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327612(27)

BE (6th Semester)
Examination, April-May, 2018

(Old Scheme)

Power Electronic Devices & Applications

Time Allowed : 3 hours *Maximum Marks :* 80

Minimum Pass Marks : 28

Note : (*i*) Part (*a*) of each question is compulsory. Attempt any **two** from parts (*b*), (*c*) and (*d*) of each question.

(*ii*) The figures in the right-hand margin indicate marks.

1. (*a*) Draw block diagram of a power electronic system. [2]

(*b*) Derive the expression of reverse recovery time of diode. The reverse recovery time of a diode is $t_{rr} = 3$ µs and the rate of fall of the diode current is $di/dt = 30$ A/µs.

Determine the storage charge Q_{RR} and reverse current I_{RR}. [7]

(*c*) Realize diode rectifier circuit with RC load using appropriate expression and waveforms. [7]

(*d*) Explain the operation of three-phase bridge rectifier with suitable waveform. [7]

2. (*a*) Write down the name of component that belongs to thyristor family. [2]

(*b*) Draw and explain the *V-I* characteristics of thyristor. [7]

(*c*) Explain the class-C computation techniques with proper waveform. [7]

(*d*) Why does the resistance firing circuit have the limited range of firing angle control between 0° to 90°? Explain through waveform what will happen if firing angle is increased more than 90°. [7]

3. (*a*) Draw the Spice model of power BJT. [2]

(*b*) Explain the switching characteristics of power BJT. [7]

(*c*) Explain IGBT operation and characteristics. [7]

(*d*) Give comparison between power BJT and power MOSFET. [7]

4. (*a*) What do you mean by semiconverter? [2]

(*b*) Explain the operation of single-phase full wave converter with its characteristics. [7]

(*c*) Explain the AC voltage controller in three-phase half wave controller. [7]

(*d*) What are the effects of load inductance on the performance of cyclo-converter? [7]

5. (*a*) Define AC link chopper. [2]

(*b*) Explain the basic principle of a step-up chopper, and derive the equation for minimum and maximum load current for chopper. [7]

(*c*) Draw the circuit of class-B chopper circuit and explain its operation with the help of waveforms. [7]

(*d*) A single-phase circuit for temperature regulation uses on-off control. The AC input is 230 V, 50 Hz. The circuit has variable frequency TRC. If the i/p goes up by 10%, calculate the percent change required in the triggering of chopper. [7]

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