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Seventh Semester B.E. Degree Examination, June/July 2011
Industrial Drives and Applications

Time: 3 hrs.   Max. Marks:100

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

PART – A

1 a. With a neat block diagram, state the essential parts of an electric drive system. Explain them briefly.   **(10 Marks)**
   b. Name the classes of motor duty. With a neat graph explain briefly.   **(10 Marks)**

2 a. With a neat graph, explain the various components of load torque.   **(10 Marks)**
   b. A weight of 500 kg is being lifted up at a uniform speed of 1.5 m/s by a Winch driven by a motor running at a speed of 1000 rpm. The moment of inertia of the motor and Winch are 0.5 and 0.3 kg-m^2 respectively. Calculate the motor torque and the equivalent moment of inertia referred to the motor shaft. In the absence of weight the motor develops a torque of 100 Nm when running at 1000 rpm.   **(10 Marks)**

3 a. With a neat circuit and graph, explain the regenerative, dynamic and plugging type of braking system for separately excited DC shunt motor.   **(10 Marks)**
   b. A 200 V, 875 rpm, 150 amp separately excited DC motor has an armature resistance of 0.06 Ω. It is fed from a single phase fully controlled rectifier with an AC source voltage of 220 V, 50 Hz. Assuming continuous conduction, calculate : i) Firing angle for rated motor torque and 750 rpm, ii) Firing angle for rated motor torque and –500 rpm and iii) Motor speed for α = 160° and rated torque.   **(10 Marks)**

4 a. With neat circuit and waveforms for continuous conduction, explain the working of DC series motor fed from single phase half controlled rectifier.   **(10 Marks)**
   b. With neat circuit and waveforms for continuous conduction mode of operation, explain Chopper control method for separately excited DC motors.   **(10 Marks)**

PART – B

5 a. Explain the working of three phase induction motor fed from non-sinusoidal voltage supply.   **(10 Marks)**
   b. Explain the working of voltage source inverter fed (VSI) induction motor. Draw the waveform for stepped wave inverter and PWM inverter.   **(10 Marks)**

6 a. Explain any three methods of starting of an induction motor.   **(10 Marks)**
   b. Describe the speed control of three phase induction motor by static rotor resistance control method.   **(10 Marks)**

7 a. A three phase, 440 V 50 Hz, star connected, 970 rpm 6 pole induction motor has the following parameters referred to the stator : $R_1 = 0.2$ Ω, $R_2^1 = 0.15$Ω, $X_1 = X_2^1 = 0.4$Ω. The stator to rotor turns ratio is 3.5. The motor is controlled by the static Karmer drive. The driver is designed for a speed range of 30% below the synchronous speed. The maximum value of firing angle is 170°. Calculate : i) The turns ratio of the transformer, ii) The torque for a speed of 750 rpm and α = 140°.   **(10 Marks)**
   b. With a neat circuit, explain the working of self-controlled synchronous motor drive employing load commutated thyristor inverter.   **(10 Marks)**

8 a. Explain the operation of a synchronous motor when fed from a fixed frequency supply.   **(10 Marks)**
   b. With a neat sketch, explain paper mill drive system.   **(10 Marks)**

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