ASSIGNMENT QUESTIONS

UNIT-1

1. Explain how do you obtain modified speed-torque characteristics of D.C series motors.

2. Derive an expression for energy loss of separately excited D.C. motor under no-load.

3. Obtain speed-torque characteristics of three phase fully controlled converter fed separately excited d.c. motor

4 Explain the function of sensing unit in an electric drive.

5. Draw speed torque characteristics of the following (i) Traction load (ii) Constant power load.

6. What is the difference between active load and passive load.

ASSIGNMENT QUESTIONS

UNIT-II

1. A 220v, 750 rpm, 200A separately excited motor has an armature resistance of 0.05Ω. Armature is fed from a 3-phase non-circulating current mode dual converter, consisting of fully controlled rectifiers A and B. Rectifier A provides motoring operation in the forward direction and rectifier B in reverse direction. Line voltage of AS.C. Source is 400v. Calculate firing angle of rectifier for the motoring operation at rated torque and 600 rpm assuming continuous conduction.

2. Derive an expression for the average output voltage of a 3 phase full converter.

3. What is the frequency of the lowest order harmonic in the 3 phase full converters?

4. Explain how four-quadrant operation is achieved by dual converters each of 3phase full wave configuration for d.c. Separately excited motor

5. A 400v, 750 rpm dc shunt motor has an armature resistance of 0.3ohms.when running under rated conditions, the motor is to be braked by plugging with armature current limited to 90A. What external resistance should be connected in series with the armature? Calculate the initial braking torque and this value when the speed has fallen to 300 rpm.
6. Name the quadrants of multi-quadrant operation of drives.

UNIT III

1. With a neat diagram, explain the operation of a dc drive in all fur quadrants when fed by a single-phase dual converter with necessary waveforms and characteristics.

2. What are the advantages of electric braking over mechanical braking of D.C. motors under dynamic braking, for the following types (i) Separately exited dc motor (ii) Series motor

3. Discuss in detail counter current and dynamic braking operations D.C. shunt motors.

4. A 400V, 75- rpm, 70A dc shunt motor has an armature resistance of 0.3 ohm when running under rated conditions, the motor is to be marked by plugging with armature current limited to 90A. What external resistance should be connected in series with the armature? Calculate the initial braking torque and its value when the speed has fallen to 300rpm.

5. With a neat diagram, explain the operation of and drive in all four quadrants when fed by a single phase dual converter with necessary waveforms and characteristics.

ASSIGNMENT QUESTIONS

UNIT-IV

1. Explain the principle of closed-loop control of a dc drive using suitable block diagram.

2. Deduce the mathematical expression for minimum and maximum currents for a class A chopper operated dc motor with back emf.

3. A 220V, 24A, 1000rpm separately excited dc motor having an armature resistance of 2W is controlled by a chopper. The chopping frequency is 500Hz and the input voltage is 230V. Calculate the duty ration for a motor torque of 1.2 times rated torque t 500rpm.

4. List the advantages offered by dc chopper drives over line-commutated converter controlled dc drives

5. A dc chopper controls the speed of dc series motor. The armature resistance R_a = 0.04ohm, field circuit resistance R_f = 0.06ohm, and back emf constant K_v = 35 mV/rad/s. The dc input voltage of the chopper Vs=600V. If it is required to maintain a constant developed torque of T_a – 547N-m, plot the motor speed against the duty cycle K of the chopper.

6. Derive the expressions for average motor current, current I_{max} and I_{min} and average torque for chopper-fed separately excited motor.

ASSIGNMENT QUESTIONS

UNIT V

1. Under what conditions regenerative braking occurs in 3-phase induction motor.

2. The voltages to the terminals of a three phase, 50 KW, 240V induction motor are to be controlled by pairs of inverse-parallel connected thyristors in the supply lines. If the motor full-load efficiency is 0.9 p.u. and the full-load power vector is 0.85m calculate the rms current, mean current and maximum voltage ratings of the thyristors

3. A pump has a torque-speed curve given by $T_L = (1.4/10^3)N^2$ Nm. It is proposed to use a 240V, 50Hz, 4 pole, star connected Induction motor with the equivalent circuit parameters (referred to stator turns) R_1 =0.25 ohms, R_2 =0.6 ohms, X_1 = 0.36 ohms, X_2 = 0.36ohms, X_m = 17.3 ohms. The pump speed N is to vary from full speed 1250 RPM to 750RPM by voltage control using pairs of inverse-parallel connected thyristors in the lines. Calculate the range of firing angles required.

4. A 3 phase, 4 pole, 50 Hz squirrel cage induction motor has the following circuit parameter. R_1 = 0.05 ohms, r_2=0.09ohms, $X_1 + X_2$ =0.55ohms. The motor is star connected and rated voltage is 400V. It drives a load whose torque is proportional to the speed and is give asT1 – 0.05 ω Nw-m. Determine the speed and torque of the motor for a firing angle of 450 of the AC Voltage Controller on a 400v, 50Hz supply

5. What is AC Voltage Controller?
   Explain with suitable diagrams the various types of solid state 3 phase AC Voltages Controllers that can be used for speed control of 3 phase induction motors from stator side. Mention the advantages of the AC Voltages Controllers over the other methods of solid-state control techniques of 3-phase induction motor

6. For stator voltage control scheme of a 3-phase Induction motor discuss about speed range, regeneration hedonics, torque pulsating, power factor, cost, efficiency and application. (ii) Draw a block a block schematic diagram for automatic speed control of 3 phase cage Induction motor using solid state Ac Voltage Controller on stator side.

ASSIGNMENT QUESTIONS

UNIT VI

1. A three phase,4-pole, 18KW, 300V star connected Induction motor is driven at 50Hz by a six step voltage source inverter supplied fro a DC supply of 200V. The motor equivalent circuit parameters for 50Hz operation are $R_1 = 0.1$, $R_2 = 0.17$,$X_1=0.3$, X2 =0.5, X_m = large.
   Calculate the harmonic torques due to the 5^{th} and 7^{th} harmonic currents. Show that, for operation at 1450 RPM, 50Hz, the harmonic torques are negligible.

2. Explain the following for variable control of Induction motor. (i) The motor has higher efficiency and better low speed performance when feed from a pulse-width modulated inverter instead of 6-step inverter. (ii) The inverter has excellent low speed performance when fed from a Cyclo converter. (iii)Cyclo-converter is suitable only for low speed drives.

3. Compare CSI and VSI drives. (ii) show that a variable frequency Induction motor drive develops at al frequencies the same torque for a given slip-speed when operating at constant flux.

4. With the help pf circuit diagram and waveforms explain the induction motor with current source inverter. Draw the circuit diagram of the Auto-sequentially commutated converter.

5. A three phase star connected 50 Hz, 4-pole induction motor has the following approximate per-phase equivalent circuit parameters referred to stator side: Rs = Rr' =0.024ohm, Xs=Xr' =0.12ohm. The motor is controlled by then variable frequency control with constant (V/f) ratio. For an operating frequency of 12Hz, Calculate (i) The breakdown torque as a ration of this value at the rated frequency for the motoring operation, (ii0 The starting torque and rotor currant in terms of their values at the rated frequency.

6. Draw a closed loop block schematic diagram for the above speed control technique. Mention the merits of the above method of speed control.

ASSIGNMENT QUESTIONS

UNIT-VII

1. Why rotor resistance control is preferred in low power crane drives

2. What are the assumptions made in the static resistance control of wound rotor induction motors?

3. What are the effects of line side inductance in a slip energy recovery scheme? (ii) Derive the relation of derating of an induction motor when it is having different harmonics under slip energy recovery scheme.

4. Why the rotor resistance of an induction motor operating under slip energy recovery scheme should have less rotor resistance.

5. Compare the power flow diagram of a normal speed control method with that of slip energy recovery scheme (SER) can be made operable for both super synchronous and sub synchronous speed control.

6. In which way the (SER) can be made operable for both super synchronous and sub synchronous speed control.

ASSIGNMENT QUESTIONS

UNIT-VIII

1. Explain the operation of a synchronous motor fed from and adjustable frequency current source, with circuit diagram and characteristic curves.

2. Discuss the CSI method of speed control of synchronous motor and describe the operation of the converter with waveforms.

3. How is the output voltage of a VSI improved by PWM techniques? Explain how you will use this converter for speed control of a synchronous motor.

4. Explain the operation of a synchronous motor fed from and adjustable frequency current source, with circuit diagram and characteristic curves.

5. Describe the converter and control systems used for (a) constant air gap flux density and (b) constant V/f operation of a synchronous motor. Draw the characteristics of the drive for the two cases

6. For variable frequency control of synchronous motor describe the power circuit and control motor has (i) below base speed and (ii) above base speed. Draw the characteristics of the drive for the two cases.