

CBCS SCHEME

17EE53

Fifth Semester B.E. Degree Examination, Dec.2019/Jan.2020

Power Electronics

Time: 3 hrs.

Max. Marks: 100

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

Module-1

- Explain any five types of power electronics converter system and also specify the form of input and output waveform. (10 Marks)
 - With block diagram, explain the peripheral effects of power electronic equipments. (06 Marks)
 - Discuss the major industrial applications of power electronic converter circuits. (04 Marks)

OR

- Briefly explain the different types of power diodes. (08 Marks)
 - With circuit diagram and waveform explain uncontrolled single phase full wave rectifier with RL load. (08 Marks)
 - Compare the advantages and disadvantages of bridge rectifier and rectifier with center tapped transformer. (04 Marks)

Module-2

- With neat circuit diagram, explain steady state and switching characteristics of power MOSFET. (12 Marks)
 - A BJT is specified to have β in the range 8 to 40 load resistance $R_C = 11\Omega$, the DC supply voltage is $V_{CC} = 200\text{volts}$ and the input voltage to the base circuit is $V_{BB} = 10\text{ volts}$. If $V_{CE(\text{sat})} = 1\text{ volt}$ and $V_{BE(\text{sat})} = 1.5\text{ volt}$, find :
 - The value of R_B that result in saturation with an ODF of 5.
 - The forced β value and
 - Power loss in the transistor. (08 Marks)

OR

- With necessary waveform explain the switching characteristics of IGBT. (06 Marks)
 - Discuss the importance of providing isolation of gate/base drive from power circuits and explain the two methods. (06 Marks)
 - Sketch the structure of n-channel enhancement type MOSFET and explain its working principle. (08 Marks)

Module-3

- Explain the V-I characteristics of SCR also define : i) Holding current ii) Latching current. (06 Marks)
 - Explain different methods of turning ON of thyristor. (08 Marks)
 - For the circuit shown in Fig.Q5(c). If the latching current is 4mA calculate the minimum width of gate pulse required properly turn ON the SCR. (06 Marks)

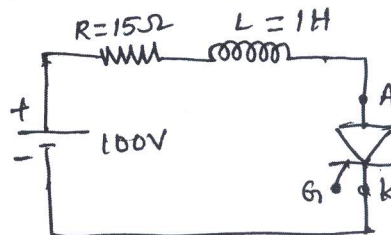


Fig.Q5(c)

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.
2. Any revealing of identification, appeal to evaluator and/or equations written eg, 42+8 = 50, will be treated as malpractice.

OR

- 6 a. Derive an expression for the anode current of thyristor with the help of two transistor analogy. (10 Marks)
- b. With circuit diagrams and waveforms, explain the methods of protection of SCR. (10 Marks)

Module-4

- 7 a. With the help of circuit diagram and wave forms, explain the working of single – phase full converter with R–L load. (10 Marks)
- b. A single phase full wave AC voltage controller has an input voltage of 230V and load resistance of 10Ω . The firing angle is 45° , calculate :
- RMS output voltage
 - The output power
 - The input power factor. (10 Marks)

OR

- 8 a. With circuit diagram and waveforms explain 1ϕ dual converter. (10 Marks)
- b. With circuit diagram and waveform, explain the operation of 3ϕ full converters. (10 Marks)

Module-5

- 9 a. Explain the working of step-up chopper. Draw the relevant waveforms, derive an expression for average output voltage. (08 Marks)
- b. Write a note on performance parameters of chopper. (04 Marks)
- c. A stepdown chopper with resistive load has a resistive load of 10Ω and the input voltage is $V_s = 220V$. When the converter switch remains ON its voltage drop is 2V and the chopping frequency is $f = 1KHz$, if the duty cycle is 50% determine :
- Average output voltage
 - RMS output voltage
 - Chopper efficiency
 - Effective input resistance. (08 Marks)

OR

- 10 a. With circuit diagram, explain the operation of a single phase–full bridge inverter supplying a resistive load. (10 Marks)
- b. Explain any two modulation technique available for voltage control of a single phase inverter. (10 Marks)
