PRN:		Course Code:	AET 403

Summer 2023

Final Year **B. Tech** End Semester Examination

Heat Transfer

Day and Date: Wednesday, 14/06/2023 Max Marks: **100**

Time: 2.00 to 5.00 PM Duration: **03** hrs

Instructions: All questions are compulsory.

			Marks	Bloom's Level	CO
Q.1		**Attempt the following.**			
	a)	Explain in detail: i. Zeroth law of thermodynamics ii. Concept of temperature and heat	08	L1	403.1
	b)	Explain the various modes of heat transfer with suitable example.	08	L1	403.1
		OR			
	b)	Define thermal conductivity and discuss the temperature variation with respect to thermal conductivity for solids, liquids and gases.	08	L1	403.1
Q.2		**Attempt the following.**			
	a)	Explain the concept of composite wall and how an electrical analogy can be used to estimate heat transfer from a composite wall.	08	L2	403.2
	b)	Derive the expression for critical thickness of insulation for a hollow cylinder.	08	L2	403.2
		OR			
	b)	Derive an expression for temperature distribution along the length of a pin fin having insulated end.	08	L2	403.2
Q.3		**Attempt any two from the following.**			
	a)	Explain with schematic sketch the thermal boundary layer.	08	L2	403.3
	b)	Draw the flow patterns in natural convection from: i. Heated vertical plate ii. Cooled vertical plate iii. Hot horizontal plate iv. Cold horizontal plate	08	L3	403.3
	c)	Explain the physical significance of: i. Grashoff's number (Gr) ii. Reynold's number (Re)	08	L3	403.3
Q.4		**Attempt any two from the following.**			
	a)	Draw the schematic sketches of: i. Tube in tube heat exchanger ii. Single pass shell and tube heat exchanger iii. Rotating matrix heat exchanger iv. Direct contact type heat exchanger	08	L3	403.4

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	b)	Derive an expression for LMTD for parallel flow heat exchanger.	08	L3	403.4
	c)	Derive an expression for effectiveness for parallel flow heat exchanger.	08	L3	403.4
Q.5		**Attempt any Two of the following.**			
	a)	State Plank's law and Stefan Boltzmann law and hence derive Stefan Boltzmann law from Plank's law.	09	L4	403.5
	b)	State and explain: i. Kirchoff's law ii. Wien's displacement law iii. Lambert's Cosign rule	09	L4	403.5
	c)	Write short note on: i. Radiation shape factor. ii. Radiation shield. iii. Heat exchange between gray surfaces.	09	L4	403.5
Q.6		**Attempt any Two of the following.**			
	a)	Write a note on thermal management for supersonic and hypersonic flights.	09	L4	403.5
	b)	Explain the nature of aerodynamic heating during planetary reentry.	09	L4	403.5
	c)	Explain ablation process in aerospace design in detail.	09	L4	403.5

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