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10CV35

Third Semester B.E. Degree Examination, Dec.2019/Jan.2020
Fluid Mechanics

Time: 3 hrs. Max. Marks:100

Note: 1. ***Answer FIVE full questions, selecting at least TWO questions from each part.***
2. ***Assume missing data suitably.***

PART – A

1 a. Distinguish between liquid and gas. **(04 Marks)**

b. Derive the expression for pressure intensity inside a soap bubble. **(06 Marks)**

c. A shaft of diameter 100 mm is rotating inside a journal bearing of diameter 102 mm at a speed of 360 r.p.m. The space between the shaft and bearing is filled with a lubricating oil of viscosity 0.5 poise (0.5 pa.s). The length of the bearing is 200 mm. Find the power absorbed in the lubricating oil. **(10 Marks)**

2 a. State and prove Pascal's law. **(06 Marks)**

b. Explain the working of Bourdan's pressure gauge with a neat sketch. **(06 Marks)**

c. Find the gauge reading G_1 and G_2 for the Fig. Q2 (c) shown: **(08 Marks)**

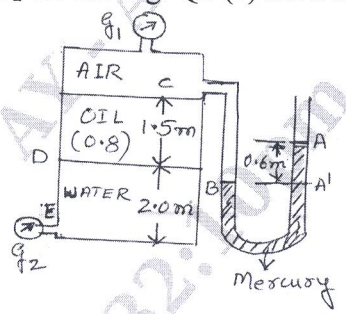

Fig.Q2 (c)

3 a. Show that centroid lies above centre of pressure, when a vertical plane is immersed in a liquid of unit weight 'W'. Also derive the expression for total pressure. **(10 Marks)**

b. Calculate the force F required to hold the hinged door in Fig. Q3 (b) in closed position. The door is a 0.5 m square. An air pressure of 30 KPa acts over the water surface. **(10 Marks)**

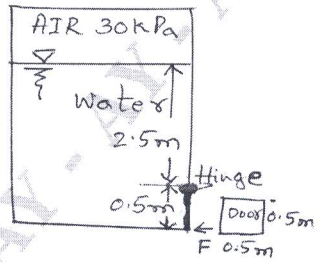

Fig. Q3 (b)

4 a. Define : (i) Steady flow and unsteady flow.
(ii) Rotational flow and Irrotational flow.
(iii) Uniform flow and Non uniform flow.
(iv) One dimensional flow and Two dimensional flow. **(08 Marks)**

b. Differentiate between laminar flow and turbulent flow. **(06 Marks)**

c. The stream function for a two dimensional flow is given by $\psi = 8xy$. Calculate the velocity at the point P(4, 5). Find the velocity potential function ϕ. **(06 Marks)**

PART – B

5 a. Explain momentum principle and give its applications. **(06 Marks)**

b. Determine the resultant force exerted by a flowing fluid on a pipe bend using impulse-momentum equation. **(06 Marks)**

c. A 30cm×15cm venturimeter is provided in a vertical pipe line carrying oil of specific gravity 0.9, the flow being upwards. The difference in elevation of the throat section and entrance section of the venturimeter is 30 cm. The differential U tube mercury manometer shows a gauge deflection of 25 cm. Calculate

(i) The discharge of oil

(ii) The pressure difference between the entrance section and the throat section. Take C_d as 0.98 and specific gravity of mercury as 13.6. **(08 Marks)**

6 a. Derive the Darcy-Weisbach equation for head loss due to friction in a pipe. **(08 Marks)**

b. Define equivalent size of pipe and give Dupit's equation. **(04 Marks)**

c. The diameter of a horizontal pipe which is 300 mm is suddenly enlarged to 600 mm. The rate of flow of water through this pipe is 0.4 m^3/s. If the intensity of pressure in the smaller pipe is 125 kN/m^2. Determine

(i) Loss of head due to sudden enlargement.

(ii) Intensity of pressure in the larger pipe

(iii) Power lost due to enlargement. **(08 Marks)**

7 a. Explain measurement of velocity in streams of lesser depth and of greater depth. **(06 Marks)**

b. Explain self recording gauge and staff gauge with neat sketches. **(06 Marks)**

c. Compute the stream flow for the measurement data given below using Mid section method:

Distance (m)		0	0.6	1.2	1.8	2.4	3.0	3.6	4.2	4.8	5.4	6.0	6.6
Depth (m)		0	0.3	1.29	2.16	2.55	2.22	1.68	1.41	1.05	0.63	0.42	0
Velocity	0.2d	0	0.48	0.57	0.78	0.87	0.80	0.75	0.69	0.63	0.54	0.45	0
at (m/sec)	0.8d	0	0.21	0.36	0.54	0.60	0.30	0.51	0.45	0.39	0.33	0.30	0

(08 Marks)

8 a. Derive an expression for the discharge over a triangular notch in terms of the depth of water above the sill of notch. **(06 Marks)**

b. Explain Rotometer with a neat sketch. **(06 Marks)**

c. A tank has two identical orifices in one of it's vertical sides. The upper orifice is 3 m below the water surface and lower one is 5 m below the water surface. If the value of co-efficient of velocity for each orifice is 0.96, find the point of intersection of the two jets. **(08 Marks)**

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