APJ ABDULKALAM TECHNOLOGICAL UNIVERSITY
08 PALAKKAD CLUSTER

Q. P. Code: **PE0821321B-I** (Pages: 2)

Name: .....

Reg. No: .....

THIRD SEMESTER M.TECH. DEGREE EXAMINATION DECEMBER 2021

Branch: Electrical and Electronics Engineering **Specialization: Power Electronics**

08EE7221(B) DESIGN OF POWER ELECTRONICS SYSTEM

(Common to PE)

Time: 3 hours **Max. Marks: 60**

Answer all six questions.

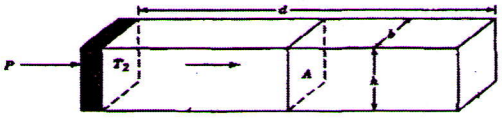
Modules 1 to 6: Part 'a' of each question is compulsory and answer either part 'b' or part 'c' of each question.

Q. No.	Module 1	Marks
1.a	What is the need for electrical isolation in drive circuits.	3
	Answer b or c	
b	Explain the design procedure for cascade drive circuits for normally on power devices with the help of neat diagram.	6
c	Explain the design procedure for dc coupled drive circuits with unipolar output with the help of neat diagram.	6

Q. No.	Module 2	Marks
2.a	SCR is operated with a supply voltage of 400V.The dv/dt is 500V/us and di/dt is 20A/us. Calculate the value of snubber circuit parameters and inductance for a damping ratio of 0.5 .	3
	Answer b or c	
b	Discuss the design procedure for a turn-off snubber circuit for transistor.	6
c	Design the values of di/dt inductor and RC snubber components for the SCR working in a 230V system. Given di/dt rating is 90A/us and dv/dt rating is 200V/us. Effective series resistance is 1.5ohm.Take the damping ratio as 0.6.	6

Q. No.	Module 3	Marks
3.a	What are the factors to be considered while designing a snubber circuit for GTO	3
	Answer b or c	
b	Discuss the design procedure for a turn-off snubber circuit for GTO.	6

c	Discuss the steps for the design of an overvoltage snubber.	6

Q. No.	Module 4	Marks
4.a	Discuss about heat transfer by convection	3
	Answer b or c	
b	A transistor module is mounted on an aluminium plate having dimensions h=4cm, b=5cm and d=3mm. A temperature drop of 4°C is allowed from one 4×5 cm^2 surface to the other. Find the maximum power that can be generated in the module. Ignore any heat losses to the surrounding air.	6
		
c	Find $R_{\theta.rad}$ for a cube of black oxidised aluminium 10 cm on a side. Assume T_s =120°C and T_a = 20°C	6

Q. No.	Module 5	Marks
5.a	Explain about the generation of electromagnetic interference in power converters	4
	Answer b or c	
b	What is stray capacitance? What is its effect on power electronic circuit?	8
c	What is a common mode choke and explain its various modes of operation? Discuss about any one application of it.	8

Q. No.	Module 6	Marks
6.a	Explain in detail about the zero voltage switching in resonant converter.	4
	Answer b or c	
b	Derive the equation for current through inductor in series resonant circuit with capacitor parallel load.	8
c	A series resonance inverter with parallel-loaded delivers a load power of P_L=1 kW at a peak sinusoidal load voltage of Vp = 330V and at resonance. The load resistance is R = 10 ohm. The resonant frequency is fo=20kHz. Determine (a) the 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.	8