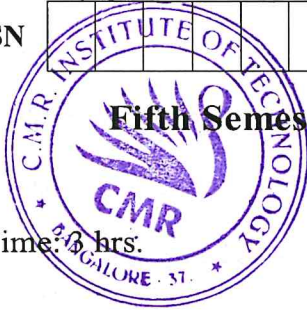


CBCS SCHEME

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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 $R_C = 11\Omega$. 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 value 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 drive 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 150 μC respectively. Each thyristor has a v/g sharing resistance of $R = 56k\Omega$ and capacitance of $C_1 = 0.5\mu F$. 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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