QP Code: RM23MTECH099 | Reg. No | | | | | | | | | | | AY 23

GIET UNIVERSITY, GUNUPUR – 765022

M. Tech. (Second Semester) Examinations, May-2024

MPCTE2010 – Convective Heat Transfer

(HPTE)

Time: 3 hrs | Maximum: 70 Marks

(The figures in the right hand margin indicate marks.)

PART – A **(2 x 10 = 20 Marks)**

Q1. Answer all questions		CO#	Blooms Level
a.	Explain convection.	CO1	K1
b.	Explain two types of convection.	CO3	K3
c.	Define Newton's law of cooling.	CO2	K1
d.	Explain Reynold's number.	CO3	K2
e.	Write the mass flow rate with mathematical formula .	CO4	K2
f.	Why are heat sinks with closely packed fins not suitable for convective heat transfer although they increase the heat transfer surface area more?	CO3	K2
g.	Define boundary layer thickness.	CO2	K2
h.	Explain Nusselt number.	CO2	K1
i.	Define thermal Boundary Layer.	CO4	K1
j.	Explain no-slip condition.	CO4	K2

PART – B **(10 x 5 = 50 Marks)**

Answer ***ANY FIVE*** questions		Marks	CO#	Blooms Level
2. a.	Explain land breeze and sea breeze with the help of a diagram.	5	CO1	K2
b.	Write the advantages and disadvantages of convective heat transfer.	5	CO1	K3
3.a.	The water is flowing over the heated plate. The water has Prandtl number of 6. Find the relation between velocity boundary layer thickness and thermal boundary layer thickness. Explain the physical significance of Prandtl number in heat transfer.	5	CO2	K3
b.	Explain drag? What causes it? Why do we usually try to minimise it?	5	CO2	K3
4. a.	A beaker filled with hot water in a room cools from 70°C to 65°C in t1 minutes, 65°C to 60°C in t2 minutes and from 60°C to 55°C in t3 minutes, then t1<t2<t3.Explain.	5	CO2	K2
b.	For the fluid passing over the heated plate the hydrodynamic boundary layer thickness at a certain point is 1.5 m. find the thickness of the thermal boundary layer if the fluid has the following properties. Dynamic viscosity = 0.001 Pa.s Specific heat, Cp = 1.2 KJ/Kg.K Thermal conductivity, K = 1.1 W/m.K	5	CO3	K1
5.a.	Explain flow separation? Describe the effect of flow separation on the drag coefficient? How is the hydrodynamic entry length defined for flow in a tube?	5	CO4	K1
b.	Define Nusselt number. Describe Grashoff number and Stanton number?	5	CO1	K2

6. a.	Explain Stokes flow? Define Couette flow? Differentiate between a Newtonian and a non-Newtonian fluid.	5	CO2	K3
b.	Under what conditions does natural convection enhance forced convection and in what conditions does it hurt forced convection? Explain the form of equation used to calculate heat transfer for flow through cylindrical pipes?	5	CO2	K2
7.a.	When is natural convection negligible and when is it not negligible in forced convective heat transfer? Consider laminar natural convection from a vertical hot plate. Will the heat flux be higher at the top or bottom of the plate and why?	5	CO4	K3
b.	A body cools down from 50^{o}C to 45^{o}C in 5 minutes and then from 45^{o}C to 40^{o}C in another 8 minutes. Determine the temperature of the surroundings?	5	CO4	K2
8. a.	Explain meant by laminar and turbulent flow?	5	CO3	K2
b.	How does surface roughness affect the heat transfer in a tube if the fluid flow is turbulent? What would be the effect if the flow in the tube were laminar? Define boundary layer thickness.	5	CO4	K2

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