

## FACULTY OF ENGINEERING AND TECHNOLOGY

SE(Civil) Examination - DEC – 2014

## Fluid Mechanics-I (Revised)

[Time: THREE Hours]

[Max. Marks: 80]

"Please check whether you have got the right question paper."

- N.B**
- 1) Question no 1 and 6 are compulsory.
  - 2) Attempt any two questions from each section.
  - 3) Draw neat sketches wherever necessary.
  - 4) Assume suitable data if necessary.

## SECTION A

- Q.1 Answer the following (any five) 10
- a) Enlist the importance properties of fluid
  - b) Define fluid kinematics and fluid dynamics.
  - c) Define compressible and incompressible fluids.
  - d) Define absolute pressure and atmospheric pressure.
  - e) Give classification of manometers.
  - f) State Archimedes principle.
  - g) What do you understand by total pressure and centre of pressure?
- Q.2
- a) What do you mean by single column manometer? How are they used? 06
  - b) A U-tube manometer is used to measure pressure at a point in a pipe. The left limb contains water is connected to a pipe full of water at a pressure & pressure at the right limb contains mercury is 15cm above the centre of pipe and difference between mercury levels is 27cm. find the pressure intensity of water in the pipe. 06
  - c) What is capillarity? Give practical examples. 03
- Q.3
- a) Derive an expression for the meta centric height of a floating body (body analytically) 08
  - b) A solid cylinder 4.0mt in diameter and 4.0mt high is floating in water with its axis vertical. If its specific gravity is 0.6. Find the meta centric height. Also state whether the equilibrium is stable or unstable. 07
- Q.4
- a) Explain the following 06
    - i) Stream function
    - ii) Velocity potential function
    - iii) Streamline and streak line
  - b) The velocity vector in fluid flow is given by  $V = 2x^3i - 5x^2yj + 4tk$  find velocity and acceleration of a fluid particle at (1, 2, 3) at time  $t = 1$  09

## SECTION B

- Q.5
- a) Find an expression for the loss of head of a fluid. Flowing through a circular pipe 07
  - b) What is Hagen formula? Derive an expression for Hagen poiseuille's formula. 08
- Q.6 Answer the following (any five) 10
- a) State Bernoulli's theorem (equation)
  - b) Define kinetic energy correction factor.
  - c) What do you mean by venacontracta?
  - d) Enlist the forces acting on fluid in motion.
  - e) What do you mean by Magnus effect?
  - f) What do you understand term boundary layer.
  - g) Define small and large orifice.
- Q.7
- a) What is Euler's equation of motion? How will you obtain Bernoulli's equation from it? 07
  - b) Derive continuity equation in Cartesian co-ordinates. 06
  - c) What is principle of venturi meter? 02
- Q.8
- a) Obtain an expression for time of emptying a tank through an orifice at its bottom. 07
  - b) A tank has two identical orifices in one of its vertical sides. The upper orifice is 4m below the water surface and lower one 6m below the water surface. If the value of  $C_d$  for each orifice is 0.90 find the point of intersection of the two jets. 08

- Q.9 a) Find an expression for the discharge over triangular notch or weir in terms of head of water. 08  
b) Water is flowing over a cipolletti weir 4.0mt long under a head of 1.0mt calculate the discharge. If 07  
the coefficient of discharge for the weir is 0.60.
- Q.10 a) Explain with neat sketch 08  
1. Laminar boundary layer. 07  
2. Separation of boundary layer.  
b) Obtain an expression for momentum thickness.