BIRLA INSTITUTE OF TECHNOLOGY, MESRA, RANCHI
(MID SEMESTER EXAMINATION SP2023)

CLASS: BTECH **SEMESTER : VI**
BRANCH: CHEM **SESSION : SP2023**

SUBJECT: CL318 TRANSPORT PHENOMENA

TIME: 02 Hours **FULL MARKS: 25**

INSTRUCTIONS:
1. The question paper contains 5 questions each of 5 marks and total 25 marks.
2. Attempt all questions.
3. The missing data, if any, may be assumed suitably.
***4*. Tables/Data handbook/Graph paper etc., if applicable, will be supplied to the candidates**

			CO	BL
Q1	Briefly describe the following terms Gradient. Divergence. Tensors.	[5]	CO-1	BL1
Q2	Write short note on: Partial time derivative. Total time derivative. Substantial time derivative.	[5]	CO-1	BL1
Q3	For a layer of liquid flowing in laminar flow in the z direction down a vertical plate or surface, derive the velocity profile. Where δ is the thickness of the layer, x is the distance from the free surface of the liquid toward the plate and v_z is the velocity at a distance x from the free surface. (i) What is the maximum velocity v_z,max ? (ii) Derive the expression for the average velocity $v_{z\,av}$ and also relate it to $v_{z,max}$.	[5]	CO3	BL2
Q4	A fluid of constant density is flowing in laminar flow at steady state in the horizontal x direction between two flat and parallel plates. The distance between the two plates in the vertical y direction is $2y_0$. Derive the equation for the velocity profile within this fluid and the maximum velocity for a distance L m in the x direction.	[5]	CO-3	BL2
Q5	Using Navier –Stoke's equation, determine the velocity distribution in steady, laminar flow of an incompressible and viscosity fluid between two parallel plates placed horizontally while the upper plate moves steadily in a direction parallel with the other plate kept fixed.	[5]	CO-3	BL2

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