

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

Term-End Examination

00515

December, 2014

**BIEE-020 : ELECTRICAL MACHINES AND
ELECTRONICS**

Time : 3 hours

Maximum Marks : 70

Note : Attempt any seven questions. All questions carry equal marks.

1. Discuss the concept of balanced 3-phase circuits. What is the difference between 3-phase star and 3-phase delta connections ? Show that the power consumed by 3 identical phase loads connected in delta is equal to 3 times the power consumed, when the phase loads are connected in star. 10

2. (a) Three coils each of impedance $20 \angle 60^\circ \Omega$ are connected in delta across a 400 V, 3-phase, 50 Hz a.c. supply. Calculate the line current and total power. 5

- (b) Two wattmeters connected to measure power in a 3-phase circuit measure 5 kW and 1 kW, the latter reading being obtained after reversing current coil connections. Calculate p.f. of the load and total power. 5

3. Derive emf equation for a single phase transformer. A 25 KVA, 2200/220 V, 50 Hz single phase transformer has the following parameters :

$$r_1 = 1.2 \Omega, x_1 = 6.0 \Omega, r_c = 1000 \Omega, \\ x_m = 300 \Omega \text{ (hv side)}$$

$$r_2 = 0.03 \Omega, x_2 = 0.06 \Omega \text{ (lv side)}$$

Draw the equivalent circuit referred to lv side for a 0.8 p.f. lagging load being supplied at 220 V.

10

4. What is all-day efficiency of a transformer ? How does it differ from ordinary efficiency ? A 100 KVA transformer has its maximum efficiency of 98% at full load unity p.f. During the day, it is loaded as follows :

12 hours – 20 kW at p.f. of 0.5 lag

6 hours – 50 kW at p.f. of 0.9 lag

6 hours – 75 kW at p.f. of 0.8 lag

Calculate the all-day efficiency.

10

5. Why is a starter necessary to start a 3-phase induction motor ? Draw and explain the star-delta starter for a 3-phase induction motor with necessary protective devices.

10

6. Show and explain through power flow diagram, how electrical input is converted into mechanical power output in a 3-phase induction motor, and hence show that

$$P_g : \text{rotor copper loss} : P_m = 1 : S : (1 - S)$$

where 'S' is slip.

10

7. Why do thyristor controlled drives employing both dc and ac motors find wide application in industries ? Explain. Give the classification of static power converters. 10
 8. With the help of basic power circuit diagram, explain the working of a current commutated chopper. Also draw the associated waveforms. Give its advantages too. 10
 9. What is the need for controlling the output voltage of an inverter ? Discuss briefly, and compare the various methods used for controlling the inverter output voltage. Enlist a few industrial applications of inverters. 10
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