

Code: EE5T4

**III B.Tech - I Semester–Regular/Supplementary Examinations
March - 2021**

**POWER ELECTRONICS
(ELECTRICAL & ELECTRONICS ENGINEERING)**

Duration: 3 hours

Max. Marks: 70

PART – A

Answer *all* the questions. All questions carry equal marks

11 x 2 = 22 M

1.

- a) Define rise time and spread time of SCR.
- b) What is the need of connecting SCRs in series or parallel?
- c) Define line commutated inverter.
- d) Obtain the essential condition to operate dual converter.
- e) List any two differences between SCR and IGBT.
- f) Why a PWM inverter is superior to a square wave Inverter?
- g) What is the principle of operation of Inverter?
- h) Discuss the time ratio control in a dc chopper.
- i) Write the advantages in operation of choppers at high frequency.
- j) For a single phase AC Voltage controller with resistive load, $R=100$ ohms, obtain RMS output voltage when supplied from 230 V, 50 Hz single phase source and fired at 65°

- k) Identify the changes to be done for making a single phase midpoint type step-up cycloconverter circuit to operate as a step - down cycloconverter.

PART – B

Answer any *THREE* questions. All questions carry equal marks.

3 x 16 = 48 M

2. a) Explain the turn-on methods of SCR. 8 M
- b) Describe the basic behavior of thyristor using a two-transistor model. 8 M
3. a) Analyze the performance of 3 phase fully controlled converter operating with RL load and sketch the output voltage and current waveforms for $\alpha=60^\circ$. Also derive the average output voltage and current. 10 M
- b) A dc battery is charged through a resistor using single phase half wave converter. For an AC source voltage of 230V, 50Hz, find the value of average charging current for $R=8$ ohm and $E =150V$ with minimum firing angle. Also find the power dissipated in the resistor. 6 M

4. Explain the operation of three phase inverter operating with 180° mode conduction. Plot the necessary phase and line voltages. List the advantages and disadvantages with this mode of operation. 16 M
5. a) Explain the operating principle of Boost chopper with a suitable diagram. Draw the voltage and current waveforms of chopper. Derive expressions for average output voltage and rms output voltage. 8 M
- b) For the ideal step- down chopper circuit, following conditions are given, $V_s = 220V$, chopping frequency is 600 Hz, chopping period is $2000\mu\text{sec}$ and $R = 1 \text{ ohm}$, $L=5\text{mH}$ and $E_b=24V$,Now compute : 8 M
- (i) whether load current is continuous or not
- (ii) average value of output current
6. a) Discuss the operation of a single phase AC voltage controller with RL load for firing angle α greater than load phase angle ϕ . Also show that, for α less than ϕ , the output voltage of AC voltage controller cannot be regulated. 8 M

b) A single phase full –wave AC voltage controller is connected with a load of $R = 10 \Omega$, with an input voltage of 230 V, 50 Hz. When the firing angle of thyristors is 45° , determine: 8 M

i) power output at load

ii) average value of thyristor current

iii) rms value of thyristor current