DIPLOMA IN ELECTRICAL ENGINEERING (DELVI)/ADVANCED LEVEL CERTIFICATE COURSE IN ELECTRICAL ENGINEERING (ACELVI)   0 1 1 1 1

Term-End Examination

December, 2012

BIEE-030 : INDUSTRIAL DRIVES AND CONTROLS

Time : 2 hours   *Maximum Marks : 70*

Note : (i)   All the questions are to be answered in English only.

*(ii)   Attempt **any five** questions. Question No. 1 is **compulsory**.*

1.   Attempt the following objective type questions :   7x2=14

(a)   In a thyristor holding current

(i)   more than latching current

(ii)   less than latching current

(iii)   equal to latching current

(iv)   very high

(b)   In a single phase semiconverter the average output voltage is given by :

(i) $\dfrac{1}{\pi}\displaystyle\int_{\alpha}^{\pi} V_m \cos \omega t \, d(\omega t)$

(ii) $\dfrac{1}{\pi}\displaystyle\int_{\pi/2-\alpha}^{\pi/2+\alpha} V_m \cos \omega t \, d(\omega t)$

(iii) $\dfrac{1}{\pi} \displaystyle\int_{\alpha-\pi/2}^{\pi/2} V_m \cos \omega t \, d(\omega t)$

(iv) $\dfrac{1}{\pi} \displaystyle\int_{\alpha-\pi/2}^{\pi} V_m \cos \omega t \, d(\omega t)$

(c)   In case of DC motor, speed more than rated speed can be obtained by :

(i)   Field control method

(ii)   Armature voltage control method

(iii)   Armature resistance control method

(iv)   None of the above

(d)   Which rule is applicable in determining the direction of rotation of a DC motor ?

(i)   Fleming's left hand rule

(ii)   Fleming's right hand rule

(iii)   Lenz's Law

(iv)   Both (i) and (ii)

(e)   In a 6 pulse bridge diode 3 phase rectifier each diode conducts for :

(i)   60°   (ii)   90°

(iii)   120°   (iv)   30°

(f)   Pole changing method of speed control is used in :

(i)   Slip ring induction motor

(ii)   Squirrel cage induction motor

(iii)   DC shunt motor

(iv)   DC series motor

(g) In a CSI if frequency of output voltage is f Hz, then frequency of voltage input to CSI is :

(i) f   (ii) 2f

(iii) f/2   (iv) 3f

2. (a) Explain the line commutated inverter.   2x7=14

     (b) A 220 V dc series motor runs at 1000 rpm and takes an armature current of 100 A when driving a load with a constant torque, r_a and R_f are 0.05 each. Find the magnitude of motor speed and armature current, if the motor terminal voltage is reversed and the number of turns in the field winding is reduced to 80%. Assume linear magnetic circuit.

3. (a) Explain the operation of 3 - phase semi controlled rectifier feded by separately excited D.C motor. Draw its N- T characteristic also.   2x7=14

     (b) The speed of the separately excited dc motor is controlled by means of a 3 - phase semi converter from a 3-phase 415 V, 50 Hz supply. The motor constants are : Inductance 10mH, resistance 0.9 ohm and armature constant 1.5 V/rad/s. Calculate the speed of this motor at a torque of 50 Nm when the converter is fired at 45°. Neglect losses in the converter.

4. (a) A fully controlled rectifier is feeding a separately excited motor driving a friction load. Motor is operating in steady state with a rectifier firing angle of 30°. Firing angle is now changed from 30° to 60°. Explain how the motor current and speed will change.

   (b) Describe how the speed of a dc series motor can be controlled by means of a dc chopper.   **2x7=14**

5. (a) A dc series motor is fed from 600 V dc source through a chopper. The dc motor has following parameters.   **2x7=14**

   r_a = 0.04 Ω, r_s = 0.06 Ω, $K = 4 \times 10^{-3} Nm/amp^2$. The average armature current of 300 A is ripple free. For a chopper duty cycle of 60% determine :

   (i) input power from the source

   (ii) motor speed and

   (iii) motor torque.

   (b) Explain the closed loop operation of chopper fed D.C. drives.

6. (a) Give the general circuit layout of a single phase dc drive. Enumerate the various 1 - phase dc drives used.   **2x7=14**

   (b) Compare the AC and DC drives.

7. (a) Explain the closed loop operation of induction motor drives.   2x7=14

    (b) Explain V/f control for a 3 - phase induction motor for its speed control. Enlist its advantages.

8. Write short notes on *any four* :   4x3½=14

    (a) V - I characteristic of an SCR

    (b) Cycloconverter

    (c) Multiquadrant operation of rectifier fed dc drives.

    (d) N - T characteristic of DC series motor

    (e) PWM control of an inverter

    (f) Induction motor speed control through CSI

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