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Code No. : 14115 N/O

**VASAVI COLLEGE OF ENGINEERING (Autonomous), HYDERABAD**  
**B.E. (Civil Engg.: CBCS) IV-Semester Main & Backlog Examinations, May-2019**

**Fluid Mechanics - I**

Time: 3 hours

Max. Marks: 60

*Note: Answer ALL questions in Part-A and any FIVE from Part-B*

Q. No.	Stem of the question	M	L	CO	PO
<b>Part-A (10 × 2 = 20 Marks)</b>					
1.	Define specific weight and specific mass.	2	1	1	1
2.	Define the terms: Metacenter and Meta centric height	2	1	1	1
3.	Define flow net.	2	1	2	1
4.	Define stream line and path line.	2	1	2	1
5.	Give the difference between notch and weir.	2	1	3	1
6.	Differentiate between free vortex motion and forced vortex motion.	2	1	3	1
7.	Plot the shear stress distribution for flow through pipes.	2	1	4	1
8.	Define the term water hammer in pipes.	2	1	4	1
9.	What do you understand by Froude's model law?	2	1	5	1
10.	Enumerate various applications of Dimensional analysis in the field of Fluid Mechanics.	2	2	5	2
<b>Part-B (5 × 8 = 40 Marks)</b>					
11. a)	State Pascal's law and explain the principle of buoyancy.	4	3	1	2
b)	A differential manometer connected at the two points A and B at the same level in a pipe containing an oil of specific gravity 0.8, shows a difference in mercury levels as 120 mm. Determine the difference in pressure at the two points.	4	3	1	2
12. a)	Obtain an expression for continuity equation for a three-dimensional, steady and incompressible flow	4	2	2	2
b)	A flow field is characterized by stream function $\psi = 3x^2y$ . Show that (i) it represents steady flow (ii) find the expression for velocity components in X and Y directions.	4	2	2	2
13. a)	A Venturimeter is introduced in a 30 cm diameter water pipe in which the maximum rate of flow is $12.0 \text{ m}^3/\text{min}$ and the pressure is 70 KPa. Calculate the minimum diameter of throat to ensure a negative pressure will not be formed in it. Take coefficient of discharge ' $C_d$ ' as 0.96.	4	3	3	1
b)	Show that the free surface of a forced vortex flow is a paraboloid.	4	3	3	1
14.	Derive Hagen – Poiseuille equation to determine the head loss in laminar flow through circular pipes.	8	4	4	1
a)	Explain in detail about the terms dynamic similarity and Modeling?	4	1	5	1
b)	A 1:45 model of a spillway records an acceleration of $2.5 \text{ m/s}^2$ , velocity of $0.65 \text{ m/s}$ and a force of $0.45 \text{ N}$ . What would be the values of the corresponding parameters in the prototype?	4	1	5	1

16. a) Explain the working of Bourdon pressure gauge.	4	3	1	2
b) For the velocity components in a fluid flow given by $u = x - 4y$ and $v = -y - 4x$ . Show that the flow is possible and irrotational flow. Also, obtain the relevant stream function.	4	4	2	1
17. Answer any <i>two</i> of the following:				
a) A 150mm diameter pipe line carries 0.5 cumec of oil of specific gravity 0.95; the pressure at 'A' is 80kPa and at 'B' is 25kPa. The section 'B' is 6m above 'A' and the diameter at this section is 300mm. Find the loss of head.	4	2	3	2
b) Discuss the application of Moody's diagram in flow through pressure conduits.	4	4	4	1
c) The time period 'T' of water surface waves depends on depth of flow 'D' fluid density ' $\rho$ ', surface tension ' $\sigma$ ', acceleration due to gravity 'g', and wavelength ' $\lambda$ '. Derive the functional relationship by dimensional analysis.	4	3	5	1

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

S. No.	Criteria for questions	Percentage
1	Fundamental knowledge (Level-1 & 2)	60
2	Knowledge on application and analysis (Level-3 & 4)	40
3	*Critical thinking and ability to design (Level-5 & 6) (*wherever applicable)	

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