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Code No. : 14167 AS N/O

VASAVI COLLEGE OF ENGINEERING (AUTONOMOUS), HYDERABAD

Accredited by NAAC with A++ Grade

B.E. (Civil Engg.) IV-Semester Advanced Suppl. Examinations, Aug./Sept.-2023

Fluid Mechanics

Time: 3 hours

Max. Marks: 60

Note: Answer all questions from Part-A and any FIVE from Part-B

Part-A (10 × 2 = 20 Marks)

Q. No.	Stem of the question	M	L	CO	PO
1.	Compare U tube differential manometers and micro manometer.	2	2	1	1
2.	Define meta centre and metacentric height.	2	1	1	1
3.	Explain the concept of convective and local acceleration.	2	2	2	1
4.	List out the various characteristics of stream function	2	1	2	1
5.	Distinguish between body forces and surface forces with examples	2	4	3	1
6.	Categorize various applications of the impulse momentum equation	2	4	3	1
7.	What is water hammering phenomenon?	2	4	4	1
8.	Classify various minor losses in detail.	2	4	4	1
9.	Distinguish drag and lift force with a sketch.	2	4	5	1
10.	Explain the concept of streamlined body and bluff body	2	2	5	1
Part-B (5 × 8 = 40 Marks)					
11. a)	Show that the equation for total pressure is $P = w \cdot A \cdot y$ when a vertical plane surface is immersed in a static fluid of specific weight 'w', where A is area of plane surface and y is centre of gravity distance of plane surface from free liquid surface. Draw the relevant sketch.	4	1	1	1
b)	Calculate the dynamic viscosity of oil, which is used for lubrication between a square plate of size 0.8 m X 0.8 m and inclined plane with angle of inclination 30° as plate is moving towards down. The weight of the square plate is 300 N and it slides down the inclined plane with a uniform velocity of 0.3m/s. The thickness of oil film is 1.5mm	4	4	1	2
12. a)	Develop continuity equation for 1-Dimensional flow along a stream line.	4	3	2	1
b)	The velocity vector in fluid flow is given $V = 4x^3i - 10x^2yj + 2tk$. Find the velocity and acceleration of a fluid particle at (2, 1, 3) at time $t = 2$ sec.	4	2	2	2
13. a)	Show that Bernoulli's equation is given by $p/\omega + V^2/2g + y = \text{constant}$ by considering the flow along a stream line. (1-Dimensional flow)	4	1	3	1

Contd... 2

b)	A venture-meter is used for measurement of discharge of water in a horizontal pipeline. The upstream diameter is 300mm and the ratio of the upstream pipe diameter to the throat diameter is 2:1. The difference in pressure head between the throat and the upstream is equal to 3m of water. The loss of head through the meter is 12.5% of the velocity head at the throat. Analyze the discharge through the pipe	4	4	3	2
14. a)	Distinguish between pipes in series and pipes in parallel with sketches.	4	4	4	1
b)	A fluid of viscosity 0.7 N-s/m ² and specific gravity 1.3 is flowing through a circular pipe of 8M diameter 100mm. The maximum shear stress at the pipe wall is given as 196.2N/m ² , find average velocity and Reynolds number of the flow.	4	1	4	2
15. a)	Explain the various methods to control boundary layer separation	4	2	5	1
b)	Find the friction drag on a plate 15cm wide and 45cm long placed longitudinally in a stream of oil (specific gravity = 0.925 and kinematic viscosity of 0.9 stokes) flowing with a free stream velocity of 6m/s. Also find the thickness of the boundary layer and shear stress at the trailing edge.	4	1	5	2
16. a)	Explain the working of Bourdan pressure gauge with a neat sketch.	4	2	1	1
b)	Find the magnitude and direction of the velocity at any point, if the stream function is given by $\Psi = 3x - 4y$	4	1	2	2
17.	Answer any <i>two</i> of the following:				
a)	Distinguish between free vortex flow and forced vortex flow	4	2	3	1
b)	Distinguish between Laminar flow and Turbulant flow	4	2	4	1
c)	Classify various types of drag and explain them briefly	4	4	5	1

M : Marks; L: Bloom's Taxonomy Level; CO; Course Outcome; PO: Programme Outcome

i)	Blooms Taxonomy Level – 1	30%
ii)	Blooms Taxonomy Level – 2	32.5%
iii)	Blooms Taxonomy Level – 3 & 4	37.5%
