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

00925

Term-End Examination

December, 2014

BIEE-030 : INDUSTRIAL DRIVES AND CONTROLS

Time : 2 hours *Maximum Marks : 70*

Note : *Attempt any **five** questions. All questions carry equal marks. Question no. **1** (objective type) is **compulsory**. Draw neat and clean diagrams, if any required.*

1. Attempt all objective type questions. *7×2=14*

(a) A full converter feeding a DC motor

(i) requires a FWD to conduct the motor current during the period all SCR's are OFF.

(ii) requires a FWD to reduce the current to be conducted by the SCR's.

(iii) does not require FWD as there is no period when the motor is disconnected from the supply.

(iv) does not require FWD as the freewheeling action is performed by SCR's themselves.

(b) Which of the following converters can feed power in any of the four quadrants ?

(i) Semi-converter

(ii) Full converter

(iii) Dual converter

(iv) Combination of semi and full converters

(c) The advantage of the tachometer speed control method for DC motor is that, it senses

(i) back e.m.f.

(ii) armature current

(iii) armature voltage

(iv) speed

(d) For DC motors, dual converter is used to obtain

(i) reversible speed control

(ii) regenerative braking

(iii) plugging

(iv) All of the above

(e) A DC chopper circuit controls the average voltage across the DC motor by

(i) controlling the input voltage

(ii) controlling the field current

(iii) controlling the line current

(iv) continuously switching ON and OFF the motor for fixed duration of t_{ON} and t_{OFF} respectively

(f) Variable voltage fixed frequency supply can be obtained from

(i) 3-phase cyclo converter

(ii) AC chopper

(iii) 3-phase inverter

(iv) None of the above

(g) In a 3-phase induction motor, the general speed control method used is the

(i) fixed voltage fixed frequency method

(ii) variable voltage variable frequency method

(iii) fixed voltage variable frequency method

(iv) None of the above

2. (a) Explain how a thyristor bridge can be used for speed control of DC shunt motor.

(b) List out the applications of phase control converters. *7+7=14*

3. (a) How do you specify an SCR and what are its important ratings ?

(b) Explain the difference in operation of a semi-converter and full converter with the help of waveform analysis. *7+7=14*

4. (a) How does a FWD (freewheeling diode) affect the performance of a DC motor drive ? Explain.

(b) Describe the operation of a DC chopper circuit. How is it able to regulate the DC voltage level ? *7+7=14*

5. (a) Explain how a DC motor speed control can be obtained using a chopper.

(b) Draw the waveforms for full converter series motor drive. *7+7=14*

6. (a) Describe the way to control the speed of an induction motor by varying the frequency. What quantity should remain relatively constant over most of the operating range ?

(b) Compare a DC motor thyristor drive with an induction motor thyristor drive. *7+7=14*

7. (a) Explain the difference between a voltage-source-inverter drive and a current-source-inverter drive for an induction motor.

(b) Explain the principle of PWM of an inverter. How does it lead to lower harmonic content of the AC voltage compared to other methods of firing the inverter circuit ? *7+7=14*

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

(a) 1-phase full wave converter feeding a separately excited DC motor

(b) Electric braking and heating, cooling of motors

(c) Stator voltage control of induction motor

(d) Speed-torque characteristics and expressions for DC series motor

(e) Differences between diode rectifier and SCR rectifier

(f) AC voltage controller