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B.Tech DEGREE EXAMINATION, DECEMBER 2023

Fifth and Seventh Semester

18MEO122J - ELECTRONICS THERMAL MANAGEMENT

(For the candidates admitted during the academic year 2020 - 2021 & 2021 - 2022)

Note:

i. **Part - A** should be answered in OMR sheet within first 40 minutes and OMR sheet should be handed over to hall invigilator at the end of 40th minute.

ii. **Part - B** and **Part - C** should be answered in answer booklet.

Time: 3 Hours **Max. Marks: 100**

PART - A (20 × 1 = 20 Marks)
Answer **all** Questions

		Marks	BL	CO
1.	Fins are used to (A) decrease the thermal resistance (B) increase the thermal resistance (C) decrease the heat transfer (D) decrease the pressure drop	1	1	1
2.	Unit of convective heat transfer coefficient is (A) W/m^2K (B) W/mK (C) W/m^2 (D) Wm/K	1	1	1
3.	The Mean Time Between Failure of electronic devices (A) Increase with increase in temperature (B) decrease with decrease in temperature (C) decreases with increase in temperature (D) never change with temperature	1	1	1
4.	As per the Moore's law the number of transistors per microprocessor will double approximately every (A) 1.8 years (B) 18 years (C) 0.18 years (D) 1 year	1	1	1
5.	The addition of insulation in the cylindrical pipe (A) increases the heat transfer and then decreases (B) decreases the heat transfer and then increases (C) has no effect in heat transfer (D) always decreases the heat transfer	1	1	2
6.	The temperature profile for heat conduction through a wall of constant thermal conductivity in the absence of a heat source is (A) a straight line (B) parabolic (C) hyperbolic (D) exponential	1	1	2
7.	In natural convection, the two significant dimensionless parameters are (A) Grashof's number and Prandtl number (B) Reynold's number and Prandtl number (C) Reynold's number and Biot number (D) Reynold's number and Nusselt number	1	1	2
8.	The thermal conductivity of semiconductors (A) increases with temperature (B) decreases with temperature (C) never change with temperature (D) are constant	1	1	2
9.	_____causes the shear stress in bonded dissimilar materials used in electronic packing (A) coefficient of thermal expansion (B) atmospheric pressure (C) density (D) thermal conductivity	1	1	3

10.	If there are no externally induced flow velocities, then the Nusselt number (Nu) does not depend upon (A) Reynolds Number (B) Grashof's Number (C) Prandtl Number (D) Grashof's number and Reynolds's number	1	1	3
11.	Natural convection heat transfer coefficient is _____ the forced convection heat transfer coefficient (A) lower than (B) higher than (C) equal to (D) always higher	1	1	3
12.	Convection is defined as (A) Conduction + advection (B) Advection alone (C) Conduction + Radiation (D) Advection + radiation	1	1	3
13.	Emissive power of a black body depends on (A) Fourth power of temperature (B) Square of temperature (C) inverse of surface area (D) Square of temperature difference	1	1	4
14.	Emissive power of grey body is (A) 0.8 (B) 1 (C) 1.8 (D) -0.8	1	1	4
15.	Good emitters of radiation are also good absorbers of radiation at specific wavelength bands. This fact is referred to as (A) Kirchhoff's law (B) Newtons Law (C) Fourier's Law (D) Boltzmann's law	1	1	4
16.	The view factor between the smaller sphere to the larger sphere is _____ if both are arranged as concentric spheres. (A) 1 (B) 0.8 (C) <1 (D) >1	1	1	4
17.	The thermocouples measures the temperature by (A) Thermoelectric effect (B) Newtons Law (C) Boltzmann's law (D) Moore's law	1	1	5
18.	The effective thermal conductivity of heat pipe is (A) Higher than copper (B) lower than copper (C) same as copper (D) lesser than aluminum	1	1	5
19.	The heat pipe works in the principle of (A) evaporation and condensation (B) Conduction and radiation (C) convection and radiation (D) condensation and radiation	1	1	5
20.	Liquid immersion cooling has (A) higher heat transfer coefficient than air cooling (B) lower heat transfer coefficient than air cooling (C) same heat transfer coefficient as air cooling (D) extremely higher heat transfer coefficient than two cooling	1	1	5

PART - B (5 × 4 = 20 Marks)

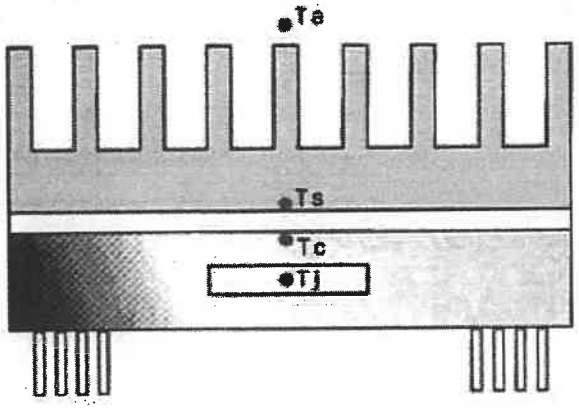
Answer **any 5** Questions

		Marks	BL	CO
21.	State Fourier's law of heat conduction and Newtons law of cooling.	4	2	1
22.	What is coefficient of thermal expansion, and how it affects the electronic packaging?	4	3	1
23.	Discuss how increasing the length of the fins affects the heat transfer?	4	3	2
24.	What are initial conditions and boundary conditions?	4	2	2
25.	State the importance of Nusselt Number and Reynolds number.	4	2	3

26.	What is emissivity and emissive power?		4	3	4
27.	Explain how the thermal imaging works?		4	3	5

PART - C (5 × 12 = 60 Marks)

Answer **all** Questions

			Marks	BL	CO
28.	(a)	Draw and explain in detail about the electrical equivalent of thermal resistance network for the below thermal system. 	12	2	1
		(OR)			
	(b)	Write the different types of thermal interface materials and explain how it helps in reducing the junction temperature?			
29.	(a)	What is a heat sink, and explain how the heat sink helps in reducing the junction temperature of electronic components?	12	2	2
		(OR)			
	(b)	Explain how the heat sink is selected for electronic cooling application based on material, efficiency and effectiveness of fins.			
30.	(a)	Discuss the advantages and disadvantages of natural and forced convection, and which one can be better for electronic cooling applications.	12	2	3
		(OR)			
	(b)	Explain the phenomenon of natural convection and how it can be applied for electronic cooling applications?			
31.	(a)	What is radiation view factor and explain its influence in electronic cooling?	12	3	4
		(OR)			
	(b)	Explain the influence of radiation combined with natural convection and forced convection in cooling of electronic devices?			
32.	(a)	Explain in detail about the fan curve, and how the fans can be selected for electronic cooling applications.	12	2	5
		(OR)			
	(b)	With neat sketch explain the working of heat pipes used in electronic cooling.			

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