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GANDHI INSTITUTE OF ENGINEERING AND TECHNOLOGY UNIVERSITY, ODISHA, GUNUPUR

(GIET UNIVERSITY)

M. Sc. (Third Semester) Regular Examinations, December – 2024

22MTPE309 – Fluid Dynamics

(Mathematics)

Time: 3 hrs | Maximum: 70 Marks

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

PART – A **(2 x 10 = 20 Marks)**

Q.1. Answer ***ALL*** questions		CO #	Blooms Level
a.	State Milne-Thomson circle Theorem.	CO3	K1
b.	Define complex speed.	CO3	K1
c.	A velocity field in a plane flow is given by V= 2yt + x j . Find the equation of the stream line passing through (4,2) at t=2	CO1	K2
d.	Define Stress and writes its Units.	CO4	K1
e.	Explain stress Matrix , direct stress and shearing stress.	CO4	K1
f.	Write the relation between Cartesian component of stress.	CO4	K2
g.	Velocity of a fluid particle in 2D steady incompressible flow is given by v = 4xi – 4yj. Find the equation of the streamline which is passes through (3,2).	CO1	K2
h.	Define Hydrostatic law.	CO1	K1
i.	Write the property of Stoke's stream function.	CO2	K2
j.	Write Potential theorem.	CO2	K1

PART – B **(10 x 5 = 50 Marks)**

Answer ***ANY FIVE*** questions		Marks	CO #	Blooms Level
2. a.	State and prove Kelvin's Energy Theorem.	5	CO2	K3
b.	State and Prove Euler' equations of motions.	5	CO1	K3
3.	Derive the Navier Stoke's Equation of motion.	10	CO4	K3
4. a.	Derive the velocity and acceleration of a fluid at a point.	3	CO1	K2
b.	State and prove Bernoulli's Equation.	7	CO2	K3
5.	State and prove The Blasius Theorem.	10	CO3	K3
6. a.	Derive an Euler's equation of continuity	5	CO1	K2
b.	If φ *and* Ψ are function of x and y satisfying Laplace equation show that s + I t analytics where $s = \frac{\partial \phi}{\partial y} - \frac{\partial \Psi}{\partial x}$ and $t = \frac{\partial \phi}{\partial y} + \frac{\partial \Psi}{\partial x}$	5	CO2	K2
7.a.	In a two dimensional fluid flow the stream function $\Psi = -\frac{y}{x^2+y^2}$. Find the velocity potential and complex potential.	5	CO3	K2
b.	The velocity potential function for a 2D flows φ = x(2y-1) at a point(4,5). Determine the velocity and value of stream function.	5	CO3	K2
8.	Derive the steady flow between concentric rotation cylinders.	10	CO4	K3