CBCS SCHEME

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15EE53

Fifth Semester B.E. Degree Examination, July/August 2021
Power Electronics

Time: 3 hrs. Max. Marks:80

Note: ***Answer any FIVE full questions.***

1 a. Mention and explain the different types of power electronic converter systems. Draw their i/p o/p waveforms. **(10 Marks)**

b. Explain the reverse recovery characteristics of diode. **(06 Marks)**

2 a. With circuit diagram and waveforms, explain the working of single phase full wave rectifiers. **(06 Marks)**

b. Explain freewheeling diode circuit with waveforms write related equations. **(06 Marks)**

c. Write a note on peripheral effects of power electronic circuits. **(04 Marks)**

3 a. Draw and explain the switching characteristics of power MOSFET. **(06 Marks)**

b. The bipolar transistor specified to have β in the range of 8 to 40. The load resistance R_C = 11Ω. The DC supply V_{CC} = 20V, the voltages $V_{CE(sat)}$ = 1.0V and $V_{BE(sat)}$ = 1.5V, V_B = 10V. Find :

i) The valve of R_B that results in saturation with an ODE of 5.

ii) The β forced and

iii) The power loss P_T. **(05 Marks)**

c. Explain base derive counter of BJT during turning on process. **(05 Marks)**

4 a. With neat waveforms and equations, explain the steady-state characteristics of BJT. **(06 Marks)**

b. Give the cross section equivalent circuit and transfer characteristics of IGBT. **(05 Marks)**

c. How isolation is achieved using pulse transformer and opto coupler. **(05 Marks)**

5 a. Derive an expression for the anode current of thyristor with help of two transistor model. **(08 Marks)**

b. Explain how thyristors are protected against high $\frac{dv}{dt}$. **(08 Marks)**

6 a. Explain the operation of a RC firing circuit with waveforms. **(08 Marks)**

b. Ten thyristors are used in a string to withstand a DC voltage of V_S = 15KV. The maximum leakage current and recovery charge differences of thyristors are 10mA and 150μC respectively. Each thyristor has a v/g sharing resistance of R = 56kΩ and capacitance of C_1 = 0.5μF. Determine :

i) Maximum steady state v/g $V_{os(max)}$

ii) Steady state voltage derating factor

iii) Maximum transient voltage sharing $V_{DT(max)}$

iv) The transient voltage derating factor. **(08 Marks)**

7 a. Explain the working of single phase full converter with resistive load. **(08 Marks)**

b. With the help of circuit diagram and waveforms explain the operation of bidirectional AC controller with R-load. **(08 Marks)**

8 a. With circuit diagram and waveforms explain the operation of 1ϕ AC counter with inductive load (RL load). **(08 Marks)**

b. Explain single phase dual converters. **(08 Marks)**

9 a. Explain the basic principle of step-down chopper and write the expressions for, i) average o/p voltage ii) output power. **(10 Marks)**

b. A chopper circuit is operating at a frequency of 2KHz on 460V supply of the load voltage of 350V. Calculate the conduction period of the thyristor in each cycle. **(06 Marks)**

10 a. Explain the working of class A, class B, class C and class D and class E choppers. **(10 Marks)**

b. A step up DC chopper has an input of 200V and an o/p of 250Volts. The blocking period in each cycle of operation is 0.6×10^{-3}sec. Find the period of conduction in each cycle. **(06 Marks)**

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