Reg.No. \_\_\_\_\_\_\_\_\_\_\_\_

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**End Semester Examination – Nov/Dec – 2018**

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| **Code :** | **14EE2012** | **Duration :** | **3hrs** |
| **Sub. Name :** | **ELECTRIC DRIVES AND CONTROL** | **Max. marks :** | **100** |

**ANSWER ALL QUESTIONS (5 x 20 = 100 Marks)**

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| **Q. No.** | **Sub Div.** | **Questions** | **Course**  **Outcome** | **Marks** |
| 1. | a. | Select the essential parts to construct the block diagram of the Electric drive used for Textile mills. Explain in detail. | CO1 | 12 |
| b. | Elaborate the components of Load torque. | CO1 | 8 |
| (OR) | | | | |
| 2. | a. | “Hoist can be operated in four quadrant while employing DC or AC Drive System”, Explain with necessary diagram. | CO1 | 10 |
| b. | Describe any two types of closed-loop configurations employed in Transportation system. | CO3 | 10 |
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| 3. | a. | Derive the expressions for the overload factor while the motor is in short time duty and intermittent periodic duty cycles. | CO3 | 15 |
| b. | A 200V, 11 A, 2200 rpm shunt motor has the armature and field resistance of 0.5 and 400 Ω respectively attached with the rear wheel of the electric vehicle. It drives a vehicle whose torque is constant at rated motor torque. Calculate motor speed if the source voltage drops to 135V. | CO1 | 5 |
| (OR) | | | | |
| 4. |  | With neat circuit diagram, waveforms and equations, elaborate, how continuous current mode of operation of single phase fully controlled rectifier fed separately excited motor gives good speed regulation. | CO2 | 20 |
|  |  |  |  |  |
| 5. | a. | Describe relative merits and demerits of four quadrant dc drives employing non-circulating and circulating current dual converters. | CO2 | 5 |
| b. | Select the appropriate DC-DC converter for controlling the speed of the separately excited DC motor and explain its operation for motoring, regenerative braking and dynamic braking modes with necessary waveforms and equations. | CO3 | 15 |
| (OR) | | | | |
| 6. |  | A 220V, 300 A DC series motor has combined resistance of armature and field of 0.04Ω. Running on no load as a generator with field winding connected to a separate source it gave following magnetization characteristic at 600 rpm:   |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | | Field  Current A | 50 | 100 | 150 | 250 | 300 | 350 | | Terminal voltage V | 66.5 | 124 | 158.5 | 198.5 | 211 | 221.5 |   Motor is controlled by a chopper from source voltage of 220V.   1. Calculate motor speed for a duty ratio of 0.9 and motor current of 400A 2. Calculate torque for a speed of 550 rpm and duty ratio of 0.9.   When motor is to be controlled by dynamic braking. The chopper available can provide control of duty ratio from 0.06 to 0.95. Calculate braking resistor value so that the maximum braking speed at rated armature current will be 850 rpm. | CO2 | 20 |
|  |  |  |  |  |
| 7. |  | Explain about the closed loop speed control of slip power recovery schemes. | CO3 | 20 |
| (OR) | | | | |
| 8. | a. | Elaborate the method of achieving the closed loop speed control with the help of load commutated inverter for synchronous motor drive. | CO3 | 12 |
| b. | A synchronous motor is controlled by a load commutated inverter, which in turn is fed from a line commutated converter. Source voltage is 6.6 kV,50 Hz. Load commutated inverter operates at a constant firing angle αl of 140° and when rectifying αl = 0° dc link inductor resistance Rd = 0.1 Ω. Drive operates in self control mode with a constant (V/f) ratio. Motor has the details: 8 MW, 3-phase, 6600 V, 6 pole, 50 Hz, unity power factor, star connected, X s = 2.8 Ω, Rs = 0. Determine source side converter firing angles for the following:  Motor operation at the rated current and 500 rpm. What will be the power developed by motor? | CO3 | 8 |
|  | |  |  |  |
|  | | **Compulsory**: |  |  |
| 9. |  | Select the suitable Permanet Magnet Motor Drive for Autonomous Electric Vehicle and explain its operation in detail with neat circuit diagram, waveforms and equations. | CO3 | 20 |