USN | | | | | | | | | | |

06EE74

Seventh Semester B.E. Degree Examination, May/June 2010
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. What are the advantages of an electric drive system? **(05 Marks)**

b. With a neat block diagram, state the essential parts of an electric drive system. Explain them briefly. **(08 Marks)**

c. Determine the expression of over-loading factor 'K' while selecting the main rating, for short time duty class. **(07 Marks)**

2 a. With a neat curve, explain the various components of load torque. **(10 Marks)**

b. A weight of 600 kg is being lifted up at a uniform speed of 1.6 m/s by a winch, driven by a motor, running at a speed of 1200 rpm. The moment of inertia of the motor and the winch are 0.6 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 N.m, when running at 1200 rpm & $\eta = 100\%$. **(10 Marks)**

3 a. State and explain the important features of various braking methods of DC motors. **(10 Marks)**

b. With a neat circuit diagram and waveforms, explain the operation of discontinuous conduction mode for a single phase fully controlled rectifier of DC separately excited motor. **(10 Marks)**

4 a. A 220v, 1500 RPM, 10A separately excited DC motor is fed from a single phase fully controlled rectifier with an ac source of voltage 230V, 50Hz, $R_a = 2\Omega$. Conduction can be assumed to be continuous. Calculate firing angles for
i) Half the motor torque and 500 rpm ii) Rated motor torque and (-1000) rpm. **(10 Marks)**

b. With a neat circuit diagram and waveforms, explain the chopper motoring control of separately excited dc motor. **(10 Marks)**

PART – B

5 a. Explain any three methods of starting of an induction motor. **(10 Marks)**

b. A 400V, star connected, 3-phase, 6 pole, 50Hz induction motor has the following parameters referred to the stator $R_s = R_r' = 1\ \Omega$; $X_s = X_r' = 1\ \Omega$ for regenerative braking operation of this motor. Determine
i) Maximum overhauling torque it can hold. ii) Speed at which it will hold an overhauling load, with a torque of 100 N.m. **(10 Marks)**

6 a. Explain the operation of variable frequency control from voltage sources **(10 Marks)**

b. Why the slip power recovery scheme is suitable mainly for drives with a low speed range? Explain static Kramer drive for slip recovery scheme. **(10 Marks)**

7 a. A single phase, 220V, 50 Hz, 1425 rpm induction motor has the following parameters:
$R_s = 2\ \Omega$; $R_r' = 5\ \Omega$; $X_s = X_r' = 6\ \Omega$; $X_m = 60\ \Omega$ It drives a fan load at rated speed when full voltage is applied. Motor speed is controlled by the stator voltage control. Calculate the motor terminal voltage for a speed of 1200 rpm. **(10 Marks)**

b. Explain the operation of a synchronous motor when fed from a fixed frequency supply. **(10 Marks)**

8 a. With a neat circuit, explain the operation of a self controlled synchronous motor drive, employing load commutated thyristor inverter. **(10 Marks)**

b. With a neat sketch, explain paper mill drive system. **(10 Marks)**

* * * * *