

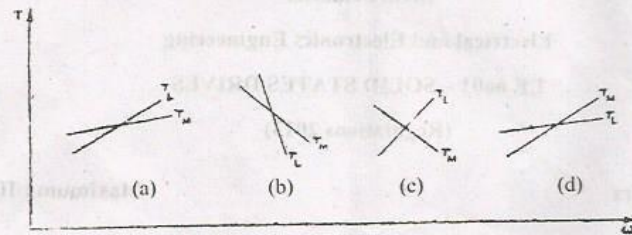


**PART - B (5 × 16 = 80 Marks)**

11. (a) (i) Classify and explain various types of load of electrical drive based on the speed - torque characteristics. (10)  
 (ii) Discuss the various factors involved in the selection of electrical drives. (6)

**OR**

- (b) (i) Explain in detail the multi quadrant dynamics in the speed torque plane. (8)  
 (ii) Based on the mathematical condition, examine the stability of equilibrium point as shown in fig. 1 below. (8)



**Fig. 1**

12. (a) (i) Describe the operation of a four quadrant chopper fed separately excited DC motor with neat diagram. (10)  
 (ii) Explain in detail about time ratio and current limit control. (6)

**OR**

- (b) Explain the operation of a three phase fully controlled rectifier fed separately excited DC motor and obtain the expression of motor speed and torque for continuous conduction mode. (16)

13. (a) (i) Explain the concept of v/f control of induction motor drives. (8)  
 (ii) A 3 Phase, 50 Hz induction motor, has the following parameters for its equivalent circuit  $R_1 = R_2 = 0.02 \Omega$  and  $X_1 = X_2 = 0.1 \Omega$  is to be operated at one half of its rated voltage and 25 Hz frequency. Calculate (i) the Maximum torque at this reduced voltage and frequency operation in terms of its normal value and (ii) the starting torque at this reduced frequency and voltage in terms of its normal value. (8)

**OR**

- (b) (i) Describe the operation of voltage sources inverter fed induction motor drives. (12)  
 (ii) State the drawbacks of an induction motor drive fed from stepped wave inverter. (4)

14. (a) Explain the concept of self-control technique of synchronous motor in detail with the operation of rotor position encoder.

**OR**

- (b) Explain the forward motoring and braking operation of open loop volts/Hz control of multiple PM synchronous motor with relevant neat phasor diagram and control characteristics curve.

15. (a) Explain in detail the design of speed controller of closed loop speed control system of separately excited DC motor.

**OR**

- (b) Explain the armature voltage control with field weakening mode of closed loop operation of separately excited DC motor drive.