Reg. No. : ....

Name : ....

Eighth Semester B.Tech. Degree Examination, April 2016
(2008 Scheme)
08.804 : POWER – SEMI – CONDUCTOR DRIVES (E)

Time : 3 Hours   Max. Marks : 100

Instruction : *Answer all questions from Part A any one question from each Module of Part B.*

PART – A

1. Derive an expression for equivalent moment of inertia and equivalent torque for a motor load system for loads with rotational motion, all referred to motor shaft.

2. Explain the speed torque characteristics of fan and traction loads.

3. Discuss steady state stability criteria of a motor load system.

4. Derive the output equation of a cycloconverter.

5. Why reverse voltage breaking is not possible with single phase half controlled rectifier.

6. Explain the speed torque characteristics of a single phase fully controlled rectifier fed dc separately excited motor at different fixing angles.

7. A 220 V, 24 A, 1000 rpm, separately excited dc motor has an armature resistance of 2 Ω motor is controlled by a chopper with frequency of 500 Hz and source voltage of 230 V. Calculate the duty ratio for 1.2 times rated torque and 500 rpm.

8. Why stator voltage control is suitable for speed control of induction motors in fan and pump drives ?

9. What are the advantages of static rotor resistance control over conventional methods of rotor resistance control ?

10. Why is the power factor of the slip power recovery scheme of speed control of induction motor low ?   **(10×4=40 Marks)**

PART – B

Answer **any one full** question from **each** Module.

Module – I

11. a) Explain the four quadrant operation of a motor driving a hoist load.   **10**

   b) With block diagram explain the closed loop speed control scheme used in electrical drives.   **10**

OR

12. a) Discuss the torque speed characteristics of the motor load system and hence derive the condition for steady state stability.   **8**

   b) Explain the operation of 1ϕ to 3ϕ step down cyclo-converter with circuit diagram and waveforms.   **12**

Module – II

13. a) The speed of a separately excited dc motor is controlled using a single phase half controlled bridge converter with relevant waveforms. Obtain the expression for average armature voltage for discontinuous conduction mode of operation.   **10**

   b) A 220 V, 1500 rpm, 10 A separately excited dc motor is fed from a single phase fully controlled rectifier with an ac source voltage of 230 V, 50 Hz, $Ra = 2\Omega$, conduction can be assumed to be continuous. Calculate.

   i) firing angle for half the rated motor torque and 500 rpm

   ii) motor speed for $\alpha = 45°$ and rated torque.   **10**

OR

14. a) Draw and explain the forward motoring and regenerative braking operation of a chopper fed d.c. motor.   **10**

   b) A 230 V, 1200 rpm, 15 A separately excited motor has an armature resistance of 1.2 Ω. Motor is operated under dynamic braking with chopper control. Braking resistance has a value of 20 Ω.

i) Calculate duty ratio of chopper for motor speed of 1000 rpm and braking torque equal to 1.5 times rated motor torque.

ii) What will be the motor speed for duty ratio of 0.5 and motor torque equal to its rated torque ?   10

Module – III

15. a) Discuss the operation of a voltage source inverter fed 3 phase induction motor.   10

   b) A 440 V, 3 phase, 50 Hz, 6 pole, 945 rpm delta connected induction motor has following parameters referred to the stator $R_s = 2\Omega$, $R'_r = 2\Omega$, $X_s = 3\Omega$, $X'_r = 4\ \Omega$.

When during a fan load at rated voltage, it runs at rated speed. The motor speed is controlled by stator voltage control. Determine :

    i) Motor terminal voltage, current and torque at 800 rpm.

    ii) Motor speed, current and torque for the terminal voltage of 280 V.   10

OR

16. a) Explain the closed loop speed control with static rotor resistance control for a 3 phase squirrel cage induction motor.   10

   b) Explain with diagram thyristor phase control scheme for the speed variation of a 3 phase squirrel cage induction motor.   10