UNIT I
DRIVE CHARACTERISTICS

1. State essential parts of electrical drive. What are the functions of power modulator?
2. Drive the equations governing motor load dynamics.
3. What are the main factors which decide the choice of electrical drive for a given application?
4. A motor of small rating can be selected for a short time duty why?
5. A constant speed drive has the following duty cycle

a. Load rising from 0 to 400 KW – 5 min.
b. Uniform load of 500 KW – 5 min.
c. Remaining idle for 2 min.

Estimate power rating of the motor. Assume losses to be proportionate to (power)2.

6. Drive the mathematical condition for steady state stability of equilibrium point.
7. Explain in detail the multi quadrant dynamics in the speed - torque plane.
8. A motor drives two loads one has rotational motion. It is couple to the motor through a reduction gear with a=0.1 and efficiency of 90%. The load has a moment of inertia of 10 Kg – m2and a torque of 10 Nm. The other load has translational motion and consist of 1000 kg weight to be lifted up at a uniform speed of 1.5m/s. coupling between this load and the motor has an efficiency of 85%. Motor has an inertia of 0.2 Kg – m2 and runs at constant speed of 1420 rpm. Determine the equivalent inertia referred to the motor shaft and power delivered by the motor.

UNIT II
CONVERTER / CHOPPER FED DC MOTOR

1. Explain the operation of a single phase fully controlled rectifier control of a dc separately excited motor.
2. Explain continuous and discontinuous operations.
3. A 200 V, 875 rpm, 150 A separately excited dc motor has an armature resistance of 0.06 ohms. It is fed from a single phase fully controlled rectifier with an ac source voltage of 220V, 50HZ assuming continuous conduction. Calculate i) firing angle for rated motor torque and 750 rpm.

ii) Firing angle for rated motor torque and (-500 rpm)

iii) Motor speed for α = 100 degree and rated torque.

4. A separately excited dc motor having an armature resistance of 3 ohms and the inductance of 25 mH is fed from a two pulse bridge rectifier. when the firing angle is 75 degree, the motor has a back emf of 55V.determine the power output ,input VA ,and power factor.
5. Explain the operation of a single phase fully controlled converter fed separately excited DC motor with neat wave forms and derive the speed torque characteristics.
6. Explain the operation of the two quadrant chopper fed drive system.
7. Explain the operation of the four quadrant chopper control in dc motor drive system.
8. Explain using a power circuit the working of a single phase semi converter fed separately excited motor drive.
9. A separately excited dc motor operating from a single phase half controlled bridge at a speed of 1450 rpm, it has input voltage of 330 sin 314t and a back emf of 75V.The SCRs are fixed symmetrically at α = π/4 in every cycle and the armature has resistance of 5 ohms .neglecting armature inductance. Calculate the average armature current and the developed torque.
10. Describe the desirable modification to the speed torque curve of synchronous motor for speed control.

UNIT- III
DESIGN OF CONTROLLERS FOR DRIVES

1. Mention effects of pulsating torque in induction motor and write down the draw backs of harmonics.
2. List out the different methods of speed control of 3 phase induction motors. Explain.
3. What is meant by stator voltage control? Explain in detail.
4. What is meant by V/F control? Explain with block diagram.
5. Describe the need of different kind of braking applied to the induction motor.
6. Describe the operation of closed loop control of stator voltage control.
7. Explain in detail the N-T characteristics of induction motor.
8. Explain the operation of the induction motor fed from non sinusoidal voltage source.

UNIT IV
INDUCTION MOTOR DRIVES

1. Explain in detail sub synchronous operation; slip power recovery scheme and rotor resistance control method.
2. Discuss on V/F control techniques in synchronous motor.
3. Explain the operation of synchronous motor while shifting from motoring to regenerative braking.
4. Discuss on permanent magnet synchronous motor.
5. Write notes on brushless excitation.
6. Explain open loop speed control of synchronous motor with constant ratio.
7. Explain power factor control of synchronous motor with relevant vector diagram.
8. Explain self-control of synchronous motor with relevant vector diagram.
9. Show that the torque of a synchronous motor is independent of speed when it operates in the controlled current mode.
10. Explain using a power circuit the working of a trapezoidally excited PM synchronous motor, operating in the self-controlled mode.

UNIT V
SYNCHRONOUS MOTOR DRIVES

1. Discuss using a diagram the operation of closed loop scheme for speed control of a dc motor below and above the base speed.
2. Derive the transfer function of the speed controller.
3. Explain how the converter power output and the controller characteristics are related.
4. Derive the transfer function of dc motor load system.
5. Give the design procedure of current controller.
6. Explain the armature voltage control of dc motor with constant field and field weakening modes.
7. Discuss on armature voltage control.
8. Compare VSI fed drives with CSI fed drives.