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BIELE-005

DIPLOMA – VIEP – ELECTRONICS AND COMMUNICATION ENGINEERING (DECVI)

00495

Term-End Examination

June, 2014

BIELE-005 : INDUSTRIAL ELECTRONICS

Time : 2 hours *Maximum Marks : 70*

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

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

(a) In a diode, the cut-in voltage and forward voltage drop are respectively.

(i) 0·7 V, 0·7 V

(ii) 0·7 V, 1 V

(iii) 0·7 V, 0·6 V

(iv) 1 V, 0·7 V

(b) As compared to Power MOSFET, a BJT has

(i) lower switching losses but higher conduction loss

(ii) higher switching losses and higher conduction loss

(iii) higher switching losses but lower conduction loss

(iv) lower switching losses and lower conduction loss

(c) In a thyristor, anode current is made up of

(i) electrons only

(ii) electrons or holes

(iii) electrons and holes

(iv) holes only

(d) In a thyristor, ratio of latching current to holding current is

(i) 0·4

(ii) 1·0

(iii) 2·5

(iv) 6·0

(e) In a UJT, with V_{BB} as 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) $\eta V_D + V_{BB}$

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

(i) α

(ii) $\pi - \alpha$

(iii) π

(iv) $\pi + \alpha$

(g) In a $1 - \phi$ full converter, if load current is I and ripple free, then average thyristor current is

(i) $\frac{1}{2}$ I

(ii) $\frac{1}{3}$ I

(iii) $\frac{1}{4}$ I

(iv) I

2. (a) Explain steady-state characteristics for BJTs.

(b) Explain BJT switching performance. *7+7=14*

3. (a) Explain static V – I characteristics of a thyristor.

(b) Explain forward voltage triggering and gate triggering turn-on methods for a thyristor. *7+7=14*

4. (a) Write short notes on the following :

(i) TRIAC

(ii) SUS

(b) A Relaxation Oscillator using a UJT, as shown in Figure 1 is to be designed for triggering an SCR. The UJT has the following characteristics :

η = 0·72, I_P = 0·6 mA, V_P = 18·0 V, V_V = 1·0 V, I_V = 2·5 mA, R_{BB} = 5 kΩ, normal leakage current with emitter open = 4·2 mA.

The firing frequency is 2 kHz. For C = 0·04 μF, compute the value of R, R_1 and R_2. *7+7=14*

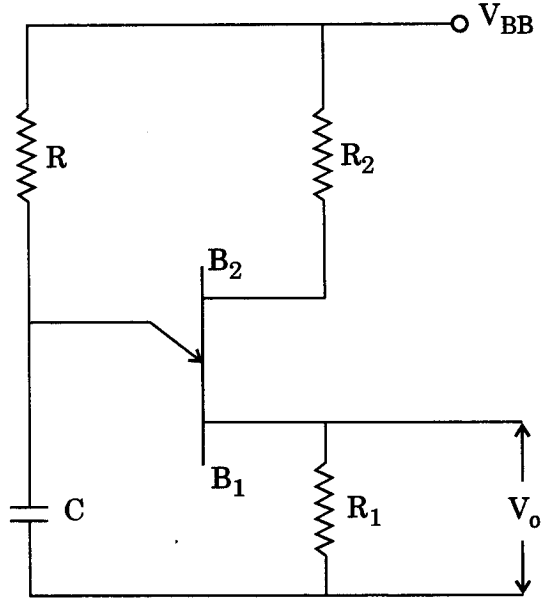

Figure 1

5. (a) A 1 – ϕ half wave SCR circuit feeds power to a resistive load. Draw waveforms for load current and voltage across the SCR for a given firing angle α.

(b) A resistive load of 10 Ω is connected through a half wave SCR circuit to 220 V, 50 Hz, 1 – ϕ source. Calculate the power delivered to load for a firing angle of 60°. Find also the value of input power factor. *7+7=14*

6. (a) For a 1 – ϕ one pulse controlled converter system, sketch waveforms for load voltage and load current for (i) RL load and (ii) RL load with freewheeling diode across RL.

(b) A 230 V, 50 Hz, one pulse SCR controlled converter is triggered at firing angle of 40° and load current extinguishes at an angle of 210°. Find average output voltage and average load current for R = 5 Ω and L = 2 mH. *7+7=14*

7. (a) Explain working of 3 – ϕ full controlled rectifier.

(b) A 3 – ϕ full converter charges a battery from a 3 – ϕ supply of 230 V, 50 Hz. The battery emf is 200 V and its internal resistance is 0·5 Ω. On account of an inductance connected in series with battery whose charging current is constant at 20 A, compute firing angle delay and the supply power factor. *7+7=14*