

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

CLASS: MTECH/PRE-PHD  
BRANCH: EEE

SEMESTER : I  
SESSION : MO/2023

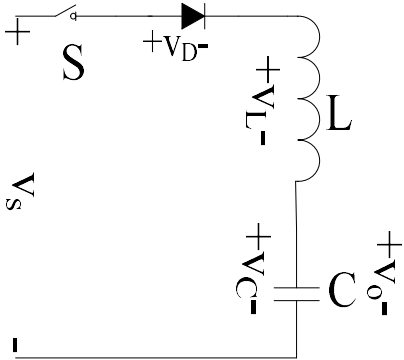
SUBJECT: EE507 ADVANCED POWER ELECTRONICS

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.

		CO	BL
Q.1(a)	Draw vertical cross-sectional diagram of POWER IGBT. Draw switching characteristics of Power IGBT.	[5] 1	2
Q.1(b)	In the diode and LC network, the capacitor is charged to voltage $V_0$ with upper plate positive. Switch S is closed at $t=0$ . Derive expressions for current through and voltage across C. Assume other data.	[5] 1	2
			
Q.2(a)	With the help of equivalent circuit diagram illustrate operating principle of full bridge converter along with the theoretical waveforms with relevant equations	[5] 2	3
Q.2(b)	Illustrate the operation of forward converter of 100W. Assume other specifications.	[5] 2	3
Q.3(a)	Analyze Space vector PWM switching scheme. Obtain and draw the instantaneous phase voltages (time averaging) during one switching cycle period for sector 1?	[5] 3	4
Q.3(b)	Examine the operating principle of cascaded multilevel converter with a neat circuit diagram and relate with other multilevel inverters	[5] 3	4
Q.4(a)	A basic series resonant inverter has both inductors ( $L_1=L_2=L$ ) of $50\mu\text{H}$ . It has a capacitor of $6\mu\text{F}$ . Connected resistive load is of $2\Omega$ . The DC supply voltage is 220V and the frequency of output voltage is 7kHz. Evaluate (a) the maximum possible turn OFF time for the Thyristor (b) maximum permissible frequency (c) peak to peak capacitor voltage (d) Peak load current (e) Output power $P_0$ .	[5] 4	5
Q.4(b)	Evaluate the Zero Voltage Switching Resonant Converter with the theoretical waveforms of Capacitor voltage and inductor current, derive the resonant capacitor voltage during resonant state.	[5] 4	5
Q.5(a)	Design a IGBT gate drive circuit	[5] 5	6
Q.5(b)	Devise an intelligent power module control strategy for an inverter	[5] 5	6