Total No. of printed pages = 4

CAI-504/PE/5th Sem/2016/N

POWER ELECTRONICS

Full Marks – 70

Pass Marks – 28

Time – Three hours

The figures in the margin indicate full marks for the questions.

Answer any *five* questions.

1. (a) What do you mean by cut-in voltage of a diode? Describe the reverse recovery characteristics of a diode and define its softness factor. 1+4=5

   (b) What do you understand by the term 'second breakdown' in power transistor ? 2

   (c) Explain the significance of junction temperature in semiconductor devices. 2

   (d) Explain the different modes of operation of SCR with the help of its I-V characteristics. 5

[Turn over

2. (a) The intrinsic stand-off ratio of a UJT is 0.67. If RB_1 = 4 KΩ, find the value of RB_2. 2

(b) In the figure 1 given below, the maximum gate current (I_{gm}) and voltage (V_{gm}) of the SCR are 200 mA and 2V respectively. Determine : 4+4=8

(i) R_1 and R, so that I_{gm} and V_{gm} do not exceed their maximum ratings.

(ii) Find a suitable value for R_2 so that the firing angle will be 60°, if the gate turn-on voltage V_{gt} = 0.8V.

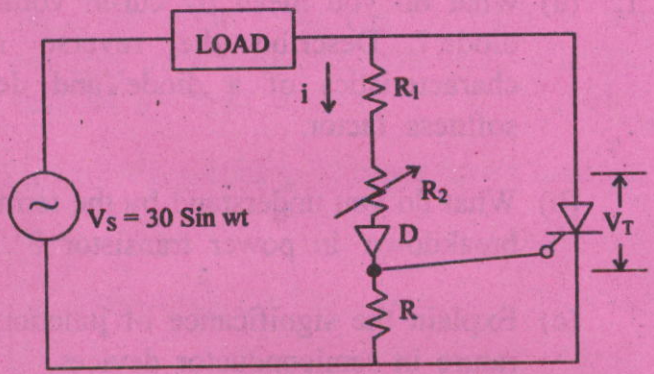

Figure – 1

(c) Describe the method of line commutation to turn-off a thyristor. 4

3. (a) With the help of voltage and current waveforms, explain the working of single phase half-wave circuit with R-L load. 8

(b) In the circuit given below, the thyristor 'T' is turned on at t = 0. Determine : 6

(i) resonant frequency of the circuit

(ii) conduction time of thyristor

(iii) voltage across thyristor after it is turned off.

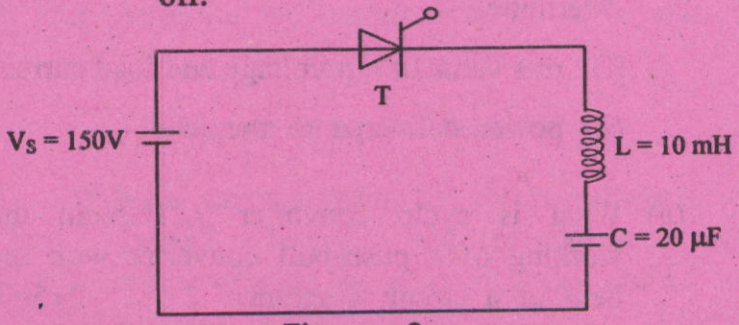

Figure – 2

4. (a) What is the function of chopper ? Explain its principle of operation. 1+4=5

(b) For a type A chopper, calculate the average and rms values of output voltage and chopper efficiency, if D.C source = 200V, Load R = 10Ω, Duty cycle = 0.4 and Voltage drop across chopper when it is on 2V. 6

(c) Mention some advantages of a single phase full-bridge inverter over half-bridge inverter. 3

5. (a) Explain the working of a single phase half-wave A.C voltage controller. 10

(b) A single phase half-wave A.C voltage controller feeds a load of R = 20Ω with an input voltage of 230V, 50 Hz. If both the thyristors are fired at an angle of 45°, determine : 4

(i) rms value of o/p voltage and load current

(ii) power delivered to the load.

6. (a) What is cyclo converter ? Explain the working of a push-pull converter with the help of a circuit diagram. 2+5=7

(b) Explain the working of basic series inverter. 7

7. Explain the working of any *two* : 7×2=14

(a) GTO

(b) TRIAC

(c) PUT.