**Seat No.: _____** **Enrolment No._____**

# GUJARAT TECHNOLOGICAL UNIVERSITY

**BE - SEMESTER–VI (NEW) - EXAMINATION – SUMMER 2017**

**Subject Code: 2162404** **Date: 27/04/2017**

**Subject Name: Industrial Drives & Control-I**

**Time: 10:30 AM to 01:00 PM** **Total Marks: 70**

**Instructions:**

1. **Attempt all questions.**
2. **Make suitable assumptions wherever necessary.**
3. **Figures to the right indicate full marks.**

| | | | MARKS |
|---|---|---|---|
| **Q.1** | | **Short Questions** | **14** |
| | **1** | Define Electrical Motor Drive. | |
| | **2** | Draw block diagram of Electric Motor Drive. | |
| | **3** | List four function of PEM in EMD. | |
| | **4** | Classify electric drives based on the means of control. | |
| | **5** | Give an expression for the losses occurring in a machine. | |
| | **6** | How heating occurs in motor drives? | |
| | **7** | What is the main purpose of freewheeling diode? | |
| | **8** | Draw the heating & cooling curve of an electric motor. | |
| | **9** | Write down the heat balance equation. | |
| | **10** | What is meant by intermittent duty? | |
| | **11** | What are the components of load torque? | |
| | **12** | What is meant by regenerative braking? | |
| | **13** | State control strategies of choppers. | |
| | **14** | Define firing angle. | |
| **Q.2** | **(a)** | Define Stability of motor load combination. Explain criteria for steady state stability for using seven possible combination of speed and torque curve of motor and load. | **03** |
| | **(b)** | A single phase full converter is used to control the speed of 7.5 KW, 220 V, 1800 rpm separately excited dc motor. The armature resistance is 0.25 Ω and the rated armature current is 20 A. The ac voltage is 240 V. The motor voltage constant is $K_a\phi = 0.0278$ V/radian/min. For a firing angle of $\alpha = 30^0$ and rated motor current, determine (a) the speed of the motor in rpm (b) motor torque. | **04** |
| | **(c)** | List the classes of motor duty and draw the different classes of motor duty with necessary figure including torque, energy losses and temperature rise. | **07** |
| | | **OR** | |
| | **(c)** | Explain the fundamental torque equation indicating dynamics of Electrical Drives. Explain nature and Classification of load torque with necessary figure. | **07** |
| **Q.3** | **(a)** | Draw circuit diagram and explain chopper circuit for motoring control along with necessary characteristics. | **03** |
| | **(b)** | Explain the comparison between : Conventional and Static Ward Leonard Schemes | **04** |
| | **(c)** | Explain closed loop speed control scheme of Separately Excited DC Motor for control of below and above base speed. | **07** |
| | | **OR** | |
| **Q.3** | **(a)** | Draw circuit diagram and explain chopper circuit for motoring control along with necessary characteristics. | **03** |
| | **(b)** | Explain the comparison between : Constant Torque and Constant HP Operation | **04** |

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|---|---|---|---|
| | **(c)** | Explain analysis of 1- Φ Fully controlled converter of Separately Excited DC Motor for continuous and discontinuous conduction of current with necessary waveform and equation | **07** |
| **Q.4** | **(a)** | Draw and Explain the armature current reversible drive using dual converter. | **03** |
| | **(b)** | Explain the comparison between : Active and Passive Load | **04** |
| | **(c)** | Explain analysis of DC Motor Drive used for industrial application for 120 KW with necessary waveform and equation | **07** |

**OR**

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|---|---|---|---|
| **Q.4** | **(a)** | Draw and Explain the field current reversible drive using dual converter. | **03** |
| | **(b)** | Explain the comparison between : In phase and phase shifted operation mode of multiphase chopper | **04** |
| | **(c)** | Using Block Diagram and necessary flow chart explain working of Microcomputer control of DC Drives for constant HP operation. | **07** |
| **Q.5** | **(a)** | Explain Traction drive employing two stage converter feeding four separately excited motors. | **03** |
| | **(b)** | A DC Shunt motor is connected to constant voltage main and drive a load torque which is independent of speed. Prove that if Induced Emf is greater than half of supply voltage, increasing air gap flux per pole and decreases the speed of the motor. | **04** |
| | **(c)** | Draw and explain the PLL system for speed control DC motor under varying load. | **07** |

**OR**

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|---|---|---|---|
| **Q.5** | **(a)** | Draw and explain the block diagram and working of Permanent Magnet DC motor Drives. | **03** |
| | **(b)** | A DC Shunt motor is connected to constant voltage main and drive a load torque which is independent of speed. Prove that if Induced Emf is less than half of supply voltage, decreasing air gap flux per pole and increases the speed of the motor. | **04** |
| | **(c)** | Draw and explain the block diagram and working of Servo Motor Drives. | **07** |

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