QPC: RD20BTECH405

AR 20

Reg. No



Maximum: 70 Marks



Time: 3 hrs

GIET UNIVERSITY, GUNUPUR – 765022

B. Tech (Fifth Semester - Regular) Examinations, December - 2022

BPCEL5010 / BPCEE5010 - Power Electronics

(EE & EEE)

Answer ALL Questions The figures in the right hand margin indicate marks. **PART – A: (Multiple Choice Questions)** $(1 \times 10 = 10 \text{ Marks})$ [CO#] [PO#] Q.1. Answer **ALL** questions CO₂ PO1 The GTO (gate turn-off thyristors) is a (i) p-n-p-n device (ii) p-n-p device (iii) p-metal-n device (iv) p-n single junction device CO3 PO₁ b. For a single phase half wave rectifier, with R load, the diode is reversed biased from $\omega t =$ (i) 0 to π , 2π to $4\pi/3$ (ii) π to 2π , $2\pi/3$ to 3π (iii) π to 2π , 3π to 4π (iv) 0 to π , π to 2π CO₁ PO₁ c. Zener diodes allow a current to flow in the reverse direction, when the (i) voltage reaches above a certain value (ii) temperature reaches above a certain value (iii) current always flows in the reverse (iv) current cannot flow in the reverse direction direction only CO3 PO1 A single-phase full wave mid-point type diode rectifier requires _____ number of diodes whereas bridge type requires __ (i) 1,2 (ii) 2,4 (iii) 4,8 (iv) 3.2CO1 PO1 The MOSFET combines the areas of _____ & ____ (i) field effect & MOS technology (ii) semiconductor & TTL (iii) MOS technology & CMOS (iv) none of the mentioned technology CO3 PO₁ f. In the _____ type of chopper, two stage conversions take place. (i) AC-DC (ii) DC link (iii) AC link (iv) None of the mentioned CO₄ PO₁ g. A cycloconverter is a _____ (i) one stage power converter (ii) one stage voltage converter (iii) one stage frequency converter (iv) none of the mentioned CO1 PO₁ h. IGBT possess (i) low input impedance (ii) high input impedance (iii) second breakdown problems (iv) high on-state resistance CO3 PO₂ i. The average output voltage is maximum when SCR is triggered at $\omega t =$ (ii) 0 (i) π (iii) $\pi/2$ (iv) $\pi/4$ CO1 PO₁ j. A thyristor (SCR) is a (ii) N-P-N device (i) P-N-P device (iii) P-N-P-N device (iv) P-N device

PART – B: (Short Answer Questions) (2 x		(2 x 10	10=20 Marks)		
Q.2. Answer ALL questions		[C	O#]	[PC	D#]
	Mention some of the applications of controlled rectifier.	C	O3	PC	D 1
b.	What are the applications of an inverter?	C	O4	PC	D 1
c.	Write down the applications of IGBT?	C	02	PC	D 1
d.	Define latching current of SCR.	C	01	PC	D 1
e.	Power BJT is a current controlled device. Why?	C	01	PC	D1
f.	Give an expression for average voltage of single phase converters.		O3	PC	
	Classify power semiconductor devices give examples		01	PC	
g. h			03	PC	
h. :	What is the function of freewheeling diodes in controlled rectifier?		CO4 PO1		
i.	Give two advantages of CSI.		CO2 PO1		
j.	Define circuit turn off time of SCR.	C	02	PC	<i>)</i> 1
PAR	PART – C: (Long Answer Questions) (10 x 4 = 40 Marks)				
Answe	er ALL questions	N	1 arks	[CO#]	[PO#]
3. a.	A single phase 230V, 1Kw heater is connected across 1 phase 230V, 50Hz supthrough an SCR. For firing angle delay of 450 and 900, calculate the power absorbin the heater element		5	CO3	PO2
b.	Explain the construction of SCR with neat sketch.		5	CO1	PO1
	(OR)				
c.	A Chopper circuit is operating at a frequency of 2 kHz on a 460 V supply. If the voltage is 350 volts, calculate the conduction period of the thyristor in each cycle.	load	5	CO4	PO2
d.	Discuss the different modes of operation of thyristor with the help of static characteristics.	VI	5	CO1	PO1
4. a.	Design a circuit to produce average voltage of $40V$ across 100Ω load resistor fro $120V$ RMS $60hz$ AC source. Determine power absorbed by the resistance and pofactor.		5	CO3	PO2
b.	Draw the switching characteristics of SCR and explain it.		5	CO1	PO1
	(OR)				
c.	Explain the operation of 1-phase AC voltage controller with R load.		5	CO4	PO1
d.	Explain the method of phase control with relevant sketches derive an expression	for	5	CO3	PO1
u.	r.m.s. Output voltage.	101	3		
5. a.	Discuss the working of 1phase bridge converters with RLE load using relewaveforms.	vant	5	CO2	PO1
b.	Discuss the principle of operation of Boost converter with suitable waveforms. (OR)		5	CO3	PO1
c.	With the help of neat diagram explain the operation of BJT.		5	CO1	PO1
d.	Draw the circuit diagram and explain the working of Half Wave Rectifier		5	CO3	PO1
				CO2	PO2
6. a.	Explain the various types of triggering methods of SCR		5		
b.	Explain the operation of single phase full bridge inverter with neat sketch. (OR)		5	CO4	PO1
c.	Draw the circuit diagram of single-phase full wave fully controlled rectifier vinductive load. Explain the operation of circuit relevant sketches.	with	5	CO3	PO1
d.	A 230V, 50hz supply connected to load resistance of 12ohm through half w controlled rectifier. If firing angle is 60 degree, calculate (i) Average output vol (ii) RMS output voltage		5	CO4	PO1