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**BIEE-008**

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

## Term-End Examination

00192

## December, 2017

## 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.** (a) Develop the phasor diagram of a single-phase transformer under load conditions. Assume lagging power factor load. 5

(b) Why is the short-circuit test performed on the hv-side of a transformer ? Why is the core loss almost negligible in this test ? 5

**2.** (a) Explain Sumpner's test for testing two single-phase transformers. 5

(b) Explain why Sumpner's test is beneficial for finding the efficiency of transformers. 5

3. What are the disadvantages of current and voltage harmonics in transformers ? Explain how these harmonics can be eliminated. *10*

4. (a) Discuss briefly the essential and desirable conditions to be fulfilled for operating two three-phase transformers in parallel. *5*

   (b) Draw and explain schematically how a three-phase transformer can be connected with another three-phase transformer. *5*

5. (a) Describe Swinburne's test with the help of a neat diagram to find out the efficiency of a d.c. machine. *7*

   (b) What are the main advantages and disadvantages of this test ? *3*

6. (a) Why is the starting current very high in a d.c. motor ? How does the starter reduce the starting current to a safe value ? What are the drawbacks of three-point starter ? *5*

   (b) Describe the four-point starter with a neat sketch. *5*

7. What is Armature Reaction ? Describe the effects of armature reaction on the operation of d.c. machines. How is the armature reaction minimized ? *10*

**8.** (a) Derive the EMF and torque equation of a d.c. generator. *5*

(b) Neatly sketch and explain the external characteristics of a d.c. compound generator. *5*

**9.** A 120 V d.c. shunt motor having an armature circuit resistance of 0·2 Ω and field circuit resistance of 60 Ω, draws a line current of 40 A at full load. The brush voltage drop is 3 V and rated full-load speed is 1800 rpm.

Calculate : *5+5*

(a) The speed at half load

(b) The speed at 125 percent full load

**10.** (a) Distinguish between Singly excited and Doubly excited systems. *5*

(b) For a singly-excited linear magnetic system, derive an expression for the electromagnetic torque. *5*