2+2=4

SHAHEED BHAGAT SINGH STATE TECHNICAL CAMPUS, FEROZEPUR

ROLL No: | | | | | | | | | | | | |

Total number of pages:[2]
Total number of questions:06

B.Tech. || CHE || 3rd Sem.

Fluid Flow (RP)

Subject Code:BTCH-303A/ 303

Paper ID: M/18

(2015 batch onwards)

Time allowed: 3 Hrs Max Marks: 60

Important Instructions:

- All questions are compulsory
- Assume any missing data
- Additional instructions, if any

PART A (2×10)

Q. 1. Short-Answer Questions: All COs

(a) An ideal fluid has no _____ or _____.
(b) Describe Newton's law of viscosity and its significance.
(c) Compare the merits and demerits of Orifice meter and Venturi meter in the measurement of flow.
(d) What is the significance of NPSH in a pump?
(e) Define boundary layer.
(f) What is hydraulic radius?
(g) What is dimensional consistency?
(h) Draw fanning friction factor chart.
(i) Mach number is the ratio of _____ to _____.
(j) Write basic dimensionless terms used to describe turbulent flow.

PART B (8×5)

Q. 2. A U - tube differential mercury manometer is connected between two pipes X and Y. Pipe X contains carbon tetra chloride (Sp.gr. 1.59) under a pressure of 103 kN/m^2 and pipe Y contains oil (Sp.gr. 0.8) under a pressure of 172 kN/m^2. Pipe X is 2.5 m above pipe Y. Mercury level in the limb connected to pipe X is 1.5 m below the centerline of pipe Y. Find the manometer reading as shown by a centimeter scale attached to it. CO1

OR

Water flows through a horizontal conical pipe. The diameter at larger end is 1.3 m and that at smaller end is 0.7 m. The pressure head at the smaller end is 5 m of water and discharge is 3.5 m^3/s. Calculate the velocities at the two ends, and pressure head at larger end. CO1

Q. 3. Water flows through a Venturi meter which has a diameter at the inlet of 1.2 m and a diameter of 0.6 m at the throat. The difference in pressure between CO2

the main and the throat is measured by a differential mercury gauge, which shows a deflection of 5.1 cm. Find the discharge through the meter and also calculate the velocity of water at the throat. Take the coefficient of discharge of the meter as 0.98.

OR

Draw a neat sketch showing the development of boundary layer for laminar flow between two parallel plates , also indicate the shape of the velocity profiles at developing and developed sections. CO2

Q. 4. Pressure drop of a homogeneous fluid in a straight smooth pipe (ΔP) is a function of the pipe geometry (diameter d, and length l), the physical properties of the fluid (densityr and viscosity m) as well as its velocity v. CO4

$\Delta P = f(d, l, r, m, v)$

Using dimensional analysis, find out the relationship between dimensionless groups.

OR

An agitator of diameter D requires power P to rotate at a constant speed N in a liquid of density ρ and viscosity μ, show with the help of Pi theorem that CO4

$$P = \rho N^3 D^5 F\left(\frac{\rho N D^2}{\mu}\right)$$

Q. 5. An oil of relative density 0.92 and dynamic viscosity 0.082 Poise flows in an 80 mm diameter pipe. In a distance of 20 m the flow has a head loss of 2 m. Calculate (I) the mean velocity (ii) discharge (iii) shear stress at the pipe wall. CO3

OR

Derive Hagen-Poiseuilles equation, highlighting the assumptions made. CO3

Q. 6. Explain principle, working and construction of centrifugal pump. CO5

OR

Name any three positive displacement pump and explain the working principle of any one type. CO5