

Approved by All India Council for Technical Education (AICTE), Delhi Affiliated to Dr. Babasaheb Ambedkar Marathwada University, Aurangabad.

Department of Electronics & Telecommunication Engineering

AY 2017-18 (Part-II)

Subject: POWER ELECTRONICS

Class- TE A & B

Question Bank

UNIT 1_Power Electronics Devices

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Sr.	Question	Marks	Year			
No						
	What would happen if positive gate voltage is given to reverse blocking thyristor? Justify.	5	ND16			
1	Why Ig ceases, ones the SCR comes into conduction? Justify.	5/5	MJ15/ND1			
			4			
2.	Diode reverse recovery characteristics	5	ND 16			
3	As gate current increases break over voltage decreases of an SCR. Justify	7	ND16			
4	For an SCR the gate cathode characteristics has source voltage of 15 straight line slope of	8/7/8	ND16/MJ1			
4	130 & allowable gate power dissipation of 0.5 watt, compute the gate source resistance		6/ND15			
5	With the help of structure & VI characteristics of DIAC & explain various operating modes	7	ND16			
2	of TRIAC					
	*The trr = 5 μ sec & di / dt = 80 A / μ s. <u>If SF = 0.5</u> determine	8/7/8	ND16/MJ1			
C	a) QRR , b) IRR		6/ND15			
0	*The trr = 3μ sec & di / dt = $30 \text{ A} / \mu$ s. determine	5				
	a) QRR , b) IRR		MJ 15			
7	With the help of neat circuit diagram explain structure of IGBT & VI characteristics	7	MJ 15			
	Bipolar transistor has current gain β =40. The load resistance RL=10 Ω , Vcc=130 V, input	8	MJ15			
	voltage to base circuit Vb=10 V,Vces=1.0 V & Vbes=1.5 Calculate					
0	1. Value of Rb for the operation in saturated state					
8.	2.Value of Rb for an overdrive factor of 5					
	3.Forse current gain					
	4.Power loss in transistor					
9.	Short Note: Gate characteristics of SCR	5	MJ16			
	Explain dynamic characteristics of SCR	7	ND14			
10	With the help of neat circuit diagram explain structure of BJT & VI characteristics	8/5	MJ16/ND1			
			5			

11	With the help of neat circuit diagram & waveform explain VI characteristics of MOSFET	7	ND15
	With the help of neat circuit diagram & waveform explain line synchronized UJT triggering	8	MJ16
	circuit		
12	State the rating & application of IGBT	5	ND14
	Design UJT firing circuit with following data.	8	ND14
13	η =0.7, Ip=50 μ A ,Iv=5mA, Vv=1V,C=0.1 ,Vbb=15 V leakage current of UJT with emitter		
	open =2mA.		
	A relaxation oscillator using UJT is to be designed for triggering on SCR the UJT has	8	MJ15
	following data.		
14	η=0.7, Ip=0.5mA ,Vp=15 V,Iv=2mA, Vv=0.8V,Rbb=6K Ω ,normal IL with emitter open		
	=3mA,C=0.05µF Compute the values of charging resistor & external resistor connected in		
	base circuit		
15	What is commutation? Why it is necessary in SCR	5	MJ16
16	Explain Class B commutation techniques with neat circuit diagram & waveform	7/8	MJ15/MJ1
10			6
17	Explain Class D commutation techniques with neat circuit diagram & waveform	7	ND15



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UNIT 2.Controlled Rectifier

Sr.No	Question	Marks	Year
1	Explain the concept of "quadrant of operation" of converter?	5	ND 14
2	Explain the operation of 3-phase full converter with R load and $\alpha < 60$	7	ND 14
3	*Explain the operation of 3-phase full converter with \mathbf{R} load with neat voltage & current waveform	7	ND16
4	Explain the operation of 3-phase full converter with RL load with neat voltage & current waveform	8	ND15
5	A 3-phase full converter feeds power to a resistive load of 10 ohm for firing angle of 30. The load takes 5KW power. Find the magnitude of per phase input supply voltage.	8	ND 14
6	What is dual converter? Explain the operation of circulating current mode dual converter.	7	ND 14
7	Find the peak value of circulating current of 3-phase dual converter given that rms supply voltage=220v, max. frequency=50Hz, α 1=60 & α 2=120	8	ND14
8	Calculate peak value of circulating current for 3 phase dual converter for the given data, per phase supply RMS voltage =230V, ω =315 rad/sec, L=12mH, α 1=60 & α 2=120	8	MJ15
9	Explain the effect of freewheeling diode on performance of 1 phase converter.	8	Dec 13
10	What is ideal dual converter? Explain.	5	May 14
11	Explain various performance parameter of 1 Phase converter.	7	ND 15
12	Explain 1 phase full converter with R load with neat ckt diagram & waveform	7	MJ16
13	 *Draw the circuit diagram of single phase full converter. Explain its working for RL load with voltage and current waveforms. *With the help of circuit diagram & waveform Explain operation of rectifier & inverter 	7	May 14
1.4	mode of single phase full converter with RL.	7	MJ15
14	A single phase rull converter with KL load having L=0.5mH, K=0.50nm, E=10V. The	ð	way

	input voltage is 120 V (rms) at 60 Hz. Calculate: 1) Load current at α=60. 2)		14
	Average thyristor current. 3) RMS thyristor current. 4) RMS input current.		
	A 1-Ø 230V, 1KW heater is connected across 1-Ø 230V,50 Hz supply through an	8	ND16
15	SCR.For firing angle delays of 45° & 90° , Calculate the power absorbed in the heater		
	element.		
-	A 1 phase Full converter operated from 220v ,50Hz supply gives an output voltage of	8	ND15
16	180V at no load .When loaded with a constant output current of 10 A. The overlap angle		
	is found to be 6^0 Compute the value of Inductances in Henneries		
17	Explain the effect of source inductance Ls on performance of 3 phase converter	7/8	ND16/
17			MJ16
10	Explain the effect of source inductance Ls on performance of 3 phase converter. Derive	8	May
18	the equation for voltage drop due to Ls.		14
	A 3 phase full controlled converter is operated from 3 phase a.c. supply with per phase	8	May
10	rms voltage=230v at 50Hz. The load resistance is 10 ohm. The average output voltage		14
19	must ve 490% of maximum possible output voltage. Calculate: 1) Delay angle.2) RMS &		
	avg .load current.3) RMS & avg.scr currents.		
20	Derive an expression for output voltage of 3 phase fully controlled bridge converter.	8	Dec 13
21	A 3 phase converter feeds power to a resistive load of 10ohm, for firing angle delay of 50,	8	Dec 13
21	the load takes 5KW. Find the magnitude of per phase input supply voltage.		
22	With help of circuit diagram explain the operating principle of dual converter.	8	June
22	Differentiate between two modes of dual converter.		13
	A 1 phase dual converter operated from 230v, 50Hz supply & the load resistance is	8	June
23	20ohm. The circulating inductance is Lc=25mH, delay angles are $\alpha 1=60$ and $\alpha 2=120$.		13
	Calculate a peak circulating current to converter.		
			1



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UNIT-3 A.C. Voltage Controller			
Sr. No	Question	Marks	Year
	Explain ON-OFF control method.	5/87/5/5	MJ14/ND16/
1	Explain Integral cycle control method		ND15/MJ15/
			MJ16
	Explain phase angle control method of ac voltage controller with neat circuit	7	MJ15
2	diagram & waveform		
3	Explain single phase a. c. voltage controller with RL load.	7/7	May
			14/MJ16
4	Explain the operation of phase angle control with neat circuit diagram and wave	8	Dec 14
4	forms. Also derive the expression for average output voltage and rms output voltage.		
	A single phase full wave ac voltage controller feeds a load of 200hm with an input	7	Dec 14
5	voltage of 230V,50Hz. Firing angle for both SCRs is 45, calculate: 1) RMS value of		
	output voltage.2) Load power and input P.F. 3)Average and rms current of SCRs		
	For a single phase a.c. voltage controller feeding resistive load, show the power	8	June 13
6	factor is given by:	8	MJ15
	$P.F.=[1/\pi(\pi-\alpha)+\sin 2\alpha/2]^{1/2}$		
7	What is cyclo converter? Explain.	5	Dec 14
8	Short note :Step Down cycloconverter	5/5	ND16/ND15
9.	Define cycloconverter & explain step-up cycloconverter	5	MJ15/MJ16
10	Explain single phase a.c. voltage controller with R load.	8	Dec 13
11	Describe the operation of 1phase to 1phase cycloconverter.	8	Dec 13
12	What is cycloconverter? What are the types? Explain advantages, disadvantages of	8	June 13
12	cycloconverter. State factors affecting the harmonics in cycloconverter.		
13	Write short notes on: 1) Reduction of harmonics in cycloconverter.	6*2=12	June 13
	2) Effect of source inductance on converter.		



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UNIT-4-INVERTERS Sr. Question Marks Year No 1.Short notes :Series inverter ND16/MJ16 1 5/5/5 2 Explain bridge inverter 5 ND16 3 Explain operation of parallel inverter 7 ND14 With neat circuit diagram & waveform explain working of 3 phase 120^o conduction 8/7/7 ND 4 mode bridge inverter. 15/16/MJ15 With neat circuit diagram and w/f .explain working of 3 phase 180° conduction mode MJ16/ND14 8/7 5 bridge inverter. A 1-phase full bridge inverter is operated from 48v battery and a resistive load of 10 7 ND16 ohm. Determine 1)O/P voltage of fundamental frequency 6 2)O/P RMS power 3) Thyristor rating Explain various voltage control techniques of an Inverter. 8/5/7 ND16/MJ15 7 /16 Calculate output frequency of series inverter with L=10 mH, MJ15/MJ16/ 8/7/8 8 $C=0.1\mu F$ & RL=500 Ω , Toff=250 μ sec, Tq=25 μ sec ND15 9 With the help of neat circuit diagram & waveforms, explain 1-phase series inverter 8 MJ15 Explain use of feedback diode in inverters 7 ND14 10 Find the output frequency and attenuation factor of a series inverter. Circuit with 8 ND14 11 following data. L=10mH & c= $0.14\mu f$ & RL=400 Ω , Toff=0.2msec,



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UNIT-5_CHOPPER

Sr.No	Ouestion	Marks	Year
	Explain current commutated chopper with neat circuit diagram, and waveform	7/7	ND16/ND1
1	Explain current commutated enopper with near encart angruin, and waverorm	,,,,	5
	The dc chopper has a resistive load of $\mathbf{R} = 10$ ohm $1/n$ dc voltage is 220 v. When the	8/7	5 ND16/M11
	chopper switch remains on Its ON stage voltage drop is 2V. Chopper frequency is	0/ /	6
2	1KUz If duty cycle is 50%. Determine 1) Average O/D Load Voltage 2) DMS O/D		0
	L and Waltage 2) Effective I/D Desistence		
	Load Voltage 3) Effective I/P Resistance	7	NID14
	The dc chopper has a resistive load of $R=10$ Ohm, $1/p$ dc voltage is 220v. When the	/	ND14
3	chopper switch Remains on. Its On-stage voltage drop is 2V. Chopper frequency is		
	1KHz. If duty cycle is 30%. Determine. 1) Average O/P Load Voltage 2) RMS		
	O/P Load Voltage 3) Effective I/P Resistance		
	With the help of neat circuit diagram, derive the expression for minimum &	7/8/8/8	ND16/MJ1
4	maximum load current of class –A Chopper.		6/ND14/N
			D15
5	Explain class 'C' chopper	5	ND16
6	Explain class 'D ' chopper	5	ND15
7	Fourth Quadrant chopper	5/5/5	MJ15/16/N
7			D15
0	Explain the voltage commutated chopper with neat circuit diagram & w/f.	7/8	MJ15/MJ1
8			6s
	For type A chopper Vs=220v,F=500Hz,Ton=800uSec,R=1Ω,l=1mH,E=72v.	8/8	MJ15/ND1
9	Find 1.load current IL is continues or not		5
	2. Compute the Imax & Imin.		
10	Explain various control strategies used for obtaining variable o/p voltage from DC	8/7	MJ15/ND1
10	chopper.		5
11	Explain various voltage control technique in chopper.	5	ND14
12	Explain step up chopper, derive expression for its o/p voltage	8	ND14



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UNIT 6_Power Electronics Applications				
Sr.No	Question	Marks	Year	
1	Explain flasher circuit with neat circuit diagram	7/7/7	MJ15/16/ND15	
2	Explain servo controlled voltage stabilizer	8	MJ15	
3	Short note :HF heating	5/5	MJ16/ND16	
4	Explain time delay circuit with neat waveform & circuit diagram	8/7/7	MJ16/	
-			ND14/ND16	
5	State the principle of Induction heating. What are its application	5	ND14	
6	What is power module explain	5	ND14	
7	Explain temp. controller with neat circuit diagram & Waveform	8/8	ND15/ ND16	