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

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Term-End Examination

December, 2017

BIEE-030 : INDUSTRIAL DRIVES AND CONTROLS

Time : 2 hours   *Maximum Marks : 70*

Note : *Question no. 1 is **compulsory**. Attempt any **five** questions. Use of scientific calculator is permitted.*

1. Attempt the following objective type questions : *7×2=14*

    (a) The output voltage of a fully controlled converter is maximum when the firing angle is

    (i) zero

    (ii) $\pi/2$

    (iii) 2π

    (iv) $3\pi/2$

(b)   In a three-phase fully controlled converter, the freewheeling diode comes into operation and improves the

    (i)   load current

    (ii)   input power factor

    (iii)   Both (i) and (ii)

    (iv)   Neither (i) nor (ii)

(c)   A DC motor can be represented as

    (i)   R load

    (ii)   RL load

    (iii)   RLC load

    (iv)   RLE load

(d)   The source inductance of VSI is _____ CSI.

    (i)   more than

    (ii)   less than

    (iii)   equal to

    (iv)   half the

(e)   Choppers can be used in

    (i)   First quadrant

    (ii)   Second quadrant

    (iii)   Fourth quadrant

    (iv)   All of the above

(f)   The output wave of a chopper is

  (i)   non-sinusoidal

  (ii)   sinusoidal

  (iii) same as input

  (iv)   None of the above

(g)   Closed loop control of drives provide

  (i)   Enhancement of speed of response

  (ii)   Protection

  (iii) Improving accuracy

  (iv)   All of the above

2. A 400 V, three-phase AC supply feeds a separately excited DC motor through two three-phase full converters, one for armature and the other for field. The firing angle of the field converter is zero. The armature current is equal to a rated value of 50 A. The motor voltage constant is 1·3 V/A-rad/sec. The speed is 1200 rpm. Find the firing angle of the converter in the armature circuit. Given $R_a = 0·3\ \Omega$ and $R_f = 250\ \Omega$.   *14*

3. Explain the operation of a single-phase fully controlled converter-fed DC separately excited motor. Draw the wave shapes of output voltage and derive its expression. Also show the current wave shape for continuous conduction.   *14*

4. Derive the speed – torque expression of a DC separately excited motor. Explain the operation of a chopper-fed DC separately excited motor and draw the wave shapes of output voltage. *14*

5. What are the methods of speed control of an induction motor ? Explain the variable frequency control of an induction motor by a cycloconverter. *14*

6. Draw the complete block diagram for the closed loop control of a DC motor drive. Explain each block and justify how it can improve the accuracy. *14*

7. Write short notes on any *two* of the following : *2×7=14*

   (a) Closed Loop Control of an Induction Motor Drive

   (b) Four Quadrant Operation of a Chopper-fed DC Drive

   (c) Advantages of Continuous Current Operation of a DC Drive

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