Printed Pages : 3
EEC604

(Following Paper ID and Roll No. to be filled in your Answer Book)

PAPER ID : 2490
Roll No.

B.Tech.
(SEMESTER-VI) THEORY EXAMINATION, 2012-13
INTRODUCTION TO ELECTRIC DRIVES

Time : 2 Hours]
[Total Marks : 50

SECTION – A

1. Attempt **all** question parts.
10 × 1 = 10

(a) State the various triggering methods in SCR.

(b) Distinguish between voltage commutation and current commutation in thyristors circuits.

(c) Define phase angle control.

(d) Compare and contrast series and parallel inverter.

(e) Specify the importance of Jones chopper.

(f) Mention the applications of cyclo-converter.

(g) A 3φ induction motor having 4 poles is fed with 3φ, 50Hz supply. Find the slip when the motor is running at 1400 rpm.

(h) Mention the significance of rotor resistance control.

(i) Why Chopper based D.C drives give better performance than rectifier controlled drives ?

(j) What is slip power recovery system ?

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SECTION – B

2. Attempt any **three** question parts : $3 \times 5 = 15$

    (a) A single phase half wave controlled rectifier is connected to RL load. Derive an expression for the load current in terms of V_m, Z etc.

    (b) Explain the various terms involved in, turn in and turn off time of SCRs in dynamic characteristics.

    (c) Describe the principle of step-up chopper. Derive an expression for the average output voltage in terms of input voltage and duty cycle.

    (d) Discuss about the braking operation of the rectifier controlled separately excited motor with neat sketch.

    (e) A single phase, 220V, 50Hz, 1425 rpm induction motor has the following parameters $R_a = 1.5\ \Omega$, $R_r = 3\ \Omega$, $X_s = X'_r = 2\ \Omega$ and $X_m = 45\ \Omega$. The motor drives a fan load at the rated speed when the rated voltage is applied. The motor speed is controlled by varying the terminal voltage. Calculate the motor terminal voltage for a speed of 1260 rpm. Also calculate the output power at 1260 rpm as the percentage of the rated power.

SECTION – C

Attempt **all** questions : $5 \times 5 = 25$

3. Attempt any **one** part. $1 \times 5 = 5$

    (a) A 200V, 10.5A, 2000 rpm DC Shunt Motor has the armature and field resistances of 0.5 Ω and 400 Ω respectively. It drives a load whose torque is constant at rated motor torque. Calculate the motor speed of the source voltage drops to 175 V.

    (b) Illustrate about the power factor improvement schemes.

4. Attempt any **one** part : $1 \times 5 = 5$

    (a) Sketch the static V-I characteristics of a thyristors. Label the various voltages, currents and the operating modes on this sketch. Explain them.

    (b) Define di/dt and dv/dt protection of SCRs. What are the components used to protect SCR from dv/dt and di./dt large values.

5. Attempt any **one** part : 1 × 5 = 5

   (a) Describe a 3 phase full wave diode bridge rectifier with a circuit diagram and relevant waveforms for load R.

   (b) Explain the operation of single phase full wave controlled rectifier with necessary waveforms.

6. Attempt any **one** part : 1 × 5 = 5

   (a) What is current limit control ? How does it differ from time ratio control ? Which of these control strategies is preferred over the other and why ?

   (b) Give a note on the principle of operation of three phase half wave cyclconverter with neat diagram.

7. Attempt any **one** part : 1 × 5 = 5

   (a) A three-phase, 460 V, 60 Hz, 6 pole, star connected cylindrical rotor synchronous motor has synchronous reactance of X_s = 2.5 Ω per phase and the armature resistance is negligible. The load torque, which is proportional to the speed squared is I_L = 398 N-m at 1200 rpm. The power factor is maintained at unity by field control and the voltage to frequency ratio is kept constant at the rated value. If the inverter frequency is 36Hz and the motor speed is 720 rpm determine the following :

   I.   The input voltage E_a

   II. The armature current I_a

   (b) Enumerate the variable frequency control of an induction motor.

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