Reg. No.



VI SEMESTER B.TECH (ELECTRICAL & ELECTRONICS ENGINEERING) GRADE IMPROVEMENT EXAMINATIONS, JAN 2021

POWER ELECTRONICS [ELE 3201]

REVISED CREDIT SYSTEM

Time:	3 Hours	Date: 05 January 2021	Max. Mar	ks: 50
Instructions to Candidates:				
	✤ Answer ALL the questions.			
	 Missing data may be suitably 	assumed.		
4.4				
1A.	With the help of waveforms co the power diode, explain the r	orresponding to voltage across and current everse recovery phenomenon.	through	(03)
1B.	With the help of two transistor model of GTO, derive an expression for anod current in terms of current amplification factor and leakage current.			(04)
1C.	With the help of suitable an equivalent circuits of IGBT.	rguments develop the approximate and o	complete	(03)
2A.	A single phase half wave controlled rectifier is used to charge a battery of 200 V having an internal resistance of 2 Ω . The SCR is triggered at the instant when the instantaneous input voltage is equal to the battery voltage of 200 V. Determine the average charging current of the battery.			(03)
2B.	A full wave rectifier feeds an RL load with R=20ohm, L=20mH, α =60°. The sup is 230V at 50Hz. Assuming discontinuous conduction determine a) The expression for i _o (ω t) b) The angle for which each SCR conducts		e supply.	(04)
2C.	A 3-phase full converter feeds power to an R-L load such that the converter operates in continuous conduction mode. For a firing angle of 30°, the average output voltage is 450 V. Find the rms value of per phase input voltage, assuming star connected supply. Accordingly, calculate the voltage rating of each switch.		onverter average issuming vitch.	(03)
3A.	A boost converter has an input of 5V and an output of 25W at 15V. The minimum inductor current must be no less than 50% of the average. The output voltage ripple must be less than 1 %. The switching frequency is 300kHz. Determine the duty ratio, inductor and capacitor values.		ninimum ge ripple the duty	(04)
3B.	For a buck converter, plot the following waveforms			
	i. Inductor current			
	ii. Switch current and swi	tch voltage		(02)
	iii. Diode current and diod	le voltage		(03)
	iv. Capacitor current			

3C. A single phase full bridge inverter circuit, has load $R = 2 \Omega$ and dc source Vs = 230V. Calculate,

(i) the rms output voltage

(ii) the rms value of fundamental component of output voltage (03)

(iii)power delivered to the load in watts only due to the fundamental component of the load current.

(iv) If the R load is replaced by an RL load, plot the load voltage and load current

- 4A. 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 (03) square wave bridge inverter when conduction angle of each device is 120°.
- **4B.** With a neat circuit diagram, explain the Bipolar switching scheme for a Full bridge inverter. Also, draw the output voltage waveform corresponding to the carrier and **(04)** control signals. Plot the harmonic spectrum for $m_f = 17$ and $m_a = 0.8$.
- **4C.** List and explain three advanced modulation techniques with the help of relevant *(03)* waveforms.
- **5A.** Discuss space vector pulse width modulation (SVPWM) technique with respect to a 3 pole voltage source inverter. Mention use of null states in SVPWM technique. (03)
- **5B.** Draw the switching loci in the i-v plane for a hard switched converter and for a soft *(03)* switched converter.
- **5C.** With the help of a neat circuit schematic, draw the voltage across the resonant capacitor and the current through the resonant inductor for a zero current **(04)** switched buck converter.