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25226

3 Hours / 70 Marks

Seat No.

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- Instructions* – (1) All Questions are *Compulsory*.
(2) Answer each next main Question on a new page.
(3) Illustrate your answers with neat sketches wherever necessary.
(4) Figures to the right indicate full marks.
(5) Assume suitable data, if necessary.
(6) Use of Non-programmable Electronic Pocket Calculator is permissible.
(7) Mobile Phone, Pager and any other Electronic Communication devices are not permissible in Examination Hall.

Marks

1. Attempt any FIVE of the following : 10
- a) Define electric drive.
 - b) List any two applications of special motor drives.
 - c) State the principle of eddy current braking.
 - d) Define inverter used in AC drives.
 - e) Give any two applications of chopper controlled drives.
 - f) State any two disadvantages of rotor resistance speed control method of induction motor.
 - g) State any two advantages of using a microcontroller in electric drive systems.

P.T.O.

2. Attempt any THREE of the following : 12

- a) Draw labelled block diagram of electric drive system and state the function of each block.
- b) Classify different braking methods used for DC shunt motors. Describe rheostatic braking method used in DC shunt motor with the help of a neat diagram.
- c) Classify choppers based on output voltages and quadrant operation.
- d) Explain the use of a servo motor drive with a block diagram in robotics applications.

3. Attempt any THREE of the following : 12

- a) Describe the regenerative braking method used in a DC series motor with the help of a neat circuit diagram.
- b) Draw a circuit diagram of single phase dual converter and describe its operation with quadrant diagram.
- c) State any two advantages and any two disadvantages of the PWM technique used in AC drives.
- d) Compare semi-converter drives and full converter drives on the basis of –
 - i) Quadrant operation
 - ii) Regenerative braking
 - iii) Power flow
 - iv) Harmonic contents.

4. Attempt any THREE of the following : 12

- a) A separately excited DC motor is required to operate in two-quadrant operation. Determine a suitable chopper class and justify its selection.
- b) Explain with neat diagram the operation of chopper controlled DC drive in battery operated electric vehicles.
- c) Explain the use of static slip power recovery in speed control of a slip-ring induction motor with neat diagram.
- d) Describe the components of load torque and their effect on motor operation.
- e) Draw labelled block diagram of Phase Lock Loop (PLL) control DC motor drive. State the function of each block.

5. Attempt any TWO of the following : 12

- a) Explain the suitability of AC drive, DC drive and Permanent Magnet Synchronous Motor (PMSM) drive for each of following application.
 - i) Constant speed applications,
 - ii) Variable speed applications,
 - iii) High - precision applications.
- b) A three - phase induction motor driving a conveyor requires reduced starting current. Explain the role of a soft starter in meeting this requirement with neat diagram.
- c) Explain the working of BLDC motor drive with block diagram and give any two application of it.

6. Attempt any TWO of the following :**12**

- a) Describe the working of single - phase full converter fed separately excited DC motor drive.
 - b) Describe the working principle of a variable frequency drive used for speed control of an induction motor with neat diagram.
 - c) Classify different braking methods used in a three-phase induction motor and give suitable industrial applications (Any one) for each method.
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