

**BONAM VENKATA CHALAMAYYA INSTITUTE OF TECHNOLOGY & SCIENCE  
(AUTONOMOUS)**

**III - B. Tech I-Semester Supplementary Examinations (BR23), Mar/Apr - 2026**

**POWER ELECTRONICS (EEE)**

Time: 3 hours

Max. Marks: 70

*Question Paper consists of Part-A and Part-B  
Answer ALL the question in Part-A and Part-B*

PART-A (10X2 = 20M)

	Marks	CO	BL
1.a) Mention the methods to turn-on the SCR.	(2M)	CO1	BL1
b) What is the need for snubber circuit?	(2M)	CO1	BL1
c) How are single-phase rectifiers classified?	(2M)	CO2	BL1
d) Give any three differences between single-phase full converter and semi-converter.	(2M)	CO2	BL1
e) Write the formula for rms value of output voltage, RMS value of source current of a six-pulse converter.	(2M)	CO3	BL1
f) List the merits and demerits of AC voltage controller.	(2M)	CO3	BL1
g) Define duty cycle.	(2M)	CO4	BL1
h) A step-up chopper operated with a duty ratio of 0.65 for a DC input voltage of 90 V. Determine the output voltage for the load resistance of $R_L=10 \Omega$ .	(2M)	CO4	BL3
i) List the modulation techniques used in an inverter.	(2M)	CO5	BL1
j) Why PWM-based inverter is superior to the square wave inverter?	(2M)	CO5	BL1

PART-B (5X10 = 50M)

2a. Explain the various triggering circuits for SCR in detail.	10(M)	CO1	BL2
(OR)			
3a. Explain the switching characteristics of IGBT.	10(M)	CO1	BL2
4a. Describe the operation of single-phase half-wave-controlled bridge rectifier without a freewheeling diode for an RL load with neat waveforms. Also derive the expression for the average output voltage.	10(M)	CO2	BL3
(OR)			
5a. Discuss the operation of single-phase fully controlled bridge rectifier with a freewheeling diode for an RL load with neat waveforms. Also derive the expression for the average output voltage.	10(M)	CO2	BL3
6a. With necessary circuit and waveform, explain the principle of operation of 6-pulse converter. Derive the expression for the average output voltage in it.	10(M)	CO3	BL3
(OR)			
7a. Explain the principle of a single-phase-to-single-phase step-down cycloconverter with power circuit and waveforms.	10(M)	CO3	BL3

- 8a. Derive the expression for voltage gain in DC-DC converter where the output voltage is greater than the input voltage and explain the modes of operation with relevant waveforms. 10(M) CO4 BL4
- (OR)
- 9a. The boost regulator has an input range of  $V_s = 6$  V. The regulated average output voltage is  $V_o = 18$  V and the average output current  $I_o = 0.4$  A. The switching frequency is 20 kHz of  $L = 250$   $\mu$ H and  $C = 420$   $\mu$ F. Determine
- (a) the duty cycle
  - (b) the ripple current of inductor ( $\Delta I$ )
  - (c) the peak current of inductor and
  - (d) the ripple voltage of filter capacitor ( $\Delta V_c$ )
- 10a. Describe, with a neat sketch, the operation of single-phase half bridge inverter supplying RL load. 10(M) CO5 BL2
- (OR)
- 11a. With neat sketches, explain the operation of three-phase voltage-source inverter. Draw the phase and line voltage waveforms on the assumption that each thyristor conducts for  $120^\circ$  and the resistive load is star connected. 10(M) CO5 BL2

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