QPC: RN22PHD387 Reg. No | | | | | | | | | | |

GIET UNIVERSITY, GUNUPUR – 765022

Ph.D. (Second Semester) Examinations, November – 2023

WPPEMT2027 / PPEMT2027– Fluid Dynamics

(Mathematics)

Time: 3 hrs Maximum: 70 Marks

The figures in the right hand margin indicate marks.

Answer ANY FIVE Questions **(14 x 5 = 70 Marks)**

		Marks
1.a.	Discuss about the Properties of Fluids.	10
b.	Define Viscosity and velocity Gradient.	4
2.a.	Determine the Velocity and Acceleration at the point $(2,1,3)$ at 0.5 second if $u = yz + t$,$v = xz + t$ and w=xy.	7
b.	Derive the equation of Streamline and Path line.	7
3.a.	Define Velocity Potential Function and stream function.	8
b.	A velocity field in a Plane flow is given by $v = 2yt\hat{\imath} + x\hat{\jmath}$.Find the Equation of Stream line passing through $(4,2)$ at point $t = 2$	6
4.a.	Find the acceleration, angular velocity about the Z-axis and vorticity vector at the point $(2,-1,1)$ at time 2 seconds, For the velocity field $V = 2xy\hat{\imath} + 4tz^2\hat{\jmath} - yz\hat{k}$	5
b.	Derive the Equation for Motion of a fluid.	9
5.a.	Derive the relation between Cartesian Co-ordinates and Spherical Co-ordinates.	7
b.	A pipe through which water is flowing having diameter 20 cm and 10cm and at cross section 1 and 2. The velocity of water at section 1 and section 2. The velocity of water at section 1 is 4 m/sec. Find the velocity head at section 2 is also rate of discharge.	7
6.a.	Find the Stream function φ and Complex Potential if the Velocity Potential function is given by $\rho = 3x^2y - y^3$.	7
b.	Derive the Formula for complex velocity Potential for standard two-dimensional flow.	7
7 a.	Derive Blasius theorem for a complex function for a real part of a complex number.	10
b.	Velocity of a fluid particle in 2D steady incompressible flow $\vec{v} = 4x\hat{\imath} - 4y\hat{\jmath}$. Find the equation of the stream line which is passes through $(3,2)$.	4
8 a.	Derive the stress component in a real fluid.	5
b.	An oil of viscosity 0.1 Ns/m^2 and relative density 0.9 is flowing through a circular pipe 50 mm and length 300 m. The rate of flow of fluid through the pipe is 5 litres/seconds. Find the pressure drop in a length 300 m.	9

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