

Code: EE6T5

III B.Tech - II Semester – Regular Examinations – April 2016

**POWER SEMICONDUCTOR DRIVES
(ELECTRICAL & ELECTRONICS ENGINEERING)**

Duration: 3 hours

Max. Marks: 70

Answer any FIVE questions. All questions carry equal marks

1. a) What is the definition of an electric drive? Give the advantages & disadvantages of electric drives over mechanical drives. 7 M

- b) A motor-load system is operation in quadrants I & II with torque of $400-0.4N$ N-m, where N is speed in RPM. Motor is coupled to an active load torque $T_l = \pm 200$ N-m. Calculate the motor speed for motoring and braking operations in forward direction. 7 M

2. a) Explain the two quadrant motoring and braking operation of a separately excited DC motor using single phase converter. Also comment on the disadvantages of braking using the above method. 7 M

- b) A 230V, 650RPM, 100A separately excited DC motor has an armature circuit resistance and inductance of 0.08 ohm and 8mH respectively. Motor is controlling by a single phase half controlled rectifier with a source voltage of 230V, 50Hz. Calculate the speed of the motor with a load torque of 1000N-m and firing angle of 60° . 7 M

3. a) With a neat sketch, explain the operation of a four quadrant DC motor drive using a three- phase conventional AC supply. 7 M
- b) What is mean by critical triggering angle? Derive its expression for a DC motor drive fed from a three-phase fully controlled rectifier. 7 M
4. a) A DC series motor is fed by a DC chopper circuit. Draw and explain the motoring and breaking characteristics? 7 M
- b) A 200HP, 230V, 500RPM separately excited DC motor controlled by a chopper. The chopper is connected to a bridge rectifier supplied from a 230V, three-phase, and 50 Hz AC mains. The motor-chopper details are as follows.
- $R_a = 0.04\Omega, L_a = 0.0015H, K_b = 4.172V / rad/sec, f_c = 2KHz$
- The motor is running at 300RPM with 55% duty cycle in the chopper. Determine the average current and electromagnetic torque of DC motor. 7 M
5. a) How to control the speed of a three-phase induction motor using V/f control technique? Also explain how to obtain variable frequency and voltages using power electronic equipment? 7 M

- b) A 1000HP induction motor is to be started using a Phase controller. The current is limited to 1PU. Find the starting torque to run the motor from stand still to 0.9PU speed at a constant load torque of 0.05PU. The base KVA and voltage of motor are 850 and 2700V. Number of poles are 4; neglect stator impedance, the rotor resistance and reactance are 0.16 ohm & 0.2 ohm at standstill. The full load slip is 0.08. 7 M
6. a) Explain the operation of variable frequency control for synchronous motors operating in parallel from an infinite bus bar. 7 M
- b) How to control the speed of a synchronous motor by employing a cycloconverter? 7 M
7. a) Draw and explain the closed loop control of a phase controlled Induction motor drive. 7 M
- b) Explain the closed loop operation of a DC motor drive fed from a chopper. 7 M
8. a) Explain the principle of vector controlled Induction motor drive. 7 M
- b) Explain the transformation of three-phase system to two-phase system. 7 M