

Reg.No.:



VIVEKANANDHA COLLEGE OF ENGINEERING FOR WOMEN
[AUTONOMOUS INSTITUTION AFFILIATED TO ANNA UNIVERSITY, CHENNAI]
Elayampalayam – 637 205, Tiruchengode, Namakkal Dt., Tamil Nadu.

Question Paper Code: 80012

B.E. / B.Tech. DEGREE END-SEMESTER EXAMINATIONS – NOV. / DEC. 2025

Fifth Semester

Electrical and Electronics Engineering
U23EE515 – POWER ELECTRONICS
(Regulation 2023)

Time: Three Hours

Maximum: 100 Marks

Answer ALL the questions

Knowledge Levels	K1 – Remembering	K3 – Applying	K5 - Evaluating
(KL)	K2 – Understanding	K4 – Analyzing	K6 - Creating

PART – A

(10 x 2 = 20 Marks)

Q.No.	Questions	Marks	KL	CO
1.	Draw the symbol of a thyristor and mention its terminals.	2	K1	CO1
2.	State the purpose of a snubber circuit.	2	K1	CO1
3.	Write the formula for average output voltage of a single-phase half-wave rectifier.	2	K1	CO2
4.	What is the effect of source inductance in rectifier operation?	2	K2	CO2
5.	Define a chopper.	2	K1	CO3
6.	Calculate the output voltage for a step-down chopper with input $V_{in} = 200 V$ and on-time ratio $\alpha = 0.4$.	2	K2	CO3
7.	What is a cycloconverter?	2	K1	CO4
8.	State the principle of phase control in AC voltage controllers.	2	K2	CO4
9.	List any two applications of an inverter.	2	K1	CO5
10.	Enumerate the PWM techniques used to reduce harmonics in an inverter.	2	K2	CO5

PART – B

(5 x 13 = 65 Marks)

Q.No.	Questions	Marks	KL	CO
11. a)	Analyze the turn-on and turn-off characteristics of a thyristor and explain how different commutation techniques influence its operation.	13	K4	CO1

(OR)

b)	Evaluate and design a suitable snubber circuit for protecting a power semiconductor device used in high-frequency switching.	13	K4	CO1
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12.	a)	Apply the principles of controlled rectifiers to solve for the average and RMS output voltage of a single-phase fully controlled bridge rectifier with an RL load. Show all necessary calculations and waveform sketches.	13	K3	CO2
(OR)					
	b)	Assess the impact of source inductance on a three-phase fully controlled converter and analyze the resultant output waveforms and voltage regulation.	13	K3	CO2
13.	a)	Create a step-up chopper circuit to achieve a specific output voltage from a given input supply. Justify your selection of switching frequency, component ratings, and control method. Include relevant calculations.	13	K4.	CO3
(OR)					
	b)	Analyze the current limit control method for choppers and evaluate its effectiveness in minimizing losses and protecting the load, using supporting diagrams.	13	K4	CO3
14.	a)	Apply pulse width modulation (PWM) techniques to control the output voltage of a single-phase inverter. Illustrate with circuit diagrams and explain how PWM enhances inverter performance.	13	K3	CO4
(OR)					
	b)	Critically compare the 120° and 180° conduction modes in a three-phase inverter, evaluating the differences in output waveform, harmonic content, and their industrial applications.	13	K3	CO4
15.	a)	Evaluate the operation of a single-phase AC voltage controller with both R and RL loads. Compare the output characteristics and discuss the effects on power factor.	13	K3	CO5
(OR)					
	b)	Analyze the working and application of a bridge cycloconverter, including output waveform generation and the influence on harmonics.	13	K3	CO5

PART – C

(1 x 15 = 15Marks)

Q.No.	Questions	Marks	KL	CO
16.	a) A company plans to build a solar photovoltaic power system to supply electricity to a remote village. Design a power converter system suitable for integrating solar panels, battery storage, and AC loads. Analyze how you would select topologies for the DC-DC and DC-AC conversions, propose protection methods for semiconductor devices, and justify your choices based on efficiency, cost, and reliability.	15	K4	CO4

(OR)

- b) An electric vehicle manufacturer seeks to optimize the propulsion system's power electronics. Devise an inverter and converter topology for a high-performance electric vehicle drive, considering safety, thermal management, and efficiency. Critically evaluate how you would integrate recent advancements (such as SiC MOSFETs and advanced PWM techniques) to enhance vehicle performance.
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15

K4

CO5