R22 Regulation *Subject code:4E5BA*

TKR COLLEGE OF ENGINEERING AND TECHNOLOGY

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

B.Tech V Semester Supplementary Examinations, April 2026

POWER ELECTRONICS

(EEE)

Maximum Marks: 60 Date:15.04.2026 Duration: 3 hours

Note: **1.This question paper contains two parts A and B.**
2. Part A is compulsory which carries 10 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

All the following questions carry equal marks (10X1M=10 Marks)		Marks	CO	BTL
1.a)	Compare MOSFET and IGBT?	1M	1	BL3
b)	Define latching current.	1M	1	BL2
c)	What is a six-pulse converter?	1M	2	BL1
d)	Write about phase-controlled technique.	1M	2	BL5
e)	Write the operation of step-up chopper.	1M	3	BL2
f)	What is the current limit control?	1M	3	BL1
g)	What is a cyclo converter?	1M	4	BL3
h)	List out the applications of AC voltage controllers?	1M	4	BL4
i)	Differentiate unipolar and bipolar SPWM?	1M	5	BL2
j)	Mention the features of parallel inverter?	1M	5	BL1

Part-B

Answer All the following questions. (5X10M=50Marks)		Marks	CO	BTL
2	a) Draw the V-I characteristics of a thyristor and explain different operating regions. What is the effect of gate current on the V-I characteristics of a thyristor?	5M	1	BL1
	b) What are the different triggering circuits of a SCR? Draw a resistance triggering circuit and explain its operation. What is the limitation of a resistance triggering circuit?	5M	1	BL2
	OR			
3	a) Draw the self-commutation circuit and discuss it in detail. What are the advantages and disadvantages of self-commutation with respect to other commutations?	6M	1	BL3
	b) Thyristors with a rating of 1250 V and 200 A are used in a string to handle 10 kV and 1 kA. Determine the number of series and parallel connected thyristors in case the de-rating factor is 0.2.	4M	1	BL4
4	Draw the circuit diagram of a single-phase half-wave-controlled rectifier with R load. Explain its working principle. Draw the relevant voltage	10M	2	BL4

	and current waveforms and determine the following parameters: (a) dc output voltage (b) Average dc load current (c) rms output voltage (d) rms load current (e) Ripple factor (f) Regulation (g) Efficiency.			
	OR			
5	a) Explain the working of three pulse converter with RL load using neat sketch. b) A single-phase full converter bridge is connected to RLE load. The source voltage is 230 V, 50 Hz. The average load current of 5 A is constant over the working range. For R = 0.4 Ω and L = 2 mH, compute the firing angle delay for E = 120 V.	5M 5M	2 2	BL2 BL3
6	a) Explain the operation of a single-phase AC voltage controller with a neat circuit diagram and output wave forms with respect to source voltage waveforms at α = 60 degrees for R-load. b) Explain the principle of integral cycle control with relevant waveforms and also derive the expression for rms value of output voltage, power delivered to load and input power factor	5M 5M	3 3	BL2 BL6
	OR			
7	With help of neat circuit diagram and associated waveforms discuss the operation of a Buck converter in continuous conduction mode and discontinuous conduction mode.	10M	3	BL4
8	a) How to control the output voltage of inverters? b) Explain What are the advantages of PWM techniques in inverters? Explain.	5M 5M	4 4	BL1 BL3
	OR			
9	a) With necessary waveforms explain the working of single-phase half bridge inverter with RL load and also derive the expression for RMS value of output voltage. b) Single phase full bridge inverter has a resistive load of R= 2.4 ohms and DC input voltage of 48 volts. Calculate: i) RMS output voltage at fundamental frequency, ii) output power, iii) Average and peak current of each thyristor.	5M 5M	4 4	BL3 BL4
10	a) Compare Voltage source inverter and Current source inverter? b) What is a three-phase inverter? What are the applications of three-phase inverter? What are the switching devices used in three-phase inverter circuit?	5M 5M	5 5	BL6 BL3
	OR			
11	a) Explain the operation of three phase voltage source inverter in 120° conduction mode. b) Compute the output frequency of a series inverter with the following specifications: L=10 mH; C=0.1μF; R= 150Ω; Toff = 0.2 ms. Also, find the attenuation factor.	5M 5M	5 5	BL4 BL5