



10EE74

Seventh Semester B.E. Degree Examination, Jan./Feb. 2021
Industrial Drives and Applications

Time: 3 hrs.

Max. Marks: 100

Note: Answer any FIVE full questions, selecting atleast TWO questions from each part.

PART - A

- 1 a. With a neat block diagram, explain the essential parts of electrical drives. (08 Marks)
b. What are the advantages of an electric drive system? (04 Marks)
c. A motor drives two loads. One has rotational motion. It is coupled to the motor through a reduction gear with a = 0.1, and efficiency of 90%. The load has a moment of inertia of $10\text{kg}\cdot\text{m}^2$ and a torque of $10\text{N}\cdot\text{m}$. Other hand load of translational motion and consists of 1000kg weight to be lifted up at a uniform speed of 1.5m/s . Coupling between this load and the motor has an efficiency of 85%. Motor has an inertia of $0.2\text{kg}/\text{m}^2$ and runs at a constant speed of 1420 rpm . Determine equivalent inertia referred to the motor shaft and power developed by the motor. (08 Marks)
- 2 a. Explain the classes of motor duty with its block diagram and applications. (10 Marks)
b. With the help of quadrant diagram, explain the four – quadrant operation of a motor driving a hoist load. (10 Marks)
- 3 a. With neat circuit diagram and waveforms, explain the working of single phase fully controlled rectifier fed dc separately excited motor for continuous conduction mode. (08 Marks)
b. A 230V , 960 rpm , 200A separately excited motor has an armature resistance of 0.02Ω . The motor is fed from a chopper which provides a dynamic braking with a braking resistance of 2Ω .
i) Calculate duty ratio of chopper for a motor speed of 600 rpm and braking torque of twice the rated value.
ii) What will be the motor speed for duty ratio of 0.6 and motor torque equal to twice its rated value. (04 Marks)
c. With dynamic equivalent circuit, explain the transient analysis of separately excited motor with armature control. (08 Marks)
- 4 a. With circuit diagram and waveforms, explain the operation of continuous conduction mode of Three Phase Fully controlled rectifier control of DC separately excited motor. (10 Marks)
b. Explain the multiquadrant operation of DC separately excited motor fed from Fully controlled rectifier. (10 Marks)

PART - B

- 5 a. Explain the regenerative braking and AC dynamic braking of an Induction motor. (08 Marks)
b. A 2200V , 2600 KW , 735 rpm , 50hz , 8 pole , 3 - phase Squirrel – cage Induction motor has following parameters referred to the stator.
 $R_s = 0.075\Omega$, $R'_r = 0.1\Omega$, $X_s = 0.45\Omega$, $X'_r = 0.55\Omega$. Stator winding is delta connected and consists of two sections connected in parallel. Calculate starting torque and maximum torque as a ratio of rated torque, if the motor is started by Star – Delta switching. What is the maximum value of line current during starting? (06 Marks)

- c. Explain the Star – Delta starter starting method of Induction motor. (06 Marks)
- 6 a. With a neat circuit diagram and relevant waveforms, explain the operation of voltage source inverter drive system. (08 Marks)
b. Draw a neat circuit arrangement of static Scherbius drive, explain its importance. (06 Marks)
c. Explain the static rotor resistance control. (06 Marks)
- 7 a. Explain the operation of self – controlled synchronous motor drive employing load commutated thyristor inverter. (08 Marks)
b. Draw the block diagram of variable frequency control of multiple synchronous motor and explain. (06 Marks)
c. Write a short notes on Starting , Pull – in operation from fixed frequency supply. (06 Marks)
- 8 a. Explain the various stages in paper mill and motors used in various stages. (10 Marks)
b. Explain the operation of drives in a cement mill. (10 Marks)
