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Code No. : 14167 N/O

VASAVI COLLEGE OF ENGINEERING (AUTONOMOUS), HYDERABAD

Accredited by NAAC with A++ Grade

B.E. (Civil Engg.) IV-Semester Main & Backlog Examinations, July-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.	Differentiate between Newtonian and Non-Newtonian fluids?	2	1	1	1
2.	A circular plate of 2m diameter is immersed vertically below. The upper edge is one metre below the free surface. What is the magnitude of hydrostatic force on the plate?	2	2	1	2
3.	What do you understand by stream function and velocity potential function?	2	1	2	1
4.	A stream function is given by an expression $\psi = x^2 - y^2$, Calculate the velocity at a point P(1,1)?	2	2	2	2
5.	Write various assumptions used in Bernoulli's equation?	2	1	3	1
6.	A pipe conveys water with velocity of 120m/min, and pressure gauge showing 3.5 bar. The pipe is located 10m above datum line. Find the total head of water in the pipe?	2	2	3	2
7.	In a laminar flow through a circular pipe of diameter 200mm, the maximum velocity is found to be 1m/s. What is the velocity at a radial distance of 50mm from the axis of the pipe?	2	2	4	2
8.	What is water hammering phenomenon?	2	1	4	1
9.	A cylindrical chimney 50m height and 0.9m diameter subjected to wind blowing of 30m/s. Density of air = 1.2Kg/m ³ and Drag coefficient = 0.8, Calculate the Drag force?	2	2	5	2
10.	What do you understand by boundary layer separation?	2	1	5	1
Part-B (5 × 8 = 40 Marks)					
11. a)	Two large plates are 6mm apart fixed and the space in between them is filled with a viscous liquid. A small plate of 1mm thickness and 100cm ² surface area is pulled with a force of 32N parallel to the plates at midway between them with a velocity of 2m/s. The velocity profile is linear on either side of plate. Find the viscosity of the fluid?	4	4	1	2
b)	Describe with the help of neat sketches different types of manometers?	4	1	1	1
12. a)	An oil flows through a 100mm diameter pipe at a mean velocity of 180m/min. Take Mass density of oil $\rho = 879 \text{ Kg/m}^3$. Find the volumetric flow rate and Mass flow rate of oil?	4	3	2	2

Contd... 2

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b)	Define and distinguish between a) Steady and Unsteady flow b) Uniform and Non-Uniform flow c) Rotational and Irrotational flow	4	1	2	1
13. a)	A horizontal pipe end connected with converge nozzle has inlet and outlet diameters of 100mm and 50mm respectively. Ignore losses. If it discharges water at the rate of 600lit/min into the atmosphere, what is the probe gauge pressure at the nozzle inlet? (Take $\gamma_w = 1000\text{kg/m}^3$ and $g=10\text{m/s}^2$)	4	3	3	2
b)	Derive Bernoulli's equation from Euler's equation of motion?	4	4	3	1
14. a)	Water is discharged from a tank maintained at a constant head of 5m above the exit of a straight pipe 100m long 150mm diameter. Calculate the rate of flow if the friction factor for the pipe is given as 0.01, Take minor losses into account.	4	3	4	2
b)	Distinguish between laminar flow and turbulent flow in pipes and Explain the terms hydraulic gradient line(HGL) and total energy line (TEL).	4	2	4	1
15. a)	In an external flow over a flat plate, laminar boundary layer exists where velocity distribution is $u/U_\infty = 0.5y/\delta$. Find the ratio of Displacement thickness (δ^*) to the boundary layer thickness (δ) ?	4	4	5	2
b)	Discuss briefly the various factors affecting the boundary layer thickness?	4	2	5	1
16. a)	A solid sphere and a cube have the same surface area. When both solids are fully submerged in a tank consists of oil of specific gravity of 0.9, what is the ratio of Buoyancy force on the cube to that on the sphere?	4	3	1	2
b)	Define and distinguish between stream line, path line and streak line?	4	2	2	1
17.	Answer any <i>two</i> of the following:				
a)	A venturimeter with throat diameter 150mm is inserted in a pipe of 300mm diameter. The pressure difference measured by a mercury oil differential manometer on the top sides of the meter give us a reading of 0.5m of mercury . Find the rate of flow of oil of specific gravity 0.9 through the pipe, when the coefficient of discharge is 0.98.?	4	3	3	2
b)	Two pipes of lengths 2.5Km each and diameters of 80cm and 60cm respectively, are connected in parallel. The friction factor for each pipe is 0.024. The total flow rate is equal to 300litres per second. Find the discharge in each pipe?	4	3	4	2
c)	Discuss briefly a) Displacement thickness b) Momentum thickness c) Energy thickness	4	2	5	1

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

i)	Blooms Taxonomy Level - 1	22.5%
ii)	Blooms Taxonomy Level - 2	32.5%
iii)	Blooms Taxonomy Level - 3 & 4	45%
