R20 Regulation *Subject code: 3P5BA*

TKR COLLEGE OF ENGINEERING AND TECHNOLOGY

(Autonomous, Accredited by NAAC with 'A+' Grade)

B.Tech V Semester Regular/Supplementary Examinations, February 2024

Power Electronics

(EEE)

Maximum Marks: 70 Date:15.02.2024 Duration: 3 hours

Note: **1.This question paper contains two parts A and B.**
2. Part A is compulsory which carries 20 marks. Answer all questions in Part A.
3. Part B consists of 5 Units. Answer any one full question from each unit.
4. Each question carries 10 marks and may have a, b, c, d as sub questions.

	Part-A	CO	Bloom Tx
All the following questions carry equal marks	(10x2M=20Marks)		
1	Define Latching current with illustration.	CO1	L1
2	Draw the turn – OFF characteristics of SCR.	CO1	L5
3	Explain the effect of source inductance in fully controlled bridge rectifier with continuous conduction.	CO2	L3
4	Draw the circuit diagram of three phase M-3 controlled converter	CO2	L1
5	What is meant by Duty cycle?	CO3	L2
6	List the applications of step-up Chopper?	CO3	L4
7	Brief about integrated cycle control	CO4	L2
8	Mention the applications of inverter	CO4	L5
9	What is the principle operation of Inverter?	CO5	L6
10	Why a PWM inverter is superior to a square wave Inverter?	CO5	L2
	Part-B		
Answer All the following questions.	(5X10M=50Marks)		Bloom Tx
11	a) List the different members of the thyristor family. Draw their characteristics and explain in brief. [5M] b) Draw and explain the output characteristics of n-channel enhancement mode MOSFET. [5M]	CO1	L3 L3
	OR		
12	a) Briefly explain the V-I characteristics of an IGBT. [5M] b) Explain the R and RC gate firing circuits of SCR for successful operations. [5M]	CO1	L3 L3
13	Draw the circuit diagram of 1 – phase full –wave-controlled rectifier with RL load and explain its operating principle with voltage and current waveforms. Determine the following parameters for RL load with firing angle $\alpha = 30^{\circ}$: i) dc output voltage ii) Average dc load current iii) rms output voltage iv) rms load current v) Ripple factor. [10M]	CO2	L3
	OR		

14	a) Explain the operation of single phase two pulse midpoint converter with relevant voltage and current waveforms and derive the expression for average output voltage. [5M] b) A single-phase semi converter delivers power to RLE load with R= 5Ω, L= 10 mH and E = 80 V. The ac source voltage is 230 V, 50 Hz. For continuous conduction, find the average value of output current for a firing angle of 500. If one of the SCR is damaged and open circuited find the new value of average output current on the assumption to continuous conduction. Also sketch the output voltage and current waveforms? [5M]	CO2	L3 L4
15	Describe the operation of a 3-ϕ, three wire a.c. thyristor controller with neat power diagram and voltage and current waveforms [10M]	CO3	L6
	OR		
16	a) Explain the principle of operation and working of buck converter with relevant waveforms in CCM mode. [5M] b) A boost regulator has an input voltage of Vs = 5 V. The average output voltage Va = 15 V and the average load current Ia = 0.5 A. The switching frequency is 25 kHz. If L = 150 μH and C = 220 μF, determine (i) the duty cycle, (ii) the ripple current of inductor ΔI, (iii) the critical values of L and C. [5M]	CO3	L3
17	a) Explain sinusoidal pulse modulation as used in PWM inverters. Write the important features of the same. [5M] b) Draw and explain basic series invertor with required wave forms. [5M]	CO4	L3
	OR		
18	a) Explain the principle of operation of an inverter. How are they classified? [5M] b) Compare voltage source and current source inverter. [5M]	CO4	L5
19	Explain 120° conduction mode of 3-phase bridge inventor and derive voltage equations. [10M]	CO5	L4
	OR		
20	Discuss about Bipolar sinusoidal Pulse width modulation? [10M]	CO5	L3