BIELE-005

DIPLOMA – VIEP – ELECTRONICS AND COMMUNICATION ENGINEERING (DECVI)

Term-End Examination

00386 **June, 2015**

BIELE-005 : INDUSTRIAL ELECTRONICS

Time : 2 hours *Maximum Marks : 70*

Note : *Question no. 1 is* **compulsory.** *Attempt any* **four** *questions from the rest. Missing data may be assumed suitably. Use of scientific calculator is permitted. All questions carry equal marks.*

1. Choose the correct answer : 7×2=14

   (a) When a UJT is used for triggering an SCR, the shape of the waveform of the voltage obtained from the UJT circuit is

   (i) Sine wave

   (ii) Saw tooth wave

   (iii) Square wave

   (iv) None of the above

   (b) The turn-off time of a transistor is

   (i) $t_{OFF} = t_d + t_f$

   (ii) $t_{OFF} = t_s + t_f$

   (iii) $t_{OFF} = t_d + t_r$

   (iv) $t_{OFF} = t_d + t_s$

(c) A freewheeling diode is used in a controlled rectifier circuit in the case of

(i) a resistive load

(ii) an inductive load

(iii) a capacitive load

(iv) All the above

(d) In a single-phase full converter, for continuous conduction each pair of SCRs conduct for

(i) $\pi - \alpha$

(ii) π

(iii) α

(iv) $\alpha - \pi$

(e) An ideal transistor switch has

(i) zero ON-value resistance

(ii) infinite OFF-value resistance

(iii) no power loss

(iv) None of the above

(f) In a three-phase full wave fully controlled bridge rectifier each SCR conducts for a duration of

(i) 120°

(ii) 60°

(iii) 45°

(iv) 180°

(g) In a UJT, with V_{BB} as the voltage across two base terminals, the emitter potential at peak point is given by

(i) ηV_{BB}

(ii) ηV_D

(iii) $\eta V_{BB} + V_D$

(iv) $\eta V_D + V_{BB}$

2. (a) Define latching and holding currents as applicable to an SCR. Show these currents on the static volt-ampere characteristic curve of an SCR. 7

(b) Explain the different methods for turning on of an SCR. 7

3. (a) Why is a separate freewheeling diode not needed in the case of a single-phase full wave, half controlled bridge rectifier ? 7

(b) Explain the construction and draw the V-I characteristic curve of a Triac. 7

4. (a) A unijunction transistor used for triggering the silicon controlled rectifier has $R_{B1} = 4$ kΩ and $R_{B2} = 2 \cdot 5$ kΩ. Find

(i) the value of intrinsic stand-off ratio.

(ii) Peak point voltage, if $V_{BB} = 15$ V and barrier potential $= 0 \cdot 7$ V. 7

(b) Explain the working of an oscillator employing UJT for triggering the SCR. 7

5. Explain how can the transistor can be used as a switching element, with the help of its output characteristic curve for a switching transistor. Also compare the transistor and SCR as switching elements. *14*

6. (a) Explain the principle of operation of IGBT. What are its advantages over the power transistors ? *7*

(b) Differentiate between full controlled bridge rectifiers and half controlled bridge rectifiers. *7*

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

(a) Three-phase half-wave Delta-Wye rectifier

(b) dv/dt triggering

(c) MOS controlled Thyristor