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BIELE-005

DIPLOMA – VIEP – ELECTRONICS AND COMMUNICATION ENGINEERING (DECVI)

Term-End Examination

00306 **December, 2014**

BIELE-005 : INDUSTRIAL ELECTRONICS

Time : 2 hours *Maximum Marks : 70*

Note : *Attempt any **five** questions. Question no. **1** is **compulsory**. All questions carry equal marks. Missing data may be suitably assumed.*

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

(a) In a BJT

(i) $\beta = \alpha / (\alpha + 1)$

(ii) $\beta = \alpha / (\alpha - 1)$

(iii) $\alpha = \beta / (\beta - 1)$

(iv) $\alpha = (\beta + 1) / \beta$

(b) Secondary breakdown occurs in

(i) MOSFET but not in BJT

(ii) Both MOSFET and BJT

(iii) BJT but not in MOSFET

(iv) None of these

(c) On-state voltage drop across a thyristor used in a 250 V supply system is of the order of

(i) 100 – 110 V

(ii) 240 – 250 V

(iii) 1 to 1·5 V

(iv) 0·5 to 1 V

(d) A forward voltage can be applied to an SCR after its

(i) anode current reduces to zero

(ii) gate recovery time

(iii) reverse recovery time

(iv) anode voltage reduces to zero

(e) In a 1-ϕ full converter, for continuous conduction, each pair of SCRs conduct for

(i) $\pi - \alpha$

(ii) π

(iii) α

(iv) $\pi + \alpha$

(f) In controlled rectifiers, the nature of load current is continuous or discontinuous

(i) does not depend on type of load and firing angle delay

(ii) depends both on the type of load and firing angle delay

(iii) depends only on the type of load

(iv) depends only on the firing angle delay

(g) In a 3-ϕ half wave rectifier, DC output voltage is 230 V. The peak inverse voltage across each diode is

(i) 481·7 V
(ii) 460 V
(iii) 345 V
(iv) 230 V

2. (a) Explain the safe operation area for power transistor.

(b) Compare MOSFET with BJT. *7+7=14*

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

(i) GTO

(ii) DIAC

(iii) IGBT

(iv) MOS controlled thyristors

4. (a) Explain two transistor model of SCR.

(b) Explain resistor capacitor full wave trigger circuit for SCR. *7+7=14*

5. (a) Explain resonant-pulse commutation turn-off circuit for SCR.

(b) A resonant-pulse commutation circuit has C = 20 μF and L = 5 μH. Initial voltage across capacitor is V_s = 230 V. For a constant load current of 300 A, calculate the

(i) conduction time for the auxiliary thyristor.

(ii) voltage across the main thyristor when it gets commutated. *7+7=14*

6. (a) Explain 3-ϕ Delta-Wye bridge rectifier.

(b) A 1-ϕ mid-point SCR converter supplies constant load current of 5 A when the triggering angle is maintained at 35°. The input voltage to converter is 220 V at 50 Hz. The turns ratio from primary to each secondary is 0·5. Determine the load voltage and input power factor. *7+7=14*

7. (a) A 1-ϕ semi-converter delivers power to RLE load with R = 5 Ω, L = 10 mH and E = 80 V. The AC source voltage is 230 V, 50 Hz. For a continuous conduction, find the average value of output current for a firing angle delay of 50°.

(b) An RL load is fed from 1-ϕ supply through a thyristor. Derive an expression for load current in terms of supply voltage, frequency, R and L. Indicate time limit during which this solution is applicable. *7+7=14*