Gandhi Institute of Engineering and Technology University, Odisha, Gunupur
(GIET University)

B. Tech (Fifth Semester - Regular) Examinations, November 2025

23BEEPC35001/23BELPC35001–– Power Electronics

(EEE/EE)

Time: 3 hrs Maximum: 70 Marks

Answer ALL questions

(The figures in the right hand margin indicate marks)

PART – A **(2 x 5 = 10 Marks)**

Q.1. Answer ***ALL*** questions	CO #	Blooms Level
a. Explain the two-transistor analogy of an SCR.	CO1	K2
b. State the function of a free-wheeling diode in a converter circuit.	CO2	K1
c. Define a cycloconverter and state its application.	CO3	K1
d. Define the duty cycle of a DC–DC converter (chopper).	CO4	K1
e. State the function of a Current Source Inverter (CSI).	CO5	K1

PART – B **(10 x 5 = 50 Marks)**

Answer ***ALL*** the questions	Marks	CO #	Blooms Level
2. a. Explain the various turn-on and turn-off methods employed for SCRs	5	CO1	K4
b. Describe the switching characteristics of MOSFET with neat diagrams.	5	CO1	K4
(OR)			
c. Design a snubber circuit for an SCR carrying 20 A, when the permissible rate of rise of voltage dv/dt is 200 V/μs and the snubber capacitor voltage is limited to 100 V.	5	CO1	K6
d. Explain in detail the construction and operation of a IGBT with neat sketches. Discuss how the device achieves high input impedance and fast switching.	5	CO1	K4
3.a. A single-phase full converter delivers power to a 20 Ω resistive load from a 230 V, 50 Hz AC source at a firing angle of 60°. Compute (i) the average DC output voltage, (ii) average load current.	5	CO2	K5
b. Explain in detail the operation of a single-phase full converter feeding an RL load under discontinuous conduction and derive the corresponding voltage equations.	5	CO2	K4
(OR)			
c. A single-phase dual converter supplies a DC motor operating at rated armature voltage of 200 V and current of 20 A. If the converters operate in circulating current mode with a supply of 230 V, 50 Hz, compute (i) the firing angles of both converters.	5	CO2	K5
d. Compare the operation and performance of a single-phase full converter and a semi-converter using waveforms and relevant equations.	5	CO2	K4
4.a. Derive an expression and draw the waveforms for the average value of output voltage of a three-phase fully controlled bridge converter.	5	CO3	K4
b. Explain the operation and waveforms of a single-phase step-down cycloconverter, stating its advantages	5	CO3	K3
(OR)			

c.	Compare half-wave, semi-converter, and full-converter configurations in terms of control range, harmonics, and power factor.	5	CO3	K4
d.	Derive the expression for average DC output voltage of a three-phase half controlled bridge converter.	5	CO3	K4
5.a.	A buck converter delivers 12 V, 2 A output from a 24 V input supply. If the voltage drop across the switch is 1 V, determine (i) duty ratio, (ii) efficiency.	5	CO4	K5
b.	With neat diagrams, explain the operation of a boost converter and derive its voltage transfer ratio.	5	CO4	K3
	(OR)			
c.	Discuss the working of a Buck converter with circuit diagram, operating principle, and expressions for output voltage and current.	5	CO4	K4
d.	Compare the performance of buck, boost, and buck–boost converters in terms of voltage gain, efficiency, and output polarity.	5	CO4	K3
6.a.	Compare voltage-source and current-source inverters in terms of circuit configuration, control method, and application domain.	5	CO5	K4
b.	Explain the operation of a single-phase Full-bridge inverter with R load and draw the voltage and current waveforms.	5	CO5	K3
	(OR)			
c.	Explain the operation of a three-phase inverter for 180° conduction mode with neat waveforms and derive the output line voltage equations.	10	CO5	K5

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