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

Term-End Examination

December, 2015

BIEE-030 : INDUSTRIAL DRIVES AND CONTROLS

Time : 2 hours   *Maximum Marks : 70*

Note : *All the questions are to be answered in English only. Attempt any **five** questions. Question no. **1** is* **compulsory.**

1. (a)   State *'True'* or *'False'*.   8

   (i)   A chopper is a d.c. – d.c. converter.

   (ii)   DC motors cannot be controlled by chopper.

   (iii) A semi-converter operates in two quadrants.

   (iv)   The use of freewheeling diode improves the wave-shapes of load current.

(v) In a 3-phase fully controlled converter, six pulses of output in one cycle of input can be observed.

(vi) All inverters use forced commutation.

(vii) The output voltage of a cycloconverter cannot be changed.

(viii) A cycloconverter is a group of controlled rectifiers.

(b) Fill in the blanks.   6

(i) _____ motor cannot be operated without load.

(ii) _____ have six pulses in the output for one cycle of input.

(iii) Electric drives is the circuit which controls the _____ of the motor.

2. (a) Explain the operation of a single phase full converter fed d.c. drive along with proper waveforms.   7

(b) Full converters are better choice as compared to semi-converters for d.c. motor drives. Comment on the statement.   7

3. (a) Derive the expressions for the average value of output voltage and current for a 3-phase full converter.   7

(b) A 220 V, 1500 rpm, 50 A separately excited motor with an armature resistance of 0·5 Ω is fed from a 3-phase full converter with an a.c. source having line voltage 440 V, 50 Hz. Determine the value of firing angle when the motor is running at 1200 rpm and rated torque. Rated terminal voltage is obtained at α = 0°. 7

4. (a) Describe the working of a chopper-controlled separately excited d.c. motor and derive the expression of armature current. 7

(b) Explain the four quadrant operation of a d.c. drive. 7

5. (a) What are the basic components of electric drives ? 7

(b) Enumerate the merits and demerits of a.c. drives and d.c. drives. 7

6. (a) Explain the variable frequency control of an induction motor by VSI. 7

(b) Explain the speed – torque characteristics of induction motors. 7

7. (a) Describe the working of closed-loop control of a chopper fed d.c. drive. Explain with a block diagram. 7

(b) A 230 V, 960 rpm, 200 A separately excited d.c. motor has an armature resistance of 0·02 Ω and source voltage of 230 V. Calculate the duty ratio of chopper at rated torque and 350 rpm. Assume continuous conduction.   7

8. Write short notes on any *four* of the following : $4 \times 3\frac{1}{2} = 14$

    (a) Current Source Inverter

    (b) Cycloconverters

    (c) Closed-loop operation of induction motor drives

    (d) Continuous current operation

    (e) Speed and torque equations of d.c. motor

    (f) PWM Control