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019404

May 2024

B.Tech. (ENV) - IV SEMESTER (Re-Appear)

FLUID MECHANICS AND

HYDRAULICS MACHINES

(PCC–ENV-401)

Time : 3 Hours] [Max. Marks : 75

Instructions :

1. *It is compulsory to answer all the questions (1.5 marks each) of Part-A in short.*
2. *Answer any four questions from Pdrt-B in detail.*
3. *Different sub-parts of a question are to be attempted adjacent to each other.*
4. *Make suitable assumptions wherever necessary.*

PART–A

1. (a) Define : Surface Tension. (1.5)

(b) Define : Cavitation. (1.5)

(c) Define : Capillarity. (1.5)

(d) Define : Stream line. (1.5)

(e) Define : Path line. (1.5)

(f) Explain : Laminar boundary layer. (1.5)

(g) Explain : Rotation. (1.5)

(h) Explain : Vorticity. (1.5)

(i) What are equivalent pipes? Mention the equation used for it. (1.5)

(j) Define Boundary Layer. (1.5)

PART–B

2. (a) Derive an equation of continuity for three dimensional Cartesian coordinate system. (10)

(b) Define and derive hydrostatics law. (5)

3. (a) The velocity potential function is given by $\emptyset = 4(x^2 - y^2)$. Calculate the velocity components at the point (2, 3). (5)

(b) Derive equation of total pressure and center of pressure for inclined submerged body. (10)

4. Derive Euler's equation of motion for flow along a stream line. Obtain Bernoulli's from it. State assumptions clearly. (15)

5. (a) A horizontal Venturimeter with inlet diameter 20 cm and throat diameter 10 cm is used to measure the flow of oil of sp.gr 0.8. The discharge of oil through Venturimeter is

60 Liters/Second. Find the reading of the oil mercury differential manometer take Cd = 0.98. (5)

(b) Derive an equation for discharge through a Venturimeter. Compare it with equation of discharge through an orifice meter. (10)

6. (a) State minor and major losses for flow through pipe and obtain Darcy-Weisbach formula for head loss due to friction. (10)

(b) State and explain stability criteria of submerged and floating bodies. (5)

7. (a) Derive an expression for Hagen-Poiseuille's formula for viscous flow. (10)

(b) Define Reynold's stress. Explain Prandtl's mixing length theory for total shear stress in turbulent flow. (5)
