

B.Tech. VI Semester (Main/Back) Examination, May-June 2015

Electronics and Communication Engg.

6EC3A Industrial Electronics

(Common for AI,EC,EI)

Time : 3 Hours

Maximum Marks : 80

Min. Passing Marks : 24

**Instructions to Candidates:**

Attempt any **five** questions, selecting **one** question from **each** unit. All questions carry **equal** marks. (Schematic diagrams must be shown wherever necessary. Any data you feel missing suitably be assumed and stated clearly. Units of quantities used/calculated must be stated clearly.)

1. a) What is a thyristor? Give constructional details of a typical thyristor. Describe the mode of a typical thyristor with the help of its static V-I characteristics. (8)
- b) Give the cross-sectional view of a triac and explain its turn-on process with relevant diagrams. Hence show that a triac is rarely operated in first quadrant with negative gate current and in third quadrant with positive gate current (8)

**OR**

1. a) How does a GTO differ from a conventional thyristor. Give its circuit symbol and static V-I characteristics. Under what conditions, it may work as a low gain transistor. (5)
- b) Discuss the turn off process in a GTO with the help of appropriate voltage and current waveforms. (6)
- c) Give the merits and demerits of a GTO as compared to conventional thyristor. (5)

## Unit - II

2. a) For a single-phase one-pulse controlled converter system, sketch waveforms for load voltage and load currents for
- i) RL load and
  - ii) RL load with freewheeling diode across RL (8)
- b) Describe the working of a single-phase half bridge inverter what is its main drawback? Explain how this drawback is overcome. (8)

OR

2. a) Describe the working of a single phase one pulse SCR controlled converter with RLE load through the waveform of supply voltage, load voltage, load current and load voltage across the SCR (8)
- b) Explain the voltage source inverter with the help of suitable circuitry and waveforms (8)

## Unit - III

3. a) What is SMPS? Give its operating principle and industrial applications (8)
- b) Describe the principle of step-up chopper. Derive an expression for the average output voltage in terms of input dc voltage and duty cycle. State the assumption made. (8)

OR

3. a) Explain the uninterruptible power supply with their suitable diagrams. (8)
- b) A step-up chopper has input voltage of 220V and output voltage of 660V. If the non-conducting time of thyristor is  $100\mu s$ . compute the pulse width of output voltage (8)

## Unit - IV

4. a) Induction motor speed control with constant-supply voltage and reduced-Supply frequency is rarely used in practice. Justify this statement (6)
- b) Describe Stator frequency control for the speed control of a 3-phase induction motor. Discuss why during this method of speed control, an induction motor is said to be working in field-weakening mode. (10)

**OR**

4. Describe how the speed of a separately-excited dc motor is controlled through the use of two 3-phase full converters. Discuss how two-quadrant drives can be obtained from this scheme.

Derive expression for rms values of source and thyristor currents state the assumptions made. (16)

**Unit - V**

5. Write short note on the following (8)
- a) Variable reluctance stepper motor (8)
  - b) Induction heating control

**OR**

5. Write short note on the following
- a) Permanent magnet stepper motor (8)
  - b) Dielectric heating control (8)