B.E.(with Credits)-Regular-Semester 2012 - Electrical Engineering & (E. & P.) Sem VIII

EP803 - Advanced Electrical Drives

P. Pages : 2 **GUG/W/16/7052**

Time : Three Hours * 4 8 4 0 * Max. Marks : 80

Notes : 1. All questions carry equal marks.
2. Assume suitable data wherever necessary.
3. Illustrate your answers wherever necessary with the help of neat sketches.
4. Use of Non – Programmable calculators is permitted.
5. Student must have to solve the questions as per internal choice.

1. a) In the motor load system, motor and load torques are given by, **6**

$T = 1 + 2\ w_m$ and $T_L = 3\sqrt{w_m}$

obtain the equilibrium points and determine their steady state stability.

b) Draw the block diagram of typical electrical drive system and explain the function of power modulator as a converter. **6**

c) Explain four quadrant operation of electric drives. **4**

OR

2. a) Explain stability of electrical drives & derive its necessary condition. **8**

b) Derive the equations for equivalent torque and equivalent moment of inertia referred to the motor shaft for a typical drive system, with two different loads of which one has the rotational motion connected directly to the motor shaft & another with translational motion connected through gears. **8**

3. a) Explain the working of single phase fully controlled, rectifier fed, separately excited DC motor drives with relevant wave forms. Also obtain the equations to represent speed – torque characteristics. **9**

b) A 220 V, 1500 rpm, 10 Amp sep. Excited DC motor is fed from single phase fully controlled rectifier with an ac source voltage of 230 V, 50Hz, Ra = 2 Ω , Conduction can be assumed to be continuous. Calculate firing angles for **7**

i) Half the rated motor torque and 500 rpm
ii) Rated motor torque and (-1000) rpm.

OR

4. a) What are the various breaking methods of DC Drives? Compare dynamic and regenerative breaking. **6**

b) Draw the drive circuit for two quadrant chopper. Explain its working with armature current & voltage waveforms fed to DC motor. **6**

c) Write short note on control of fractional hp motors. **4**

5. a) Explain the working principle of V/f method of speed control of induction motor with the help of speed – torque characteristics showing all speed ranges for below and above base value. **6**

b) Compare stepped wave and PWM inverter fed induction motor drives. **4**

c) How can you obtain variation in rotor circuit resistance using static control? Draw drive circuit. **6**

OR

6. a) What do you mean by slip power? Explain any one method in detail of utilizing this power for control drive. **8**

b) Draw a neat diagram of 3 phase current source inverter fed induction motor drive. Explain the working in detail. **8**

7. a) With the help of diagram explain the working of reversing cold rolling mill. **8**

b) Explain with reason the type of electrical drives that will be used for following industries **8**
i) Cement mill ii) Paper mill

OR

8. a) Explain with neat diagram the working of automatic slip regulator. Give its area of application. **8**

b) What are the various sections associated with paper industry? How this process are carried out. **8**

9. a) With the help of block diagram explain true synchronous mode of variable frequency synchronous motor drives. What are its main features? **8**

b) A 1000 KW, three phase 6.6 KV, 50Hz, 6 pole, unity power factor, star connected synchronous motor has following parameters $X_s = 30\,\Omega$, $R_s = 0$. Motor is connected by line commutated and load commuted converters in self control mode. The load side converter operates at fixed firing angle of 0^o. When working as a rectifier and fixed firing angle of 150^o when working as an inverter. Calculate the source side converter firing angle for following cases. **8**
i) Motor is operating at rated torque & 750 rpm.
ii) Motor is generating at torque equal to the rated torque & 750 rpm.
Assume that the motor operates at a constant V/f ratio, and neglect commutation overlap. $3 - \phi$ ac source voltage is 6.6 KV. The dc link inductor resistance of $0.2\,\Omega$.

OR

10. a) With the help of equivalent circuit derive expression for steady state torque for the cylindrical rotor synchronous motor. **5**

b) Write brief note on synchronous motor drive using cycloconverter. **5**

c) Describe the operation of brushless dc motor and explain its advantages over unipolar drives. **6**

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