(Following Paper ID and Roll No. to be filled in your Answer Book)

PAPER ID : 2490   **Roll No.** [ ][ ][ ][ ][ ][ ][ ][ ][ ][ ][ ]

B. Tech.

(SEM. VI) THEORY EXAMINATION 2010-11

INTRODUCTION TO ELECTRIC DRIVES

Time : 2 Hours   *Total Marks : 50*

Note : Attempt **all** questions. All questions carry equal marks.

1. Attempt any two parts of the following :   **(5×2=10)**

    (a) Explain the basic principle of thyristor. Explain forward conduction mode of thyristor.

    (b) Explain two transistor model of a thyristor. Explain holding and latching current.

    (c) Explain thristor turn-on methods. What are the application of thyristor.

2. Attempt any **two** parts of the following :   **(5×2=10)**

    (a) Explain basic principle of phase control. Define single phase half wave circuit with RL load.

(b) A singl-phase 230 V, 1 kW heater is connected across 1-phase, 230 V, 50 Hz supply through an SCR for firing angle delays of 45° and 90°. Calculate the power absorbed in the heater element.

(c) Explain single phase full wave bridge converter. Also explain three phase bridge inverter.

3. Attempt any two parts of the following :   (5×2=10)

(a) A step-up chopper has input voltage 220 V and output voltage of 660 V. If the non-conducting time of thyristor chopper is 100 μs, compute the pulse width of output voltage. In case pulse width is halved for constant frequency operation, find the new output voltage.

(b) Explain the basic principle of operation of step up and step down chopper with V-I characteristics.

(c) Define the basic principle of operation of cycloconverter. Explain the working of 1-ϕ and 3-ϕ half wave cycloconverter.

4. Attempt any two parts of the following :   (5×2=10)

(a) Explain basic machine equations. Define DC motor speed control.

(b) Explain Single-ϕ qual converter drives, also explain two-quadrant chopper drives.

(c) - Explain four quadrant chopper drives. Define 3-φ semiconductor drives.

5. Attempt any two parts of the following : (5×2=10)

(a) Define speed control of induction motors. Define method of resistance control.

(b) A 3-φ, 400 V, 15 kW, 1440 rpm, 50 Hz star connected induction motor has rotor leakage impedance of $0.4 + j1.6 \, \Omega$. Starter leakage impedance and rotational losses are assumed negligible. If this motor is energised from 120 Hz, 400 V, 3-φ source, then calculate :

   (i) the motor speed at rated load

   (ii) the slip at which maximum torque occurs and

   (iii) the maximum torque.

(c) What are ac drives ? Give the merits and demerits of ac drives with respect to dc drives.