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10CV35

Third Semester B.E. Degree Examination, June/July 2019
Fluid Mechanics

Time: 3 hrs. Max. Marks:100

Note: ***Answer any FIVE full questions, selecting at least TWO full questions from each part.***

PART – A

1 a. Define :
i) Weight density
ii) Specific gravity
iii) Dynamic viscosity
iv) Vapour pressure
v) Surface tension
vi) capillarity **(12 Marks)**

b. The dynamic viscosity of oil used for lubrication between a shaft and a sleeve is 5 poise. The diameter of the shaft is 400mm and it rotates at 200rpm. Calculate the power lost in the bearing for a sleeve length of 100mm. The thickness of oil film is 2mm. **(08 Marks)**

2 a. State and prove hydrostatic law. **(08 Marks)**

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

c. With a neat sketch explain working of Bourdan's pressure gauge. **(06 Marks)**

3 a. Obtain an expression for hydrostatic force for a vertical lamina immersed inside a liquid and show that centre of pressure lies below its centroid. **(10 Marks)**

b. A rectangular tank 10m × 5m × 3.25m deep is divided by a partition wall parallel to shorter wall of tank. One on the compartment contains water to a depth of 3.25m and the other contains oil of specific gravity 0.85 to a depth of 2m. Find the resultant pressure on the partition wall. **(10 Marks)**

4 a. Define:
i) Steady flow and unsteady flow
ii) Uniform flow and non uniform flow
iii) Laminar flow and turbulent flow
iv) Rotational flow and Irrotational flow. **(08 Marks)**

b. Show that stream lines and equipotential lines are orthogonal to each other. **(04 Marks)**

c. In a two dimensional incompressible flow, fluid velocity components are given by $u = x - 4y$ and $v = -y - 4x$. Show that velocity potential exists and determine its form. **(08 Marks)**

PART – B

5 a. Derive Bernoulli's equation and state the assumptions made. **(10 Marks)**

b. A 2m long pipe line tapers uniformly from 100mm diameter to 200mm diameter at its upper end. The pipe centre line slopes upwards at an angle of 30° to the horizontal and the flow direction is from smaller to bigger cross sections. If the pressure gauges installed at the lower and upper ends of the pipeline read 200kPa and 230kPa respectively, determine the flow rate and the fluid pressure at the mid length of the pipeline. Assume no energy losses. **(10 Marks)**

6 a. Obtain an expression for loss of head due to sudden expansion of flow in pipe. (08 Marks)
b. Obtain an expression for pressure rise due to sudden closure of valve when the pipe is elastic. (08 Marks)
c. Water is flowing with an velocity of 1.5m/s in a pipe of length 2500m and diameter 0.5. At the end of the pipe a valve is provided. Find the rise in pressure if the valve is closed in 25 seconds. Take C = 1460 m/s. (04 Marks)

7 a. Write a note on the following:
i) Point gauge
ii) Hook gauge
iii) Staff gauge
iv) Weight gauge
v) Float gauge. (10 Marks)
b. Obtain an expression for finding velocity at a point using pitot tube. (06 Marks)
c. Find the velocity of flow of an oil through a pipe when the difference of mercury level in a differential u tube monometer connected to the two tappings of the pitot tube is 100mm. Take coefficient of pitot tube 0.98 and specific gravity of oil is 0.8. (04 Marks)

8 a. Explain the experimental method to find hydraulic coefficients of orifice. (06 Marks)
b. Derive an expression for discharge over a rectangular notch. (06 Marks)
c. Water flows over a rectangular weir 1m wide and 0.15m depth afterwards passer through a triangular right angled weir. Take C_d for rectangular and triangular weir as 0.62 and 0.59 respectively. Find the depth of flow over the triangular weir. (08 Marks)

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