PRN:		Course Code:	MET 2603

Third Year **B. Tech** End Semester Examination Summer 2024

Heat and Mass Transfer

Day and Date: 25 MAY 2024 Sat Max Marks: **100**

Time: 02:00PM To 05:00PM Duration: **03** hrs

Instructions: All questions are compulsory.

		Marks	Bloom's Level	CO
Q.1	**Attempt the following**			
a)	Explain with suitable example: 1. Conduction 2. Convection 3. Radiation 4. Flick's law	08	L1	2603.1
b)	Define thermal conductivity and discuss the temperature variation with respect to thermal conductivity for solids, liquids and gases.	08	L1	2603.1
	OR			
b)	Explain second law of thermodynamics with suitable example.	08	L1	2603.1
Q.2	**Attempt the following**			
a)	Derive the expression for temperature distribution and heat transfer for a cylinder with uniform heat generation.	08	L2	2603.2
b)	Derive the expression for critical thickness of insulation for a sphere.	08	L2	2603.2
	OR			
b)	Derive an expression for the rate of heat flow through an infinite slab with thickness b, if its conductivity varies with temperature according to the law $K = K_O(1 + \frac{\alpha}{T})$	08	L2	2603.2
Q.3	**Attempt any two from the following**			
a)	Analyze the governing equation of Natural convection by Algebraic Rayleigh method	08	L2	2603.3
b)	Explain the physical significance of: i. Prandtl number (Pr) ii. Nusselt number (Nu)	08	L3	2603.3
c)	Explain with schematic sketch the concept of thermal boundary layer.	08	L3	2603.3
Q.4	**Attempt any two from the following**			
a)	Derive the differential equation of a pin fin.	08	L3	2603.4
b)	Analyze the temperature distribution, heat flow and efficiency for an insulated end pin fin.	08	L3	2603.4

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	c)	An Aluminum rod 2.5 cm in diameter and 10 cm long, protrudes from a wall which is maintained at 250 °C. the rod is exposed to an environment at 15 °C. the convection heat transfer coefficient is 15 W/m^2K. calculate the heat lost by the rod. Assume rod end is insulated. Take K for Aluminum = 200 W/mK. Also find the fin efficiency.	08	L3	2603.4
Q.5		**Attempt any Two of the following**			
	a)	Solve the following: i. Concept of black body ii. Emissivity and transmissivity iii. Various theories of radiation heat transfer	09	L4	2603.5
	b)	Write short note on: i. Radiation shape factor. ii. Radiation shield. iii. Heat exchange between gray surfaces.	09	L4	2603.5
	c)	State and explain: i. Kirchoff's law ii. Wien's displacement law iii. Lambert's Cosign rule	09	L4	2603.5
Q.6		**Attempt any Two of the following**			
	a)	Explain with neat sketch the pool boiling curve.	09	L4	2603.5
	b)	Differentiate between the phenomenon of condensation and boiling.	09	L4	2603.5
	c)	Explain the concept of forced boiling with suitable sketch.	09	L4	2603.5

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