No. of Printed Pages : 3

BIEE-008

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

00953

Term-End Examination

June, 2018

BIEE-008 : ELECTRO-MECHANICAL ENERGY CONVERSION – I

Time : 3 hours *Maximum Marks : 70*

Note : *Attempt any* ***seven*** *questions out of ten. All questions carry equal marks. Use of scientific calculator is allowed. Make suitable assumptions, if needed.*

1. Define voltage regulation of a transformer and derive conditions for

(a) Zero regulation, and

(b) Maximum regulation. *10*

2. (a) Define power efficiency and all day energy efficiency of a transformer. *5*

(b) Obtain the condition for maximum power efficiency of a single-phase transformer. *5*

3. What are the conditions for satisfactory parallel operation of 1-ϕ transformer ? Deduce expressions for the load shared by two transformers in parallel, when no-load voltages of these transformers are not equal. What will be the load distribution if the voltage ratio is exactly equal ? *10*

4. (a) Explain how the exciting (or no load) current of a single-phase transformer contains harmonics even when the supply voltage is a sine wave. *5*

   (b) Explain why it is essential to have one of the three-phase windings connected in delta for the transformers used in three-phase systems. *5*

5. (a) Explain briefly, the Hopkinson's test for determination of efficiency of dc shunt machines. *5*

   (b) What are the main advantages and limitations of Hopkinson's test ? *5*

6. Explain the necessity of a starter in a dc motor and describe a three-point starter with a neat sketch. *10*

7. Define Commutation. Explain the process of commutation in dc generators with neat sketches and describe the methods to improve it. *10*

8. Distinguish between self-excited and separately excited dc generators. How are self-excited dc generators classified ? Give their circuit diagrams. *10*

9. A 500 V shunt motor takes 4 A on no load. The armature resistance including that of brushes is 0·2 Ω and the field current is 1 A. Estimate the output and the efficiency when the input current is (i) 20 A, (ii) 100 A. *5+5=10*

10. (a) Define field energy and co-energy. *5*

(b) Show that the field energy in a linear magnetic system is given by *5*

$$W_j = \frac{1}{2} L_i^2 = \frac{1}{2} \psi_i = \frac{1}{2L} \psi^2$$