Reg. No.															

B.Tech. DEGREE EXAMINATION, MAY 2024

Sixth Semester

18MEE451J – MICROELECTRONICS THERMAL MANAGEMENT

(For the candidates admitted from the academic year 2018-2019 to 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 & Part - C** should be answered in answer booklet.

Time: 3 hours | Max. Marks: 100

	Marks	BL	CO	PO

PART – A (20 × 1 = 20 Marks)

Answer **ALL** Questions

1. Significant causes of electronic failures occur due to — 1 | 1 | 1 | 1,2
   (A) Temperature (B) Vibration
   (C) Dust (D) Humidity

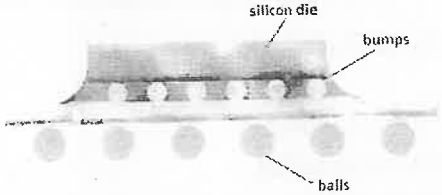
2. Fins are provided on a heat transfer surface to — 1 | 1 | 1 | 1,2
   (A) Decrease the heat transfer rate (B) Reduce the thermal resistance
   (C) Increase the pressure drop (D) Decrease the pressure drop

3. Heat transfer between two objects, or across a single object, that happens without a medium is — 1 | 1 | 1 | 1,2
   (A) Conduction heat transfer (B) Convection heat transfer
   (C) Radiation heat transfer (D) Radiation, convection and conduction heat

4. A TO-220 package has junction to ambient thermal resistance as 30°C/W, which is dissipating thermal power of 4W at an ambient temperature of 30°C. Its junction temperature is — 1 | 1 | 1 | 1,2
   (A) 130 (B) 120
   (C) 150 (D) 90

5. Equivalent thermal conductivity of PCB depends on — 1 | 1 | 2 | 1,2
   (A) Metal fraction (B) Epoxy layer
   (C) Electronic components (D) FR4 material

6. This arrangement is called as — 1 | 1 | 2 | 1,2



   (A) Wire bond package (B) Flip chip package
   (C) Through hole package (D) DIP

7. Vias in PCB 1 1 2 1,2
   (A) Decreases heat conduction (B) Decreases heat convection
   (C) Increases the heat conduction (D) Increases thermal resistance

8. The temperature profile for heat conduction through a wall of constant thermal conductivity in the absence of a heat source is 1 1 2 1,2
   (A) Hyperbolic (B) Logarithmic
   (C) A straight line (D) Parabolic

9. The thermal conductivity of semiconductors 1 1 3 1,2
   (A) Do not vary (B) Are constant
   (C) Increases with temperature (D) Decreases with temperature

10. If there are no externally induced flow velocities, then the Nusselt number (Nu) does not depend upon 1 1 3 1,2
   (A) Reynolds number (Re) (B) Prandtl number (Pr)
   (C) Grashoff number (Gr) (D) Stanton number (st)

11. The laminar or turbulent flow is determined by using 1 1 3 1,2
   (A) Nusselt number (B) Reynold's number
   (C) Biot number (D) Fourier number

12. Nusselt number in forced convection process is a function of 1 1 3 1,2
   (A) Grashoff number and Reynold's number (B) Grashoff and Prandtl number
   (C) Prandtl and Reynolds number (D) Grashoff number, Prandtl number and Reynolds number

13. Heat pipe works in the principle of 1 1 4 1,2
   (A) Evaporation and condensation (B) Conduction alone
   (C) Convection alone (D) Radiation alone

14. Heat pipe have effective thermal conductivity 1 1 4 1,2
   (A) Higher than copper (B) Lower than copper
   (C) Very low (D) Same as aluminum

15. The fluid used in heat pipe can be 1 1 4 1,2
   (A) Water (B) Air
   (C) No liquid (D) Dry air

16. The use of heat pipe 1 1 4 1,2
   (A) Decreases the thermal resistance (B) Increases the thermal resistance
   (C) Decreases heat transfer (D) Heat the surface

17. The thermoelectric cooler uses _____ to cool the surface. 1 1 5 1,2
   (A) Ammonia (B) Electrons and holes
   (C) Freon (D) Carbon-di-oxide

18.	Figure of merit of thermoelectric material depends on (A) Seebeck coefficient alone (B) Thermal conductivity alone (C) Electrical conductivity alone (D) Seebeck coefficient, thermal and electrical conductivity	1	1	5	1,2
19.	The thermocouples measures the temperature by (A) Thermoelectric principle (B) Joules law (C) Ohms law (D) Newton's law	1	1	5	1,2
20.	The thermocouple used to measure (A) Wind speed (B) Air density (C) Temperature (D) Solar radiation	1	1	5	1,2

PART – B (5 × 4 = 20 Marks)
Answer **ANY FIVE** Questions

		Marks	BL	CO	PO
21.	List the types of printed circuit board.	4	1	1	1,2
22.	Discuss the problem associated with thermal grease.	4	2	1	1,2
23.	Difference between Fan in and Fan out packaging.	4	1	2	1,2
24.	What are the advantages and disadvantages of wafer level packaging?	4	1	2	1,2
25.	Draw the fan curve and mention the region of operation.	4	2	3	1,2
26.	Draw the thermal resistance network of a heat pipe.	4	1	4	1,2
27.	Explain the seebeck and peltier effect.	4	2	5	1,2

PART – C (5 × 12 = 60 Marks)
Answer **ALL** Questions

		Marks	BL	CO	PO
28. a.	Explain how the thermal interface materials helps in electronic cooling.	12	2	1	1,2
	(OR)				
b.	Explain how the immersion cooling works and how it is useful for electronic cooling applications.	12	2	1	1,2
29. a.	Draw the detailed thermal resistance network of an electronic package and explain the thermal management options based on the same.	12	2	2	1,2
	(OR)				
b.	Explain in detail about the board cooling techniques.	12	1	2	1,2
30. a.	Draw the thermal resistance network of a cold plate and explain the same.	12	2	3	1,2
	(OR)				

b.	Discuss in detail, how the heat exchanger systems works in electronic cooling and how it affects the temperature of the electronic chip.	12	2	3	1,2
31. a.	Explain in detail about the working of heat pipe with a neat diagram.	12	2	4	1,2
	(OR)				
b.	Explain how the heat pipe system works in a mobile phone and laptop.	12	2	4	1,2
32. a.	With neat explain the working of thermoelectric cooling system.	12	1	5	1,2
	(OR)				
b.	Explain how the thermal imaging works, and how it is useful in identifying the problems in electronic cooling systems.	12	3	5	1,2

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