EVENING

18 MAR 2021

Please check that this question paper contains 09 questions and 02 printed pages within first ten minutes.

[Total No. of Questions: 09] [Total No. of Pages: 02]

Uni. Roll No. .....

Program: B.Tech. (Batch 2018 onward)
Semester: 3rd
Name of Subject: Fluid Mechanics
Subject Code: PCCE-103
Paper ID: 16022

Time Allowed: 03 Hours **Max. Marks: 60**

NOTE:

1) Parts A and B are compulsory
2) Part-C has Two Questions Q8 and Q9. Both are compulsory, but with internal choice
3) Any missing data may be assumed appropriately

Part – A **[Marks: 02 each]**

Q1.

a) What do you mean by major and minor losses in pipes?
b) Define Bernoulli's equation. Enlist various applications of Bernoulli's equation.
c) State hydrostatic law.
d) Differentiate pipe flow and open channel flow.
e) Explain briefly the term boundary layer.
f) Define dynamic viscosity and kinematic viscosity.

Part – B **[Marks: 04 each]**

Q2. Determine mass density, specific volume and specific weight of fluid whose specific gravity is 0.85.

Q3. Draw and explain in detail the specific energy curve. Discuss its importance.

Q4. The diameters of a tapering pipe at the sections 1-1 and 2-2 are 100mm and 150 mm respectively. if the velocity of water flowing through the pipe at section 1-1 is 5 m/s, find: a) Discharge through the pipe b) Velocity of water at section 2-2

Q5. The velocity of flow in a badly corroded 8 cm pipe is found to be increase 30 perecnt as a pitot tube is moved from a point 1 cm from the wall to 3cm from the wall. Estimate height of roughness elements.

Q6. What do you understand by Prandtl mixing length theory? Also write an expression for shear stress due to Prandtl.

Q7. Find head loss due to friction in a pipe of diameter 300 mm and length 50 m, through which water is flowing at a velocity of 3 m/s using (i) Darcy formula (ii) Chezy's formula for which C = 60. Take kinematic viscosity of water as 0.01 stoke.

Part – C **[Marks: 12 each]**

Q8. Determine rate of flow of water through a pipe 300 mm diameter placed in an inclined position where a venturimeter is inserted, having throat diameter of 150 mm. The difference of pressure between the main and throat is measured by a liquid of specific gravity 0.7 in an inverted U-tube which gives a reading of 260 mm. The loss of head between the main and throat is 0.3 times the kinetic head of pipe.

OR

A trapezoidal channel with side slope of 1 to 1 has to be designed to convey 10 m^3/s at a velocity of 2 m/s so that the amount of concrete lining for the bed and sides is the minimum. Calculate the area of lining required for one metre length of canal.

Q9. A horizontal pipe line 40 m long is connected to a water tank at one end and discharges freely into the atmosphere at the other end. For the first 25 m of its length from the tank, the pipe is 150 mm diameter and its diameter is suddenly enlarged to 300 mm. The height of water level in the tank is 8 m above the centre of the pipe. Considering all the losses of head which occur. (i) Determine the rate of flow. (ii) Draw hydraulic gradient line and energy gradient line. Take f= 0.01 for both sections of pipe.

OR

A U-tube manometer is used to measure the pressure of water in a pipe line, which is in excess of atmospheric pressure. The right limb of the manometer contains mercury and is open to atmosphere. The contact between water and mercury is in left limb. Determine the pressure of water in the main line, if the difference in the level of mercury in the limbs of U-tube is 10 cm and the free surface of mercury is in the level with the centre of pipe. If the pressure of water in pipe line is reduced to 9810 N/m^2, Calculate the new difference in the level of mercury . Sketch the arrangements in both cases.

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