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Total Number of Pages : 02

B.Tech  
PCE3I101

3<sup>rd</sup> Semester Back Examination 2019-20  
FLUID FLOW AND FLOW MEASUREMENT

BRANCH : CHEM, PT

Max Marks : 100

Time : 3 Hours

Q.CODE : HB677

Answer Question No.1 (Part-1) which is compulsory, any EIGHT from Part-II and any TWO from Part-III.

The figures in the right hand margin indicate marks.

Part-I

Q1 Only Short Answer Type Questions (Answer All-10) (2 x 10)

- Differentiate between Newtonian and non Newtonian fluid.
- Define hydraulic radius and equivalent diameter
- Why is there a negative sign in the pressure – height relation?
- Determine the absolute pressure and the gauge pressure that would exist within a spherical droplet of water 5 mm in diameter.
- What do you mean by stream line and write its differential equation?
- Distinguish between kinetic energy correction factor and momentum correction factor.
- What conditions lead to cavitation?
- Name the forces considered in the derivation of Euler's equation of motion.
- What are the factors which finite the suction head of a pump?
- Find the kinematic viscosity in stokes of a liquid whose specific gravity is 0.95 and viscosity is 0.011poise.

Part-II

Q2 Only Focused-Short Answer Type Questions- (Answer Any Eight out of Twelve) (6 x 8)

- What do you mean the term fluid and give their classification?
- Derive an expression for velocity distribution for laminar flow through pipe.
- Write a short note on inclined tube manometer.
- What is the condition for fluidization?
- What is the main difference between an orifice meter and a pitot tube?
- What is water hammer? Discuss in brief.
- What are the disadvantages in case of orifice meter?
- What do you mean by NPSH? Explain in detail.
- A tank full of water is open at the top with a hole near the bottom, the area of which is  $0.25\text{m}^2$  and the cross sectional area of the tank is  $1\text{m}^2$ . If the height of water above the hole is maintained at 10m, what is the volumetric flow rate out of the hole?
- A centrifugal pump is used to pump water through a horizontal distance of 150m and then raised to an overhead tank 10m above. The pipe is smooth with an ID of 50mm. What head must the pump generate at its exit to deliver water at a flow rate of  $0.001\text{m}^3/\text{s}$ ? Fanning friction factor,  $f$  is 0.0062.
- A venture meter is installed to measure the flow rate of water in a 178 mm diameter pipe. The throat diameter is 102 mm. The differential pressure measured using a manometer is  $154.3\text{KN}/\text{m}^2$ . The data for discharge coefficient is 0.98.
- A centrifugal pump delivers water at the rate of  $0.22\text{m}^3/\text{s}$  from a reservoir at ground level to another reservoir at a height  $H$ , through a vertical pipe of 0.2m diameter. Both the reservoirs are open to atmosphere. The power input to the pump is 90KW and it operates with an efficiency of 75%. Given that  $f=0.004$ . Calculate the height of the water delivered.

**Part-III**

**Only Long Answer Type Questions (Answer Any Two out of Four)**

**Q3** What is fluidization? Explain the term minimum fluidization and derive its expression. **(16)**

**Q4** For laminar flow of the fluid flowing through a circular pipe, derive the expression for average velocity, maximum velocity and friction factor. Show the velocity profile. **(16)**

**Q5** What is meant by head loss due to friction in a pipe? What are the various types of losses occurring in a pipe? How it can be calculated? Express various empirical formulas. **(16)**

**Q6** Draw the characteristic curve of a centrifugal pump for head, capacity, power and efficiency. **(16)**