CBCS SCHEME

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21MT641

Sixth Semester B.E./B.Tech. Degree Examination, Dec.2024/Jan.2025
Power Electronics

Time: 3 hrs. Max. Marks: 100

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

Module-1

1 a. Define power electronics. List the applications of power electronics. **(06 Marks)**

b. With necessary waveforms, explain the switching characteristics of power MOSFET. **(06 Marks)**

c. Explain the peripheral effects of power electronics equipment. **(08 Marks)**

OR

2 a. How devices are protected against $\frac{di}{dt}$ and $\frac{dv}{dt}$? **(06 Marks)**

b. Explain isolation of gate and base drives using pulse transformers. **(06 Marks)**

c. What is Power converter? List different types of power converters and mention their functions. **(08 Marks)**

Module-2

3 a. Derive an expression for anode current in terms of the common base current gain of the transistor (two transistor analogy). **(10 Marks)**

b. Explain the turn-on characteristics of SCR with neat diagrams. **(10 Marks)**

OR

4 a. Define commutation. Compare natural and forced commutation. **(10 Marks)**

b. Explain with the help of circuit diagram and relevant waveforms the impulse commutation of SCR. **(10 Marks)**

Module-3

5 a. Explain with circuit diagram single phase AC voltage controllers with resistive load. **(10 Marks)**

b. What is an AC voltage controller? With the help of circuit diagram and waveforms explain the principle of ON-OFF control. **(10 Marks)**

OR

6 a. Explain single-phase semiconverter with circuit, waveform and relevant expressions. **(10 Marks)**

b. Explain Three-phase half wave converter circuit with resistive load waveforms. **(10 Marks)**

Module-4

7 a. What is chopper? Explain the principle of step up chopper with RL load. **(10 Marks)**

b. Describe the principle of a step down chopper of resistive load. With the half of schematic and waveform. Write an expression for the output voltage. **(10 Marks)**

OR

8 a. With neat circuit diagram, explain four quadrant operation of a chopper. **(10 Marks)**

b. Explain the working principle of impulse commutated thyristor chopper with necessary circuit diagram and waveforms. **(10 Marks)**

Module-5

9 a. Explain the principle of operation of single phase half-bridge inverter with resistive load. **(10 Marks)**

b. With the help of neat diagram and waveforms explain an operation of 180° mode of three phase inverter. **(10 Marks)**

OR

10 a. Write a note on performance parameters of a inverter:

i) Harmonic factor of n^{th} harmonic

ii) Total Harmonic Distortion (THD)

iii) Distortion Factor (DF) **(10 Marks)**

b. Explain sinusoidal pulse width modulations with relevant waveforms. **(10 Marks)**

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