

THE KAVERY ENGINEERING COLLEGE
(An Autonomous Institution)

B.E/B.TECH DEGREE END SEMESTER THEORY EXAMINATIONS, APRIL-MAY 2025

Fifth Semester

Electrical and Electronics Engineering

EE3591 – Power Electronics

Regulations - 2021

Duration : 3 Hrs

Maximum : 100 Marks

PART – A (ANSWER ALL QUESTIONS) (Marks 10*2=20)

Q.No	Questions	BLT	CO	Marks
1.	Define the term duty cycle.	L1	1	2
2.	What are the advantages of high switching frequency in SMPS?	L1	1	2
3.	What are the advantages and applications of current source inverter?	L1	2	2
4.	What are the desirable characteristics of a good inverter?	L1	2	2
5.	Define softness factor of power diode.	L1	3	2
6.	Differentiate midpoint full wave rectifier and bridge rectifier.	L2	3	2
7.	A 3-phase full converter delivers a ripple free load current of 10A with a firing angle delay of 45°. The input voltage is 3-phase, 400V, 50Hz. The source current is given by the following relation. $i(t) = \sum_{n=1,3,5}^{\infty} \frac{4I_o}{n\pi} \sin \frac{n\pi}{3} \sin(n\omega t - n\alpha)$ Find the fundamental component of the source current amplitude.	L3	4	2
8.	Define the terms: displacement factor, total harmonic distortion, input power factor.	L1	4	2
9.	What is integral cycle control?	L2	5	2
10.	What type of gating signal is used in single phase ac voltage controller with RL load?	L2	5	2

PART – B (ANSWER ALL QUESTIONS) (Marks 5*16 = 80)

Q.No	Questions	BLT	CO	Marks
11. a	Draw the circuit diagram of a buck converter and explain its operation with equivalent circuit for different modes and waveforms.	L2	1	16
Or				
b i	Compare ZVS and ZCS.	L2	1	8
ii	Discuss the need for resonant switching in SMPS.	L2	1	8

12.	a	Explain the following PWM techniques used in inverter:	L3	2	16
		i. Sinusoidal PWM ii. Modified Sin PWM iii. Space vector PWM			
		Or			
	b	Discuss the principle of working of a three phase bridge inverter with an appropriate circuit diagram. Draw line voltage waveforms on the assumption that each thyristor conducts for 180° and the balanced resistive load is delta connected. The sequence of firing of various SCRs should also be indicated in the diagram.	L3	2	16
13.	a	Draw and explain full wave voltage doubler circuit and derive the output voltage expression.	L4	3	16
		Or			
	b	Derive peak reverse current and write short note on different types of power diodes from reverse recovery characteristics.	L4	3	16
14.	a	Describe the working of 1ϕ fully controlled bridge converter in the rectifying mode and inversion mode and derive the expressions for average output voltage and rms output voltage.	L3	4	16
		Or			
	b	Explain the two-transistor analogy of SCR and derive the anode current equation.	L3	4	16
15.	a	Explain with neat diagrams, the four modes of operation of a TRIAC.	L2	5	16
		Or			
	b	For a 1ϕ full wave AC voltage controller, feeding a resistive load, draw the waveforms of source voltage, gating signals, output voltage and voltage across the SCR. Describe the working with reference to waveforms drawn. Also derive the expression for average value of output voltage.	L2	5	16