

**BIRLA INSTITUTE OF TECHNOLOGY, MESRA, RANCHI  
(END SEMESTER EXAMINATION MO2022)**

**CLASS: M.Tech / PRE-PHD  
BRANCH: EEE**

**SEMESTER : I  
SESSION : MO2022**

**TIME: 03 Hours**

**SUBJECT: EE507 ADVANCED POWER ELECTRONICS**

**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. Tables/Data handbook/Graph paper etc., if applicable, will be supplied to the candidates

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Q.1(a)	What are the conditions for a thyristor to conduct?	[2]	CO1 (BL1-Knowledge)
Q.1(b)	Draw the transfer, output, and switching characteristics of MOSFET	[3]	CO1 (BL1-Knowledge)
Q.1(c)	Discuss the steps required to design a heat sink for power electronic module.	[5]	CO3 (BL4-Analyze)
Q.2(a)	Is volt-second balance and charge balance applicable under transient conditions? Explain.	[2]	CO3 (BL4-Analyze)
Q.2(b)	Discuss the practical issues associated with isolated DC-DC converter.	[3]	CO2 (BL2-Understand)
Q.2(c)	Explain operation of push-pull converter and illustrate with transformer primary voltage, flux, inductor current, switch current and switch voltage waveforms.	[5]	CO4 (BL4-Analyze)
Q.3(a)	What is third harmonic PWM?	[2]	CO1 (BL1-Knowledge)
Q.3(b)	Illustrate the key features and advantages of the cascaded multilevel inverter topology?	[3]	CO3 (BL2-Understand)
Q.3(c)	Design space vector modulation based control strategy for three phase voltage source inverter.	[5]	CO5 (BL5-Evaluate) (BL6- Create)
Q.4(a)	What is the principle of series resonant inverter?	[2]	CO1 (BL1-Knowledge)
Q.4(b)	A series resonant inverter with parallel-loaded delivers a power of $P_L = 1$ kW at a peak sinusoidal load voltage of $V_p = 330$ volt and at resonance. The load resistance is $R = 10$ ohm and resonant frequency is 20 kHz. Determine (a) DC input voltage $V_s$ , (b) the frequency ratio $u$ if it is required to reduce the load power to 250 w by frequency control, (c) the inductor $L$ and, (d) the capacitor $C$ .	[3]	CO4 (BL4-Analyze) (BL5-Evaluate)
Q.4(c)	Design L-Type Zero Current Switching Resonant Converter.	[5]	CO5 (BL5-Evaluate) (BL6- Create)
Q.5(a)	Draw the PIN diagram of TLP 250.	[2]	CO2 (BL2-Understand)
Q.5(b)	Explain the various protection schemes required for power electronic switches.	[3]	CO3 (BL2-Understand)
Q.5(c)	Design a GATE driver circuit for SiC based MOSFET using MIC4425.	[5]	CO5 (BL5-Evaluate) (BL6- Create)