Reg. No.



MANIPAL INSTITUTE OF TECHNOLOGY

(A constituent Institution of MAHE, Manipal)

## VI SEMESTER B.TECH (ELECTRICAL & ELECTRONICS ENGINEERING)

## **END SEMESTER EXAMINATIONS, APRIL 2018**

## SUBJECT: POWER ELECTRONICS [ELE 3201]

**REVISED CREDIT SYSTEM** 

Time	e: 3 Hours	Date: 18 April 2018	Max. Marks: 50	
Instructions to Candidates:				
	✤ Answer ALL the questions.			
	<ul> <li>Missing data may be suitably</li> </ul>	v assumed.		
1A.	A thyristor string is made up of a has a voltage and current rating	number of SCRs connected in series and paralle s of 11 kV and 4 kA respectively. The voltage a	l. The string	
	ratings of available SCRs are 1800 calculate the number of series and	0 V and 1000 A respectively. For a string efficie d parallel connected SCRs.	ncy of 90%, <b>(02)</b>	
1B.	With the help of neat sketch, list t on the device behavior.	the salient features of MOSFET`s structure and t	heir impact <b>(04)</b>	
1C.	With the help of two transistor mo of a GTO using gate triggering me	odel and suitable expression, explain the turn on thod.	mechanism (04)	
2A.	A voltage source e = 100 sin (37 which performs half-wave contro the triggering angle is 45°.	7t), supplies a resistive load of 100 $\Omega$ through led rectification. Calculate the average power in	a thyristor, n the load, if <b>(02)</b>	
2B.	A controlled single phase full-w $L = 50$ mH. The source is 240 V rr angle of 75°.	vave bridge rectifier has an RL load with R = ns at 60 Hz. Determine the average load curren	= 25 Ω and t for a firing <b>(04)</b>	
2C.	An AC voltage regulator supplies is such that $L = 6.5$ mH and $R = 2.5$ the conduction angle of any one s	a RL load. The input rms voltage is 120 V at 60 I $\Omega$ . The delay angles of switches are $\alpha_1 = \alpha_2 = \pi/2$ witch and rms output current.	Hz. The load . Determine <b>(04)</b>	
3A.	A three-phase fully controlled bri per phase is operating at a firing a current is level at 80 A. The thyris	idge converter with 415 V supply, 0.04 $\Omega$ source angle of 35°. Calculate the average output voltage stor voltage drop is 1.5 V.	e resistance ge when the <b>(02)</b>	
3B.	Define the terms (i) amplitude mo to pulse width modulation techn respect to inverter output.	odulation ratio (ii) frequency modulation ratio v nique. Hence, mention the importance of these	vith respect terms with (03)	
3C.	A buck converter has an input o switching frequency if 400 kHz, inductor currents, average and pe	f 6 V and an output of 1.5 V. The load resiston L = 5 $\mu$ H and C = 10 $\mu$ F. Determine the average ack diode currents and average source current.	• is 3 Ω, the ge and peak (05)	
4A.	Mention any two limitation of Pus	sh-Pull inverter.	(02)	

4B.	With the help of neat circuit schematic and triggering sequence, plot any two phase voltage waveforms and corresponding line voltage waveform for a three phase square wave bridge inverter when conduction angle of each device is 120°.	(04)
4C.	With the help of circuit schematic and relevant waveforms, explain bipolar switching scheme as applied to a full bridge inverter. Hence, plot the harmonic spectrum for $m_a = 0.8$ and $m_f = 17$ .	(04)
5A.	Draw the switching loci in the i-v plane for a hard switched converter and for a soft switched converter.	(03)
5B.	With the help of neat circuit schematic, draw the voltage across the resonant capacitor and the current through the resonant inductor for a zero voltage switched buck converter.	(03)
5C.	With the help of neat circuit schematic and relevant waveforms explain the working of a 5-level cascaded inverter.	(04)