Also, derive the equation for voltage regulation. **10**

8. A 200 kVA single-phase transformer is connected throughout 24 hours. For 8 hours in a day, the load is 150 kW at 0·8 p.f. lagging and for 7 hours, the load is 90 kW at 0·9 p.f. Remaining time or the rest period, it is at no-load condition. Full-load copper loss is 4 kW and the iron loss is 1·8 kW. Calculate the all day efficiency of the transformer. *10*

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

(a) Armature Reaction in DC Generators

(b) Sumpner's Test

(c) Three-Phase to Two-Phase Conversion

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