

**BIRLA INSTITUTE OF TECHNOLOGY, MESRA, RANCHI**  
**(END SEMESTER EXAMINATION)**

**CLASS: B.TECH**  
**BRANCH: EEE**

**SEMESTER : VI**  
**SESSION : SP/2023**

**SUBJECT: EE353 POWER ELECTRONICS**

**TIME: 3 Hours**

**FULL MARKS: 50**

**INSTRUCTIONS:**

1. The question paper contains 5 questions each of 10 marks and total 50 marks.
  2. Attempt all questions.
  3. The missing data, if any, may be assumed suitably.
  4. Before attempting the question paper, be sure that you have got the correct question paper.
  5. Tables/Data hand book/Graph paper etc. to be supplied to the candidates in the examination hall.
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		CO	BL
Q.1(a)	Describe the resistance firing circuit for one SCR with proper waveforms. Is it possible to get a firing angle greater than $90^\circ$ with resistance firing? Illustrate your answer with proper waveforms.	[5] 1	1
Q.1(b)	Describe the transfer, output and switching characteristics of IGBT with proper waveforms.	[5] 1	1
Q.2(a)	Discuss various gate turn-on methods for a SCR.	[5] 2	2
Q.2(b)	Explain working principle of Class B commutation circuit of SCR with SCR current, capacitor voltage and capacitor current waveforms.	[5] 2	2
Q.3(a)	Illustrate with proper waveform a single-phase full-wave SCR with RLE load. Draw waveforms for source voltage, load voltage and load current for a given firing angle $\alpha$ .	[5] 3	3
Q.3(b)	The single-phase full converter with RLE load is connected to a 120-V, 60-Hz supply. The load current is continuous and its ripple content is negligible. The turns ratio of the transformer is unity. For delay angle $\alpha = \pi/3$ , calculate $V_{dc}$ , $V_{rms}$ , HF, DF, and PF.	[5] 3	3
Q.4(a)	Compare the different control strategies for dc-dc chopper.	[5] 4	4
Q.4(b)	Analyze step-up chopper in order to obtain the expression of output voltage in terms of duty cycle.	[5] 4	4
Q.5(a)	Develop switching technique for $180^\circ$ mode of conduction in three -phase voltage source inverter for resistive load and sketch its waveform.	[5] 5	6
Q.5(b)	Design and compare the control strategy for bipolar and unipolar SPWM switching technique in case of a single-phase full bridge voltage source inverter.	[5] 5	5,6

:::27/04/2023:::M