

Code: 20EE3502

**III B.Tech - I Semester – Regular / Supplementary Examinations  
NOVEMBER 2023**

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

Duration: 3 hours

Max. Marks: 70

Note: 1. This paper contains questions from 5 units of Syllabus. Each unit carries 14 marks and have an internal choice of Questions.  
2. All parts of Question must be answered in one place.

BL – Blooms Level

CO – Course Outcome

			BL	CO	Max. Marks
<b>UNIT-I</b>					
1	a)	With help of a neat diagram and V-I characteristics, explain the different modes of operation of SCR.	L2	CO2	7 M
	b)	Explain the snubber circuit of SCR.	L2	CO3	7 M
<b>OR</b>					
2	a)	Describe input and transfer characteristics of an IGBT.	L1	CO1	7 M
	b)	Briefly give explanation about parallel operation of thyristors.	L2	CO2	7 M
<b>UNIT-II</b>					
3	a)	Explain the operation of single phase half wave converter with R load. Also derive the output voltage equation.	L2	CO2	7 M

	b)	Explain the operation of single phase fully controlled rectifier with RL load and also derive the average output voltage.	L2	CO2	7 M
<b>OR</b>					
4	a)	Explain the operation of 3 phase fully controlled rectifier with resistive load.	L2	CO2	7 M
	b)	Explain the operation of single phase dual converter with circulating current mode.	L2	CO2	7 M
<b>UNIT-III</b>					
5	a)	Explain the operation of series inverter.	L2	CO3	7 M
	b)	Explain the operation of 3-phase full bridge inverter with $120^\circ$ mode of control with neat sketch.	L2	CO3	7 M
<b>OR</b>					
6	a)	Explain the operation of single phase full bridge voltage source inverter with the help of voltage and current waveforms.	L2	CO3	7 M
	b)	Explain about Voltage Control Techniques for Inverters.	L2	CO3	7 M
<b>UNIT-IV</b>					
7	a)	Illustrate the operation of buck converter with neat waveforms.	L3	CO4	7 M
	b)	Explain the operation of a four quadrant chopper.	L2	CO4	7 M
<b>OR</b>					
8	a)	Illustrate an expression for duty ratio of buck-boost converter.	L3	CO4	7 M

	b)	A boost converter has input voltage of 5 V and it operates at 20 kHz. When the average output voltage $V_o = 10$ V, the average load current $I_o = 0.8$ A, $L = 100$ $\mu$ H and $C = 47$ $\mu$ H, determine i) Duty cycle, ii) Ripple current of inductor $\Delta I$ .	L3	CO4	7 M
<b>UNIT-V</b>					
9		Explain about the 1- $\emptyset$ AC voltage controller with RL load with neat diagram and waveforms.	L2	CO5	14 M
<b>OR</b>					
10		Describe the principle of working of single phase to single phase step up bridge cycloconverter with RL load.	L2	CO5	14 M