6. (a) Derive the criteria for steady state stability of an electric drive. (6)

(b) A motor having a suitable control circuit develops a torque given by $T_m = aw + b$, where a and b are positive constants. This motor is used to drive a load whose torque is given by $T_L = cw^2 + d$., where c and d are some other positive constants. The total inertia of the rotating masses is J

(i) Determine the relations amongst constant a, b, c and d in order that the motor can start with the load and have an equilibrium speed.

(ii) Calculate the equilibrium speed.

(iii) Will the drive be stable at this speed?

(iv) Determine the initial acceleration of the drive. (9)

7. (a) Explain the speed control of a three phase induction motor using three phase bridge inverter – 120° mode of conduction. (10)

(b) A 400 V, three phase 50 Hz supply feeds a separately excited dc motor through half controlled three phase converters. The motor parameters are – inductance 0.012 H, resistance 0.8 ohm, armature constant 2 V/rad/sec (N–m/A). Neglecting converter losses and source impedance. Determine speed-torque characteristics up to 80 N-m at fixed firing angle of 90°. (5)

8. (a) What do you understand by load equalization? Explain briefly how effect of fluctuating load is reduced? (5)

(b) An 8 pole 50 Hz induction motor coupled to a flywheel drives a load, which requires a torque of 110 N-m when running light. For an intermittent period of 8 seconds, a pulse load rising instantaneously to 550 N-m is supplied. What must be the combined inertia of the system to ensure that the peak motor torque does not exceed 400 N-m? The motor characteristic may be taken as linear and giving a torque of 350 N-m at a slip of 0.05. (10)

9. Write short notes on any THREE of the following: (3 × 5 = 15)

(a) Drives used in Textile mill.

(b) Equivalent system in electric drives.

(c) Methods of reducing energy loss during starting.

(d) Four quadrant operation of electric drives.
