VIT
Vellore Institute of Technology

Continuous Assessment Test – II

Programme Name & Branch: B.Tech (chemical Engineering)

Course Name & Code: Momentum Transfer, CHE1005

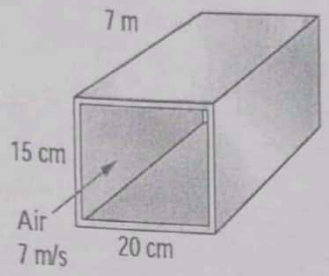
Class Number :VL2019201001176
Slot : D1+TD1

Exam Duration : 50 Min
Maximum Marks : 50

General instruction:
1. Use of Moody chart is permitted.
2. Assume necessary and appropriate data if required.

Answer ALL Questions (5 x 10 = 50 Marks)

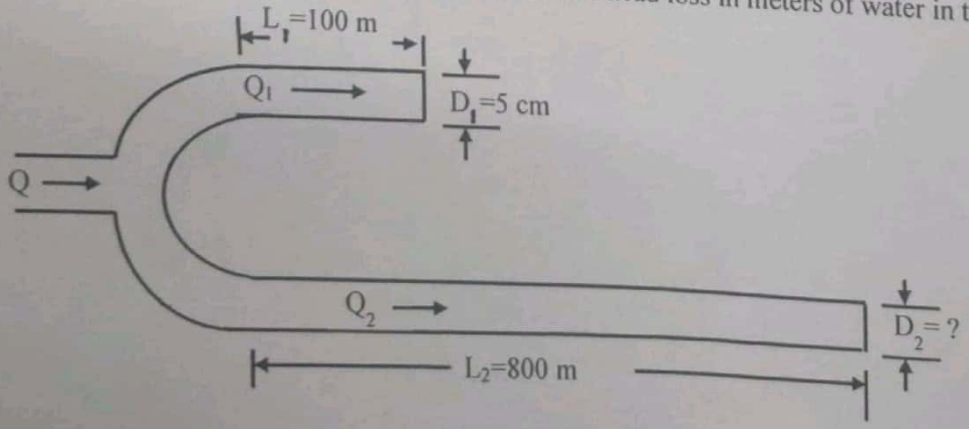
1. Air enters a 7-m-long section of a rectangular duct of cross section 15 cm x 20 cm made of commercial steel at 1 atm and 35°C at an average velocity of 7 m/s. Disregarding the entrance effects, determine the fan power needed to overcome the pressure losses in this section of the duct. The roughness of commercial steel surfaces is ε = 0.000045 m.



2. Oil of specific gravity 0.82 is pumped through a horizontal pipeline 150 mm in diameter and 3 km long at a rate of 0.015 m^3/sec. the pump has an efficiency of 68% and requires 7.5 kW to pump the oil. Calculate the dynamic viscosity of oil. Is the flow laminar?

3. The rate of flow of water through a horizontal pipe is 0.25 m^3/sec. The diameter of the pipe which is 200 mm is suddenly enlarged to 400 mm. The pressure intensity in the smaller pipe is 11.772 N/cm^2. Determine:
   (i) Loss of head due to sudden enlargement
   (ii) Pressure intensity in the larger pipe
   (iii) Power lost due to enlargement

4. A farmer wishes to connect two pipes of different lengths and diameters to a common header supplied with 8×10^{-3} m^3/sec of water from a pump. One pipe is 100m long and 5 cm in diameter. The other pipe is 800 m long. Determine the diameter of the second pipe such that both have the same flow rate. Assume the pipes to be laid on level ground and friction coefficient for both pipes as 0.02. Also determine the head loss in meters of water in the pipes.



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5. The fixed parallel plates kept at 80 mm apart have laminar flow of oil between them with a maximum velocity 1.5 m/sec. Taking dynamic viscosity of oil to be 19.62 poise, calculate;

(i) The discharge per meter width,
(ii) The shear stress at the plates,
(iii) The pressure difference between two point 25 m apart
(iv) The velocity at 20 mm from the plate, and
(v) The velocity gradient at the plates end.

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