TE202B - Electrical Drive

P. Pages : 2   ‖‖‖‖‖‖‖‖‖‖   **GUG/S/23/13873**

Time : Three Hours   * 2 6 1 0 *   Max. Marks : 80

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Notes :
1. All questions carry equal marks.
2. Due credit will be given to neatness and adequate dimensions.
3. Assume suitable data wherever necessary.
4. Illustrate your answers wherever necessary with the help of neat sketches.
5. Use of slide rule, Logarithmic tables, Steam tables, Mollier's chart, Drawing instruments, Thermodynamic tables for moist air, Psychrometric charts and Refrigeration charts is permitted.

1.   a)   Explain various components of load torque. How will you take into account the effect of coulombs friction and windage in the dynamic analysis of motor-load system.   **8**

      b)   Explain the block diagram of an electrical drive. Also define the important factors for choice of electrical drives.   **8**

<div align="center">OR</div>

2.   a)   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 the moment of inertia of 10 kg-sq meter and a torque of 10 N-m. Other load has translational motion and consists of 1000 kg weight to be lifted up at an uniform speed of 1.5 m/s. Coupling between this load and the motor has efficiency of 85%. Motor has an inertia of 0.2 kg-spm and runs at a constant speed of 1420 rpm. Determine equivalent inertia referred to the motor shaft and power developed by the motor.   **8**

      b)   Explain the Steady state stability of an electric drive with the help of neat figure.   **8**

3.   a)   Discuss about the single phase half controlled converter drives with the help of neat diagram. Also draw the related characteristics waveform.   **8**

      b)   A 220 V, 1500 rpm, 10 A, separately excited dc motor has an armature resistance of 0.06Ω It is fed from a single-phase fully-controlled rectifier with an ac source voltage of 230 V, 50 Hz. Assuming continuous conduction, calculate firing angles for   **8**
a) Half the motor rated torque and 500 rpm.
b) Rated torque and – 1000 rpm.

<div align="center">OR</div>

4.   a)   Define two quadrant chopper drives? Also explain the various types of two quadrant chopper drives.   **8**

      b)   A 200V, 900 rpm, 180 Amp, separately excited DC motor has an armature resistance 0.0422. The motor is fed from a chopper which provides both motoring and breaking operation. The source has a voltage of 220V, Assuming continuous conduction, calculate duty ratio of chopper for-   **8**
i) Motoring operation at rated torque & 400 rpm.
ii) Breaking operation at rated torque & 400 rpm.

5. a) Explain about the stator frequency control for speed control of three phase induction motor. Also drive the expression for the torque speed and draw the torque speed characteristics. **8**

   b) Explain CSI fed Induction Motor Drive. Also write its appcations. **8**

OR

6. a) What do you mean by slip power recovery? Explain Static Scherbius drive system of slip power recovery scheme. **8**

   b) Sketch and explain the Static Kramer's Variable Speed drive system with the help of neat figure. **8**

7. a) Explain various classes of motor duty with neat sketches. **8**

   b) A constant speed drive has the following duty cycle. **8**
   i) Load rising from 0 to 400 kW: 5 min
   ii) Uniform load of 500 kW: 5 min
   iii) Regenerative power of 400 kW returned to the supply : 4 min
   iv) Remains idle for : 2 min

   Estimate power rating of the motor. Assume losses to be proportional to $(\text{power})^2$.

OR

8. a) Explain the frequency of operation of motors subjected to intermittent loads. **8**

   b) Half hour rating of a motor is 100 kW. Heating time constant is 80 min and the maximum efficiency occurs at 70% full load. Determine the continuous rating of the motor. **8**

9. a) Discuss the self controlled synchronous motor drive employing load commuted thyristor inverter along with the neat diagram. **8**

   b) What do you mean by variable frequency control of synchronous motor drives? Also explain its different modes of control. **8**

OR

10. a) Explain the closed loop speed control of load commuted inverter fed synchronous motor drive. **8**

   b) Discuss the self controlled synchronous motor drive employing a cycloconverter along with the neat diagram. **8**

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