Total No. of Questions: 21

Enrollment No : _____

MEDICAPS UNIVERSITY

Faculty of Engineering

End Semester Examination May 2025

ME3CO32 Heat & Mass Transfer

Programme	:	B.Tech.	**Branch/Specialisation**	:	ME
Duration	:	3 hours	**Maximum Marks**	:	60

Note: *All questions are compulsory. Internal choices, if any, are indicated. Assume suitable data if necessary. Notations and symbols have their usual meaning.*

Answer any two Questions from section 6

Section 1 (Answer all question(s))

Q1. Up to the critical radius of insulation- **Marks 1 CO 1 BL 1**

Rubric	Marks
Added insulation will increase heat loss	1

- (•) Added insulation will increase heat loss
- ( ) Added insulation will decrease heat loss
- ( ) Convective heat loss will be less than conductive heat loss
- ( ) The heat flux will decrease

Q2. The unit of thermal diffusivity is- **1 1 1**

Rubric	Marks
m^2/hr	1

- (•) m^2/hr
- ( ) $m^2/hr\ °C$
- ( ) $kcal/m^2\ hr$
- ( ) $kcal/m.\ hr\ °C$

Q3. The rate of energy transferred by convection to that by conduction is called- **1 2 1**

Rubric	Marks
Nusselt number	1

- ( ) Stanton number
- (•) Nusselt number
- ( ) Biot number
- ( ) Peclet number

Q4. The transfer of heat by molecular collision is smallest in- **1 2 1**

Rubric	Marks
Solids	1

- (•) Solids
- ( ) Liquids
- ( ) Gases
- ( ) None of these

Q5. The value of Prandtl number for air is about- **1 3 1**

Rubric	Marks
0.7	1

- ( ) 0.1
- ( ) 0.3
- (•) 0.7
- ( ) 1.7

Q6. The extended surface used for the enhancement of heat dissipation is- **1 3 1**

Rubric	Marks
Boilers and turbines	1

- ○ Convective coefficient
- ○ Fourier number
- ◉ Fin
- ○ No finned surface

Q7. The non-dimensional parameter known as Stanton number is used in which of the following heat transfer? **1 4 1**

Rubric	Marks
Forced convection heat transfer	1

- ○ Natural convection heat transfer
- ○ Unsteady state heat transfer
- ○ Condensation heat transfer
- ◉ Forced convection heat transfer

Q8. The value of transmissivity may vary from- **1 4 1**

Rubric	Marks
Increases if a higher viscosity fluid is used	1

- ◉ 0-1
- ○ 1-2
- ○ 2-3
- ○ 3-4

Q9. Which among the following is always true for mass transfer to occur? **1 5 1**

Rubric	Marks
Difference in concentration	1

- ◉ Difference in concentration
- ○ Difference in Pressure
- ○ Difference in temperature
- ○ Difference in chemical potential

Q10. The counterflow heat exchanger has- **1 5 1**

Rubric	Marks
more efficiency then parallel flow	1

- ◉ more efficiency then parallel flow
- ○ less efficiency then parallel flow
- ○ equal efficiency as parallel flow
- ○ none of the above

Section 2 (Answer all question(s))

Marks CO BL

Q11. Enumerate the basic laws which govern the heat transfer. **4 1 2**

Rubric	Marks
statement	2
formulation and application	2

Q12. (a) Explain the critical thickness of insulation with diagram. **6 1 2**

Rubric	Marks
Explanation	3
Diagram	3

(OR)

(b) Explain conduction in composite walls with diagram.

Rubric	Marks
Conduction in wall	3
Diagram	3

Section 3 (Answer all question(s))

Marks CO BL

Q13. Explain the difference between free and forced convection with diagrams. **4 3 3**

Rubric	Marks
Free convection explanation	2
Forced convection explanation with diagram	2

Q14. (a) Explain the Thermal Boundary Layer with a diagram. **6 2 2**

Rubric	Marks
Explanation	3
Diagram	3

(OR)

(b) Discuss Laminar and Turbulent flow over a flat plate.

Rubric	Marks
Laminar flow	3
Turbulent flow	3

Section 4 (Answer all question(s))

Marks CO BL

Q15. Explain types of fins with diagram. **4 3 3**

Rubric	Marks
Fins explanation	2
Types	2

Q16. (a) Explain fins effectiveness with expression and diagram. **6 3 2**

Rubric	Marks
Fins effectiveness	3
Diagram	3

(OR)

(b) Explain fins efficiency with applications.

Rubric	Marks
Fins efficiency	3
Applications	3

Section 5 (Answer all question(s))

Marks CO BL

Q17. Explain the difference between parallel and counterflow heat exchangers. **4 4 2**

Rubric	Marks
Parallel flow	2
Counter flow	2

Q18. (a) Explain NTU and LMTD method of heat exchanger analysis. **6 4 2**

Rubric	Marks
NTU	3
LMTD	3

(OR)

(b) Explain Fick's Law with diagram.

Rubric	Marks
Explanation	3
Diagram	3

Section 6 (Answer any 2 question(s))

Marks CO BL

Q19. Explain radiation laws with expression and diagram. **5 3 1**

Rubric	Marks
Radiation law	2
Expression and diagram	3

Q20. Explain Planck's law with a diagram. **5 5 2**

Rubric	Marks
Definition	3
Diagram	2

Q21. Explain differences between a grey and black body. **5 5 2**

Rubric	Marks
Explanation	2
Differences	3

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