

Code No: 114AV

**R13**

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD**

**B.Tech II Year II Semester Examinations, May - 2016**

**MECHANICS OF FLUIDS**

**(Metallurgical and Material Engineering)**

**Time: 3 Hours**

**Max. Marks: 75**

**Note:** This question paper contains two parts A and B.

Part A is compulsory which carries 25 marks. Answer all questions in Part A.

Part B consists of 5 Units. Answer any one full question from each unit.

Each question carries 10 marks and may have a, b, c as sub questions.

**PART - A**

**(25 Marks)**

- 1.a) What is specific weight? State its units. [2]
- b) What is Archimedes' principle? [3]
- c) Define steady flow and unsteady flow. [2]
- d) Define velocity potential function. [3]
- e) State the momentum equation. [2]
- f) Classify flow measurements. [3]
- g) Define boundary layer theorem. [2]
- h) Differentiate Pressure drag and skin drag. [3]
- i) Define fully developed flow. [2]
- j) What is friction factor? Give equation of friction factor for laminar flow. [3]

**PART - B**

**(50 Marks)**

- 2.a) Why are specific gravities most often referred to the density of water at 4 °C instead of 0 °C?
- b) A water filled U-tube manometer is used to measure the pressure inside a tank that contains air. The water level in the U-tube on the side that connects to the tank is 1.5 m above the base of the tank. The water level in the other side of the U-tube (which is open to the atmosphere) is 0.6 m above the base. Determine the pressure within the tank. [5+5]

**OR**

- 3.a) Discuss about metacenter and meta centric height.
- b) When the submarine Thresher sank in the Atlantic in 1963, it was estimated in the newspapers that the accident had occurred at a depth of 304.9 m. What is the pressure of the sea at that depth? [5+5]
- 4.a) What do you understand by uniform flow and non-uniform flow?
- b) Write a short note on vorticity and irrotational flow. [5+5]

**OR**

- 5.a) Discuss path line, stream line, streak line and stream tube with neat sketches.
- b) A pipe line tapers from 8 cm diameter to 4 cm diameter. If the discharge through the pipe is 100 liter/sec, find the average velocities at the two sections. [5+5]

- 6.a) State Bernoulli's theorem and its limitations.  
b) When an airplane is flying at 322 km/h at 1524 m altitude in standard atmosphere, the air velocity at certain point on the wing is 439 km/h relative to the airplane. What suction pressure is developed on the wing at that point? [5+5]

**OR**

- 7.a) Discuss on Buckingham's  $\Pi$ -theorem.  
b) Derive equation for flow through venturimeter. [5+5]

- 8.a) Write short note on velocity profile on flat plate with neat sketch.  
b) A 3.6 m long boat moves with a speed of 1.5 m/s. Would a boundary layer type flow be developed along the sides of the boat? Explain. [5+5]

**OR**

- 9.a) Explain the flow around submerged objects with neat sketch.  
b) A viscous fluid flows past a flat plate such that the boundary layer thickness at a distance 1.3 m from the leading edge is 12 mm. Determine the boundary layer thickness at distances of 0.2 m from the leading edge. Assume laminar flow. [5+5]

- 10.a) Derive an expression for finding the major loss when the fluid flows through a pipe. Also give the formulae for various minor losses.  
b) Find the loss of head due to friction in pipe of 1 meter diameter and 15 km long. The velocity of water in the pipe is 1 m/sec. take  $f = 0.005$ . [5+5]

**OR**

- 11.a) The Moody diagram illustrates the effect of roughness on the friction factor in turbulent flow but indicates no effect of roughness in laminar flow. Explain why this is so.  
b) Analyse the flow between parallel plates and flow through long tubes. [5+5]

--ooOoo--