

CBCS SCHEME

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17EE53

Fifth Semester B.E. Degree Examination, Jan./Feb. 2021

Power Electronics

Time: 3 hrs.

Max. Marks: 100

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

- With a neat circuit diagram Input and Output waveform, explain the different types of Power Electronic Converters. (10 Marks)
 - With neat circuit diagram and waveforms, explain the operation of single phase full wave rectifier with RL Load. Derive the expression for rms output current for continuous load current. (10 Marks)

OR

- Discuss the peripheral effects of power electronic equipments and mention the Industrial applications of power electronic converter circuits, explain briefly. (10 Marks)
 - With the help of a neat wave form, explain the reverse recovery characteristic a power diode and also explain the VI characteristics of Power Diode. (10 Marks)

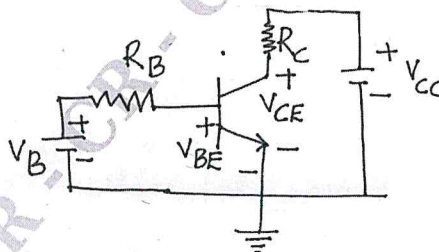
Module-2

- Explain the important characteristics features of power transistors. With the aid of output and transfer characteristics, discuss the different operating regions of a power BJT. (10 Marks)
 - With a neat sketch, explain the transfer and output characteristics of MOSFET and compare the characteristics of MOSFET with IGBT. (10 Marks)

OR

- What is the necessity of base drive control in a power transistor? List and explain the base drive control methods. (10 Marks)
 - The beta (β) bipolar transistor shown in Fig. Q4(b), below varies from 12 to 75. The load resistance $R_C = 1.5\Omega$. The DC supply voltage is $V_{CC} = 40V$ and input voltage to the base circuit $V_B = 6V$. If $V_{CE} = 1.6V$, $R_B = 0.7\Omega$, determine i) Over drive factor ii) The forced β and iii) Power loss in the transistor (P_T). (10 Marks)

Fig. Q4(b)



Module-3

- Explain VI characteristics of SCR also define holding current and latching current. (06 Marks)
 - Explain different methods of turning ON of Thyristor. (06 Marks)
 - Derive an expression for the anode current of thyristor with the help of 2 transistor analogy. (08 Marks)

OR

- 6 a. With a neat circuit diagram and waveforms, explain the resistance triggering circuit to turn on SCR in the phase control circuit. (06 Marks)
- b. With the help of neat circuit diagram and wave forms, explain RC firing circuit used with half controlled rectifier. (06 Marks)
- c. Discuss the need of protection against $\frac{di}{dt}$ and $\frac{dv}{dt}$. Explain how it is achieved with suitable circuit diagrams. (08 Marks)

Module-4

- 7 a. With necessary waveforms, explain the operation of a single phase AC voltage controller with RL load. Derive the expression for rms output voltage. (10 Marks)
- b. A single phase half wave controlled rectifier is used to supply power to 10Ω load from 230V, 50Hz supply at a firing angle of 30° . Calculate i) Average output voltage
ii) Effective output voltage iii) Average load current. (10 Marks)

OR

- 8 a. With the help of a circuit diagram and waveforms, explain the working of 1ϕ fully controlled converters for continuous load current. Derive expression for V_o and V_{rms} . (10 Marks)
- b. With circuit diagram and waveforms, explain the operation of a Three phase dual converter and what are the significance of circulating current in dual converters. (10 Marks)

Module-5

- 9 a. Explain the principle of operation of a step up chopper. A step up DC chopper has an input of 200V and an output of 250V, the blocking period in each cycle of operation of 0.6×10^{-3} secs. Find the period of conduction in each cycle. (10 Marks)
- b. With the help of circuit diagrams, explain the operation of different types of Choppers. (10 Marks)

OR

- 10 a. With a circuit diagram and waveforms, explain single phase bridge inverter and mention the advantages and disadvantages of full bridge inverter. (10 Marks)
- b. With a neat circuit diagram and waveforms, explain anyone mode of operation of a Three phase bridge inverter. (10 Marks)

