

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

**Term-End Examination**

**June, 2014**

00877

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

*Time : 3 hours*

*Maximum Marks : 70*

---

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

---

---

1. Explain two wattmeter method to measure 3-phase power in star-connected load. Derive the phase angle in terms of wattmeter readings. Draw phasor diagram also. 10
  
2. Each phase of a star-connected load consists of a resistance of  $100 \Omega$  in parallel with a capacitance  $31.8 \mu\text{F}$ . Calculate the line current, power absorbed, total kVA and power factor of the load when connected to a 416 V, 3-phase, 4-wire, 50 Hz supply. 10
  
3. Explain the OC and SC tests performed on a single phase transformer. Determine the equivalent circuit based on the above tests. Derive the condition for maximum efficiency of a transformer. 10

4. The efficiency of a 400 kVA, single phase transformer is 98.77% at full load 0.8 power factor and 99.13% at half full load unity power factor. Find (i) iron losses at full and half full loads, (ii) copper losses at full and half full loads. 10
5. Derive the expression for developed torque in a 3-phase induction motor and find the condition for maximum torque. Draw and explain the torque-slip characteristics of a typical 3-phase induction motor. 10
6. A 3-phase, star-connected, 440 V, 50 Hz, 4-pole induction motor has the following parameters, referred to stator :
- $r_1 = 0.15 \Omega$ ,  $x_1 = 0.44 \Omega$ ,  $r_2' = 0.12 \Omega$ ,  
 $x_2' = 0.44 \Omega$ ,  $x_m = 30 \Omega$ . Neglecting core loss resistance ( $r_c$ ), find stator current, power factor at rated voltage and slip of 4%. 10
7. Single phase induction motor is not self-starting. Explain it with the help of double revolving field theory. What are the various starting methods of 1-phase induction motor ? 10
8. Why are 3-phase inverters used ? Describe the working principle of 3-phase bridge inverters. What are the two modes of operation ? How are these two modes obtained ? 10
9. Describe static Kramer slip-power recovery scheme for speed control of slip-ring induction motor. Why is this scheme not applicable to squirrel cage induction motor ? 10