U.S.N

P.E.S. College of Engineering, Mandya - 571 401
(An Autonomous Institution affiliated to VTU, Belgaum)
Seventh Semester, B.E. - Electrical and Electronics Engineering
Semester End Examination; Dec. - 2015
AC and DC Drives

Time: 3 hrs   *Max. Marks: 100*

Note: *Answer any FIVE full questions, selecting at least TWO full questions from each part.*

PART - A

1 a.	With reason state four advantage of an electric drive. Draw the block diagram of an electric drive.	6
b.	With the help of circuit diagram and waveforms, explain the operation of fully controlled converter fed DC drive assuming discontinuous conduction mode of operation. Derive voltage across the armature winding.	8
c.	Explain the basic speed-Torque characteristic of DC separately excited motor.	6
2 a.	A 220 V, 1500 rpm, 50 A separately excited motor with armature resistance of 0.5 Ω is fed from a 3-phase fully controlled rectifier. Available AC source has a line voltage AC source has a line voltage of 440 V, 50 Hz. A star-Delta connected transformer is used to feed the armature so that motor terminal voltage equals related voltage when converter firing angle is zero, (i) Calculate transformer turns ratio (ii) Determine the value of firing angle when motor is running at 1200 rpm and rated torque.	10
b.	Explain the drive operation of DC separately excited motor when fed from single phase fully controlled rectifier.	10
3 a.	In Rheostatic braking of a separately excited DC motor a chopper is used. The motor is having armature resistance $R_a = 0.06$ Ω and $R_b = 8$ Ω and armature current is assumed to be continuous and ripple free. The average armature current is 180 A and field current is current 2 A. if the duty cycle of the chopper is 50% and $K_V = 1.52$ V/A rad/ sec. Determine; (i) Average voltage across chopper (ii) The equivalent resistance of motor when it acts as generator (iii) The power dissipated in braking resistance (iv) The motor speed and peak to peak voltage of chopper.	10
b.	With the help of circuit diagram and waveform explain the two quadrant operation of separately excited DC motor when fed from chopper control.	10
4 a.	What is meant by phase locked loop? With the help of block diagram explain the concept of phase locked loop.	10
b.	With the help of block diagram, explain the closed loop speed control scheme for DC drives.	10

PART - B

5 a. With neat circuit and waveform, explain the operation of voltage source Inverter (VSI) fed induction motor drive. **8**

b. Using stator voltage control principle, explain how speed control is achieved in Induction motor drive? **6**

c. A 3-phase, 1460 rpm, 415 V, 50 Hz, 4 pole, star connected Induction motor has following parameter $R_1 = 0.65\,\Omega$; $R_2^1 = 0.35\,\Omega$; $X_1 = 0.95\,\Omega$ and $X_2^1 = 1.43\,\Omega$ and $X_m = 28\,\Omega$. The speed of the motor is controlled by varying stator voltage and frequency. The $\left|\frac{v}{f}\right|$ ratio at rated condition is kept constant. Determine the maximum torque and speed at which it occurs for stator frequency of 35 Hz. **6**

6 a. With neat block diagram, explain closed loop speed control operation for Induction motor drive using either CSI or VSI. **10**

b. With necessary circuit and speed torque curve, explain the operation of static Scherbius drive system for slip power recovery. **10**

7 a. Explain variable frequency control scheme for both true synchronous and self synchronous mode of operation for synchronous motor drive. **10**

b. With a neat circuit diagram, explain the operation of self controlled synchronous motor drive employing load commutated Inverter. **10**

8 a. With the help of single line diagram explain the operation of cement mill and drives used in the operation. **10**

b. Explain different stages involved in production of cloth in a textile industry. Clearly mention the rating and types of electric drive used in each state. **10**

✻ ✻ ✻ ✻