

C.U.SHAH UNIVERSITY

Summer Examination-2016

Subject Name : Fluid Mechanics

Subject Code : 4TE04FME1

Branch :B.Tech (Mech,Auto)

Semester : 4

Date :10/5/2016

Time :2:30 To 5: 30

Marks : 70

Instructions:

- (1) Use of Programmable calculator & any other electronic instrument is prohibited.
 - (2) Instructions written on main answer book are strictly to be obeyed.
 - (3) Draw neat diagrams and figures (if necessary) at right places.
 - (4) Assume suitable data if needed.
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Q-1

Attempt the following questions:

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- a) Which of the following is dimensionless
(a) specific gravity (b) specific volume (c) specific speed (d) specific weight
- b) The two important forces for a floating body are
(a) buoyancy, gravity (b) buoyancy, pressure (c) buoyancy, inertial
(d) inertial, gravity
- c) Falling drops of water become spheres due to the property of
(a) adhesion (b) cohesion (c) surface tension (d) viscosity
- d) Rotameter is a device used to measure
(a) absolute pressure (b) velocity of fluid (c) flow (d) Rotation
- e) The property of a fluid which enables it to resist tensile stress is known as
(a) viscosity (b) surface tension (c) cohesion (d) adhesion
- f) Barometer is used to measure
(a) pressure in pipes, channels etc. (b) atmospheric pressure
(c) very low pressure (d) difference of pressure between two points
- g) Laminar developed flow at an average velocity of 5 m/s occurs in a pipe of 10 cm radius. The velocity at 5 cm radius is:
(a) 7.5 m/s (b) 10 m/s (c) 2.5 m/s (d) 5 m/s
- h) If w is the specific weight of liquid and h the depth of any point from the surface, then pressure intensity at that point will be
(a) h (b) wh (c) w/h (d) h/w
- i) The property of fluid by virtue of which it offers resistance to shear is called
(a) surface tension (b) viscosity (c) cohesion (d) adhesion
- j) Working principle of dead weight pressure gauge tester is based on
(a) Pascal's law (b) Dalton's law of partial pressure
(c) Newton's law of viscosity . (d) Avogadro's hypothesis
- k) All the terms of energy in Bernoulli's equation have dimension of
(a) Energy (b) Work (c) Mass (d) Length



- l) For measuring flow by a venture meter, it should be installed in
 - (a) vertical line (b) horizontal line
 - (c) inclined line with flow downward (d) in any direction and in any location.
- m) The stress-strain relation of the Newtonian fluid is
 - (a) linear (b) parabolic (c) hyperbolic (d) inverse type
- n) Surface tension has the units of (SI unit)
 - (a) Newton (b) Newton/cm (c) Newton/m (d) None of the above.

Attempt any four questions from Q-2 to Q-8

- Q-2 Attempt all questions**
- a) Discuss types of Fluid. **04**
 - b) Derive an expression for the meniscus effect of a liquid. **05**
 - c) Obtain an expression for capillary rise & capillary fall of liquid? **05**
- Q-3 Attempt all questions**
- a) Derive an expression for the Meta-centric height of floating body. **07**
 - b) Enlist types of manometers. Differentiate between u-tube manometer and u-tube differential manometer. **07**
- Q-4 Attempt all questions**
- a) Give the differences between the following **04**
 - (1) Steady flow and Unsteady flow. (2) Laminar flow and Turbulent flow.
 - b) In three dimensional fluid flow, the velocity component are $u = X^2 + Y^2Z^2$, $v = -(XY+YZ+ZX)$. Determine the 'w' to satisfy the continuity equation. **05**
 - c) A 30 cm X 15 cm venturimeter is inserted in vertical pipe carrying water, flowing in upward direction. A differential mercury manometer connected to the inlet and throat gives a reading 20 cm. Find the discharge. Take $C_d = 0.98$ **05**
- Q-5 Attempt all questions**
- a) What is Venturimeter? Derive an expression for the discharge through a Venturimeter **07**
 - b) Discuss different types of similarities that must exist between a prototype and its model. **07**
- Q-6 Attempt all questions**
- a) State the various dimensionless numbers with their significance in fluid flow situations. **04**
 - b) Write a short note on Reynold's experiment. **05**
 - c) A shaft of diameter 0.35 m rotates at 200 r.p.m. inside a sleeve 100 mm long. The dynamic viscosity of lubricating oil in the 2 mm gap between sleeve and shaft is 8 poises. Calculate the power lost in the bearing. **05**



Q-7

Attempt all questions

- a) Derive an expression for velocity distribution for viscous flow through a circular pipe. Also sketch the velocity distribution and shear stress distribution across the section of a pipe. **07**
- b) Prove that the velocity of sound waves in a compressible fluid is given by $C = \sqrt{k/\rho}$. Where K= Bulk modulus, ρ = Mass Density. **07**

Q-8

Attempt all questions

- a) State Bernoulli's theorem for compressible fluid flow and derive an expression for the same when the process is adiabatic **07**
- b) Define Mach number. What is the signification of Mach number in compressible fluid flows? **07**

