Code No: R203202B **R20** SET -1

III B. Tech II Semester Supplementary Examinations, December -2023
ELECTRIC DRIVES
(Electrical and Electronics Engineering)

Time: 3 hours Max. Marks: 70

Answer any **FIVE** Questions **ONE** Question from **Each unit**
All Questions Carry Equal Marks
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UNIT-I

1. a) List down the various components of load torques. [7M]
   b) Illustrate the four quadrant operation of drive considering hoist as an example. [7M]

(OR)

2. a) Explain briefly about steady state stability of motor load systems. [7M]
   b) Explain in detail about plugging and regenerative braking. [7M]

UNIT-II

3. Explain in detail about single phase half-controlled rectifier control of self excited motor in continuous and discontinuous conduction mode with waveforms. [14M]

(OR)

4. A 220V, 960 rpm, 12.8 A separately excited DC motor has armature circuit resistance and inductance of 2 ohm and 150 mH, respectively. It is fed from a single-phase fully-controlled rectifier with an ac source voltage of 230V, 50Hz. Calculate [14M]
   (i) Motor torque for $\alpha = 60^0$ and Speed = 600 rpm
   (ii) Motor speed for $\alpha = 60^0$ and T = 20 N-m.

UNIT-III

5. With the help of waveforms, explain in detail about two quadrant DC-DC converter fed separately excited DC motor, when operating in continuous mode? [14M]

(OR)

6. a) Discuss the operation of single quadrant DC-DC converter fed DC motor drive. [7M]
   b) Explain closed loop operation of self excited DC motor with neat diagram. [7M]

UNIT-IV

7. a) Explain variable frequency control of induction motor to obtain speeds below and above base speed. Derive the necessary equations. [7M]
   b) With neat waveforms and circuit diagram, explain the stator voltage control of three phase induction motor using three phase AC voltage regulator. [7M]

(OR)

8. a) Draw the circuit diagram and explain the operation of rotor-resistance control of induction motor. Mention the advantages and disadvantages of the above method of control. [7M]
   b) Explain closed loop operation of slip controlled PWM inverter fed induction motor drives. [7M]

UNIT-V

9. a) Describe separate control mode of operation of a synchronous motor drive in detail. [7M]
   b) Draw the block diagram of closed loop synchronous drive fed from VSI and explain its operation. [7M]

(OR)

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10. A 5MW, 3Ø, 11kV, star-connected, 6-pole, 50 Hz, 0.9 leading pf synchronous motor has $X_s = 10\Omega$ and $R_s = 0\Omega$. The rate field current is 50A. Assume that stator resistance is to be neglected. The machine is controlled by variable frequency control at constant V/f ratio up to base speed and constant V above base speed. Determine [14M]
    (i) The torque and the field current for the rated armature current of 750 rpm and 0.8 pf leading.
    (ii) The armature current and pf for half the rated motor torque, 1500 rpm and rated field current.