QP Code: R262B002 | Reg. No | | | | | | | | | | | AY 25

Gandhi Institute of Engineering and Technology University, Odisha, Gunupur
(GIET University)

M.Tech. (Second Semester - Regular) Examinations, May – 2026

24MCHPC12001 – Advanced Transport Phenomena

Chemical Engg.

Time: 3 hrs | Maximum: 60 Marks

Answer ALL questions

(The figures in the right hand margin indicate marks)

PART – A **(2 x 5 = 10 Marks)**

Q.1. Answer ***ALL*** questions	CO #	Blooms Level
a. What is the relation between friction factor and Reynolds number in laminar flow?	CO1	K1
b. What is Joule–Thomson effect?	CO2	K1
c. What is black body?	CO3	K2
d. What is boundary layer?	CO1	K1
e. Differentiate between Newtonian & Non-Newtonian fluid.	CO1	K2

PART – B **(10 x 5 = 50 Marks)**

Answer ***ALL*** the questions		Marks	CO #	Blooms Level
2. a.	Explain the significance of Reynolds number in determining flow regimes and friction factor correlations.	5	CO1	K2
b.	Explain how flow regime affects heat and mass transfer in industrial equipment.	5	CO1	K3
	(OR)			
c.	Discuss the concept of boundary layer development and its effect on friction factor.	5	CO1	K2
d.	Derive an expression for average velocity in terms of maximum velocity for laminar flow.	5	CO1	K3
3.a.	Discuss methods to minimize viscous losses in industrial pipelines.	5	CO2	K3
b.	Explain mass balance for systems with multiple inputs and outputs.	5	CO2	K3
	(OR)			
c.	Derive the macroscopic mechanical energy balance for steady incompressible flow including pump and turbine work.	5	CO2	K3
d.	Explain vena contracta and its relevance to sudden contraction and expansion.	5	CO2	K3
4.a.	Derive the relationship between pressure drop and flow rate for a power-law fluid in slit flow.	5	CO3	K2
b.	Discuss experimental methods used to characterize non-Newtonian fluids.	5	CO3	K3
	(OR)			
c.	Derive the momentum balance for flow through a nozzle or diffuser.	5	CO3	K2
d.	Discuss the effect of pipe roughness on viscous losses in turbulent flow.	5	CO3	K3
5.a.	Derive the relation between pressure and temperature for an adiabatic process in an ideal gas.	5	CO4	K3
b.	Explain correction factor in LMTD method.	5	CO4	K3
	(OR)			
c.	Derive the energy balance for a steady-flow process with negligible kinetic and	5	CO4	K3

	potential energy changes.			
d.	Explain mixing of gases at different pressures and its implications.	5	CO4	K3
6.a.	Explain the variation of condensate film thickness along a vertical plate during film-wise condensation.	5	CO3	K3
b.	Discuss design considerations for condensers handling pure vapor.	5	CO4	K3
	(OR)			
c.	Explain how Mach number affects flow regime and measurement accuracy.	5	CO1	K3
d.	Derive the expression for mass flow rate under choked flow conditions.	5	CO3	K3

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