Total No. of printed pages = 3

CAI-504/PE/5th Sem/2017/M

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) How are power semiconductor devices different from normal semiconductor devices? Name some advantages of Power Electronic Circuits. 1+3=4

   (b) List the following devices as under : 3

   (i) Uncontrollable

   (ii) Semi controllable and

   (iii) Controllable

   BJT, MOSFET, Diode, SCR, Triac, GTO

[Turn over

(c) What is the reason of designating the semiconductor materials as p^+, p^-, η^+, η^- ? 2

(d) Explain the physical structure of power diodes with a neat diagram. 5

2. (a) Explain the working of BJT as a switch in power electronic circuits. 6

(b) Explain the different modes of operation of SCR depending on the biasing given to it. 8

3. (a) Name any four methods of turning on a thyristor. Explain each of them briefly. 4

(b) What is a Snuffer circuit ? Briefly explain its working. 5

(c) Explain the working of triac with its constructional details. 5

4. (a) Describe the method of line commutation to turn-off a thyristor. 5

(b) What do you mean by firing angle ? How is it related to phase control for any rectifier circuit ? 2

(c) Explain the working of a single phase half-wave circuit with R-L-E load. 7

5. (a) Explain the principle of operation of a chopper and define the terms Chopping period, Duty cycle and Chopping frequency. 8

(b) Draw the various configurations in order to achieve type-A, type-B and type-C choppers. 6

6. (a) A single phase full-bridge inverter is connected to an R-L load. For a d.c source voltage of V_s and output frequency 'f = 1/T, obtain the expressions for load current as a function of time for the first two half cycles. 8

(b) Explain the working of single phase full-wave a.c voltage controller with proper voltage and current waveforms. 6

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

(a) Resistance firing circuit of thyristor

(b) GTO

(c) Power MOSFET.