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No. of Printed Pages : 4

BIELE-005

DIPLOMA – VIEP – ELECTRONICS AND COMMUNICATION ENGINEERING (DECVI)

Term-End Examination

December, 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.*

1. Choose the correct answer : *7×2=14*

(a) Latching current in a P-N-P-N SCR is

(i) normal operating current

(ii) current corresponding to break-over voltage

(iii) minimum current to keep the device on

(iv) None of the above

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

(i) 120°

(ii) 60°

(iii) 45°

(iv) 30°

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

(i) ηV_{BB}

(ii) ηV_D

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

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

(d) A UJT exhibits a negative resistance region

(i) before the peak point

(ii) between the peak point and the valley point

(iii) after the valley point

(iv) None of the above

(e) An ideal transistor switch has

(i) infinite ON-value resistance

(ii) zero OFF-value resistance

(iii) no power loss

(iv) None of the above

(f) The turn-on time of a transistor is

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

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

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

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

(g) In a single-phase semi-converter, for continuous conduction, freewheeling diode conducts for

(i) ∞

(ii) $\pi - \alpha$

(iii) π

(iv) $\alpha - \pi$

2. (a) Draw a two-transistor representation of a silicon-controlled rectifier (SCR) and describe the method and condition for its conduction. *7*

(b) Give the schematic representation of the basic structure of a power transistor and explain its working. *7*

3. (a) Explain the construction and draw the volt – ampere characteristic of an Insulated Gate Bipolar Transistor (IGBT). *7*

(b) Give comparison among Power MOSFET, Power Transistor and Power IGBT. *7*

4. (a) The intrinsic stand-off ratio for UJT is determined to be 0·60. Inter base resistance is 7 kΩ. What are the UJT static values of R_{B_1} and R_{B_2} ? *7*

(b) Explain the V – I characteristic curve of UJT. Why is it called current-controlled negative-resistance device ? *7*

5. (a) For a single-phase half-wave controlled rectifier system, sketch the waveforms for load voltage and load current for (i) RL Load, and (ii) RL load with freewheeling diode. 7

(b) Explain the construction and characteristics of DIAC. 7

6. (a) With the help of a neatly labelled circuit diagram explain the working principle of a single-phase full wave half-controlled bridge rectifier using two SCRs and two diodes. 7

(b) Explain the forward voltage triggering and gate triggering methods for turning on a thyristor. 7

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

(a) Three-phase Delta-Wye Bridge Rectifier

(b) GTO

(c) Resistance Capacitance (RC) Firing Circuit