

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

**CLASS: B.TECH.
BRANCH: MECH / PROD**

**SEMESTER: V
SESSION: MO/2022**

SUBJECT: ME353 COMPUTATIONAL FLUID DYNAMICS (M)

TIME: 2 HOURS

FULL MARKS: 25

INSTRUCTIONS:

1. The total marks of the questions are 25.
 2. Candidates attempt for all 25 marks.
 3. Before attempting the question paper, be sure that you have got the correct question paper.
 4. The missing data, if any, may be assumed suitably.
 5. Tables/Data hand book/Graph paper etc. to be supplied to the candidates in the examination hall.
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			CO	BL	
Q1	(a)	Explain the conservation and non-conservation form of governing equations.	[2]	CO1	II
Q1	(b)	Convert the conservation form of continuity equation $\partial\rho/\partial t + \nabla \cdot (\rho\mathbf{V}) = 0$ into non-conservation form.	[3]		II
Q2	(a)	What do understand by Solver of a CFD code? Explain it.	[2]	CO1	II
Q2	(b)	Derive the x-momentum equation $\rho Du/Dt = - \partial p/\partial x + \partial\tau_{xx}/\partial x + \partial\tau_{yx}/\partial y + \partial\tau_{zx}/\partial z + \rho f_x$.	[3]	CO1	II
Q3	(a)	Explain the shear and normal stresses acting on a fluid element.	[2]	CO1	II
Q3	(b)	Discuss the linear and non-linear partial differential equations with example.	[3]	CO2	II
Q4	(a)	Briefly discuss on the marching problems.	[2]	CO2	II
Q4	(b)	Determine the mathematical character of the equations given by	[3]		III
		$\beta \partial u/\partial x - \partial v/\partial y = 0$			
		$\partial v/\partial x - \partial u/\partial y = 0$			
Q5	(a)	Discuss the physical boundary conditions for a viscous flow.	[2]	CO2	II
Q5	(b)	Explain the domain of dependence and zone of influence of hyperbolic equations.	[3]	CO2	II

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