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B.E. (Elect.) VIII (Rev) 10/12/07

Drives & control

P4/RT-Ex-07-256

Con. 5000–07. **[REVISED COURSE]** **CD–6510**

(3 Hours) **[Total Marks : 100**

MASTER

N.B. : (1) Question No. **1** is **compulsory**.
(2) Attempt any **four** questions from remaining **six** questions.
(3) Assume **suitable** data if **necessary**.

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1. (a) Explain the block diagram of an electrical drive. What are the functions of power modulator ? Explain. **10**
(b) Derive the fundamental torque equation. **10**

2. (a) Explain with example the principle of steady state stability. Using the above concept, show that for an equilibrium point to be stable following equation must be satisfied– **10**

$$\left[\frac{d\,T_L}{dt} - \frac{dT}{dW_M}\right] > 0$$

(b) Explain the extinction angle control and symmetrical angle control method using circuit diagrams and related waveforms. **10**

3. (a) Explain 'Slip power recovery' schemes draw the schematic diagrams and also derive the necessary equations. **10**
(b) Explain the four quadrants of d.c. drives (separately excited D.C. motor) using three phase dual converter. **10**

4. (a) A 220V, three phase, four pole, 60 Hz squirrel cage induction motor develops a maximum internal torque of 250% at a slip of 16%, when operating at rated voltage and frequency. If the effect of stator impedance is neglected, determine the maximum internal torque that the motor would develop if it were operated at 200 V, 50 Hz. Under this conditions, at what speed in rpm, would the maximum torque be developed ? Find also the full-load speed for 220V, 60 Hz supply. **10**
(b) Explain the different braking methods often induction motor. **10**

5. (a) A drive has following parameters : **10**
$J = 10$ kg-m^2, $T = 100 - 0.1$ N, N – M, Passive load torque $Tl = 0.05$ N, N – M, where N is the speed in rpm.
Initially the drive is operating in steady state. Now it is to be reversed. For this motor characteristic is change to,
$T = -100 - 0.1$ N, N – M. Calculate the time of reversal.
(b) Explain the basic principle of vector control method and its classification. **10**

6. (a) A 440 V, 50 Hz, 6 pole , Y-connected wound-rotor induction motor has following parameters referred to stator : $R_s = 0.5\ \Omega$, $R_r' = 0.4\ \Omega$, $X_s = X_r' = 1.2\ \Omega$, $X_m = 50\ \Omega$. An external resistance is inserted into the rotor circuit so that maximum torque is developed at $S_m = 2$. The motor, which was initially operating on No-load is being braked by 1–phase ac dynamic braking with three lead connection. Calculate the braking current and torque as a ratio of their full load values for 950 rpm. **10**
(b) Write short note on Thermal model of motor for heating and cooling. **10**

7. Write short notes on (any **two**) :– **20**
(a) Brushless D.C. motor drives
(b) Switched reluctance motor drives
(c) PLL control of D.C. drives.