

Code No: P18EET09

HALL TICKET NUMBER

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PACE INSTITUTE OF TECHNOLOGY & SCIENCES::ONGOLE
(AUTONOMOUS)

III B.TECH I SEMESTER END SUPPLEMENTARY EXAMINATIONS, MARCH/APRIL – 2023
POWER ELECTRONICS
(EEE Branch)

Time: 3 hours

Max. Marks: 60

Note: Question Paper consists of Two parts (Part-A and Part-B)

PART-A

Answer all the questions in Part-A (5X2=10M)

Q.No.	Questions	Marks	CO	KL
1.	a) Draw and explain static characteristics of thyristor	[2M]	1	2
	b) Explain the effect of free-wheeling diode on the operation of thyristor	[2M]	2	1
	c) Explain the operation of buck convertor	[2M]	3	5
	d) Discuss the comparison between single phase and three phase full	[2M]	4	4
	e) Explain modes of operation of Triac	[2M]	5	2

PART-B

Answer One Question from each UNIT (5X10=50M)

Q.No.	Questions	Marks	CO	KL
UNIT-I				
2.	a) Explain the significance of di/dt protection in thyristors and describe the method employed for improving the same.	[5M]	1	2
	b) With help of detailed structure explain the operation of MOSFET.	[5M]	1	3
OR				
3.	a) Describe briefly the RC triggering circuit for SCR with a neat circuit diagram. With the help of a graph explain how firing angle control up to 180 degrees is obtained.	[5M]	1	2
	b) Explain dynamic characteristics of SCR with neat sketch	[5M]	1	2
UNIT-II				
4.	Draw the circuit of 3 phase fully controlled rectifier with RLE load and explain the working for $\alpha=60^\circ$ with necessary waveforms. Derive the expression for output voltage.	[10M]	2	5
OR				
5.	a) Draw the circuit and derive the expression for output voltage of a single-phase bridge converter.	[5M]	2	5
	b) A battery is charged through a single-phase half wave controlled converter. The supply voltage is 230 V, 50 Hz and battery emf is constant at 160 V. Find the value of average charging current for firing angle of 30 degrees. Internal resistance of battery is 2 Ω .	[5M]	2	2
UNIT-III				
6.	a) Draw the circuit of buck boost converter and explain its working in discontinuous mode	[5M]	3	5
	b) For a dc-dc buck-boost converter with a dc input voltage of 50V and output voltage of 100V, calculate (i) duty cycle (ii) value of inductor if inductor ripple current $\Delta I = 10\text{mA}$. Given the switching frequency is 10kHz	[5M]	3	2
OR				



7.		Draw the power circuit diagram of a buck-boost regulator and explain its operation with equivalent circuit for different modes and waveforms.	[10M]	3	5
UNIT-IV					
8.	a)	Explain the operation of 3 phase voltage source inverter with 180o mode of operation.	[5M]	4	2
	b)	A single-phase bridge inverter fed from 200 V dc, is connected to an RL load of R = 9 Ω and L = 0.04 H. Determine the power delivered to the load in case the inverter is operating at 50 Hz with square wave output.	[5M]	4	4
OR					
9.	a)	Explain the sinusoidal pulse width modulation used in single phase inverter and draw its waveform.	[5M]	4	2
	b)	Differentiate a Current source inverter from a Voltage source Inverter.	[5M]	4	2
UNIT-V					
10.	a)	Draw and describe the circuit diagram of single-phase AC voltage controller with RL load. Explain the circuit operation with necessary waveforms.	[5M]	5	2
	b)	Explain working of Transformer tap changing using anti-parallel Thyristors.	[5M]	5	2
OR					
11.	a)	For a single-phase voltage controller, develop a relationship between conduction angle and firing angle. Under what condition conduction angle equals π ?	[5M]	5	2
	b)	A single-phase voltage controller has input voltage of 230V 50Hz and a load of R=15 Ohm. For 6 cycles ON and 4 cycles OFF. Calculate (i)RMS output voltage (ii)Input pf (iii)Average and rms thyristor currents.	[5M]	5	4
