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**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  $1000\text{kg}$  weight to be lifted up at an uniform speed of  $1.5\text{m/s}$ . 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  $1420\text{ rpm}$ . 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  $230\text{V}$ ,  $960\text{ rpm}$ ,  $200\text{A}$  separately excited motor has an armature resistance of  $0.02\Omega$ . The motor is fed from a chopper which provides a dynamic braking with a braking resistance of  $2\Omega$ .
    - i) Calculate duty ratio of chopper for a motor speed of  $600\text{ rpm}$  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  $2200\text{V}$ ,  $2600\text{ KW}$ ,  $735\text{ rpm}$ ,  $50\text{hz}$ ,  $8\text{ pole}$ ,  $3\text{ – phase}$  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)

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