Reg. No.																

Question Paper Code	14277

M.E. / M.Tech. - DEGREE EXAMINATIONS, NOV / DEC 2025

First Semester

M.E. - Power Electronics and Drives

24PPEPC103 - ANALYSIS AND DESIGN OF POWER CONVERTERS

Regulations - 2024

Duration: 3 Hours | Max. Marks: 100

PART - A (MCQ) (10 × 1 = 10 Marks)

Answer ALL Questions

		Marks	K – Level	CO
1.	The main purpose of a phase-controlled converter is to: (a) Control voltage only (b) Control current only (c) Control the average DC output voltage (d) Control frequency	1	K1	CO1
2.	The power factor of a converter can be improved by: (a) Increasing firing angle (b) Using PWM rectifiers (c) Adding resistance in load (d) Reducing load current	1	K1	CO1
3.	Switched mode power supplies (SMPS) are preferred because they: (a) Operate at low frequency (b) Are less efficient (c) Have higher efficiency and smaller size (d) Require large transformers	1	K1	CO2
4.	The Flyback converter is a type of: (a) Non-isolated converter (b) Isolated converter (c) Linear converter (d) Resonant converter	1	K1	CO2
5.	Which of the following is a hard magnetic material? (a) Ferrite (b) Silicon Steel (c) Alnico (d) Perm alloy	1	K1	CO3
6.	Which type of core is preferred for high-frequency transformer design? a) Air core b) Ferrite core c) Laminated iron core d) Powdered iron core	1	K1	CO3
7.	In soft switching, the main advantage is: (a) Increased EMI (b) Reduced losses and stress on switches (c) High conduction loss (d) Larger size components	1	K1	CO4
8.	In a ZCS converter, current through the switch becomes: (a) Maximum before turn-on (b) Zero before turn-off (c) Constant throughout (d) Infinite during switching	1	K1	CO4
9.	In a single-phase AC voltage controller, phase control is achieved by varying: (a) Load resistance (b) Firing angle (c) Line frequency (d) Input voltage	1	K1	CO5
10.	In three-phase AC voltage controllers, the number of thyristors used is usually: (a) 2 (b) 4 (c) 6 (d) 8	1	K1	CO5

PART - B (12 × 2 = 24 Marks)

Answer ALL Questions

		Marks	K – Level	CO
11.	What is the purpose of a dual converter?	2	K1	CO1
12.	Differentiate between semi-converter and full converter.	2	K2	CO1
13.	Outline the limitations of linear power supplies.	2	K2	CO2
14.	Identify the function of an inductor in DC-DC converters.	2	K3	CO2
15.	List different types of magnetic cores used in power converters.	2	K1	CO3
16.	Why transformer utilization factor is important in designing power converter.	2	K1	CO3
17.	Define switching loss.	2	K1	CO4
18.	Infer the purpose of using resonant components in converters.	2	K2	CO4
19.	What is on-off control in AC voltage controllers?	2	K1	CO5
20.	Define cycloconverter.	2	K1	CO5

21.	Differentiate between hard switching and soft switching.	2	K2	CO4
22.	Mention two applications of AC voltage controllers.	2	K2	CO5

PART - C (6 × 11 = 66 Marks)

Answer ALL Questions

23.	a)	Construct the single-phase dual converter with necessary circuit diagram and waveforms.	11	K3	CO1
		OR			
	b)	Construct the single phase full converter operation with RLE load. Draw relevant waveforms and derive the output voltage equation.	11	K3	CO1
24.	a)	Construct the Boost converter and explain its operation with circuit diagram showing the various modes.	11	K3	CO2
		OR			
	b)	Construct the Flyback converter showing various modes and draw the steady state waveforms of discontinuous mode operation.	11	K3	CO2
25.	a)	Explain the design steps of a transformer used in power converters with relevant equations.	11	K2	CO3
		OR			
	b)	Explain the design procedure of an inductor for a buck/flyback converter with suitable specifications.	11	K2	CO3
26.	a)	Summarize the basic principles of soft switching.	11	K2	CO4
		OR			
	b)	Summarize the operation of Zero Current Switching (ZCS) and Zero Voltage Switching (ZVS).	11	K2	CO4
27.	a)	Explain in detail the principle of on-off and phase angle control in AC voltage controllers.	11	K2	CO5
		OR			
	b)	With a detailed note on matrix converters, explain their working principles and advantages.	11	K2	CO5
28.	a)	A 3 phase bridge converter is used for obtaining a regulated DC output voltage. The supply voltage is 440V and the firing angle is maintained at 60˚ so that the load current is 15 A; Calculate the DC output voltage, active and reactive power input.	11	K3	CO1
		OR			
	b)	A six pulse thyristor converter connected on the secondary of delta /star connected 6.6 kV /415V, 50 Hz transformer is supplying to 460 V,200 A DC load. Identify the converter firing angle, dc power delivered by the converter and AC line current.	11	K3	CO1