



(Following Paper ID and Roll No. to be filled in your Answer Book)

PAPER ID : 154315

Roll No.

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B. Tech.

(SEM. III) (ODD SEM.) THEORY
EXAMINATION, 2014-15

FLUID FLOW & SOLID HANDLING

Time : 3 Hours]

[Total Marks : 100

- Note:** (1) Attempt all questions.
(2) All questions carry equal marks.

1. Attempt any four parts of the following **5x4=20**
- (a) What is Pitot tube? How will you determine the velocity at any point with the help of Pitot tube?
 - (b) Why does the viscosity of a gas increases with the increase in temperature while that a liquid decreases with increase in temperature?
 - (c) what is surface tension? Determine the surface tension on a liquid jet having diameter d and length L .
 - (d) 25 mm diameter nozzle discharges 0.76 m^3 of water per minute when the head is 60 m. The diameter of the jet is 22.5 mm. Determine the value of co-efficients C_c , C_v , C_d and the loss of head due to fluid resistance.

2. Attempt any four parts of the following **5x4=20**

- (a) What is the difference between U-tube differential manometers and inverted U tube differential manometers? Where are they used?
- (b) What is sedimentation process? Determine the terminal velocity of sedimentation system.
- (c) Prove that the maximum velocity in a circular pipe for viscous flow is equal to two times the average velocity of the flow.
- (d) What is Buckingham π -theorem? Explain in detail with suitable examples.
- (e) An oil of viscosity 5 poise is used for lubrication between a shaft and sleeve. The diameter of the shaft is 0.5 m and it rotates at 200 rpm. Calculate the power lost in oil for a sleeve length of 100 mm. The thickness of oil film is 1.0 mm.

3. Attempt any two parts of the following **10x2=20**

- (a) Define the equation of continuity. Obtain an expression for continuity equation for a three-dimensional flow.
- (b) Describe the working of centrifugal pump and obtain an expression for the work done by a pump.
- (c) Derive on the basis of dimensional analysis suitable parameters to present the thrust developed by a propeller. Assume that the thrust P depends upon the angular velocity, speed of advance V , diameter D , Dynamic Viscosity μ , mass density ρ , elasticity of the fluid medium which can be denoted by the speed of sound in the medium C .

4. Attempt any two parts of the following **10x2=20**

- (a) What are the classifications of filtration process? Determine the total pressure circulation in the cake filtration system.
- (b) What is dynamics of fluid flow? Describe the Euler's equation of fluid motion and how you obtain Bernoulli's equation from it?
- (c) A closed vessel contains water upto a height of 1.5 m and over the water surface there is air having pressure 7.848 N/cm^2 above atmospheric pressure. At the bottom of the vessel there is an orifice of diameter 100 mm. Find the rate of flow of water from orifice. Take $C_d=0.6$.

5. Attempt any two parts of the following **10x2=20**

- (a) What are the practical applications of Bernoulli's equation? Derive an expression for calculating the rate of fluid flow through venturimeter.
- (b) What is Darcy-Weisbach equation? Derive the equation to calculate the loss of head due to friction in pipe flow.
- (c) The diameter of a small piston and a large piston of a hydraulic jack are 3 cm and 10 cm respectively. A force of 80 N is applied on the small piston. Find the load lifted by the large piston when:
 - i. the piston are at the same level
 - ii. small piston is 40 cm above the large piston.

The density of the liquid in the jack is given as 1000 kg/m^3 .