DR. BABASAHEB AMBEDKAR TECHNOLOGICAL UNIVERSITY, LONERE – RAIGAD -402 103
Winter SemesterExamination – December - 2019

Branch: Mechanical Engineering **Sem.:-III**

Subject with Subject Code:-Fluid Mechanics - BTMEC303 **Marks:60**
Date:-14/12/2019 **Time:- 3 Hr.**

Instructions to the Students
1. Each question carries 12 marks.
2. Attempt **any five** questions of the following.
3. Illustrate your answers with neat sketches, diagram etc., wherever necessary.
4. If some part or parameter is noticed to be missing, you may appropriately assume it and should mention it clearly

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(Marks)

Q.1. (a) Define the following fluid properties: (06)

(i)Viscosity

(ii)Compressibility

(iii)Surface Tension

(b)A U-tube manometer is used to measure the pressure of water in a pipe line,which is excess of atmospheric pressure. The right limb of the manometer contains mercury and open to atmosphere. The contact between water and mercury is in the left limb. Determine the pressure of the water in the main line. If the difference in the level of mercury in the limbs of U-tube is 10cm and the free surface of mercury is in the level with the center of the pipe. If the pressure of water in the pipe line reduced to 9810N/m^2 Calculate the new difference in the level of mercury. Sketch the arrangement in both cases. (06)

Q.2.(a) Prove that the Center of Pressure of a completely sub-merged plane surface is always below the Center of Gravity of the sub-merged surface when the plane surface is vertical. (06)

(b)What are the conditions of equilibrium of floating body and sub-merged body? (06)

Q.3.(a)Define the following flow: (06)
    (i)Steady Flow
    (ii)Non-Uniform Flow
    (iii)Laminar Flow
    (iv)Turbulant Flow
    (v)Compressible Flow
    (vi)Irrotatinal Flow

(b)Derive an expression of three dimensional continuity equation in rectangular cooridinate system. (06)

OR

(b)If for a two-dimensional potential flow, the velocity potential is given by $\Phi=x(2y-1)$ Determine the velocity at the point P(4,5) and value of stream function at the point P. (06)

Q.4.(a)Derive an expression for the Discharge through Triangular Notch. (06)

(b)A 30cm×15cm venturimeter is provided in a vertical pipe line carrying oil of specific gravity 0.9, the flow being upward. The difference in elevation of the throat section and entrance section of the venturimeter is 30cm. The

differential U-tube mercury manometer shows a difference of mercury level 25cm.
Calclate:
(i)The discharge of oil
(ii)The pressure difference between entrance section and throat section.
Take Cd=0.98 and specific gravity of mercury =13.6 (06)

Q.5.(a)Derive an expression for shear stress distribution and velocity distribution for Laminar flow though circular pipe. (06)

(b)A horizontal pipe line 40m long is connected to a water tank at one end and discharges freely into atmosphere at other end. For the first 25m of its length from the tank, the pipe is 150mm diameter and its diameter is suddenly enlarged to 300mm.The height of water level in the tank is 8m above the center of the pipe. Considering all losses of head which occur. Determine the rate of flow.Take f=0.01for both pipe. (06)

Q.6.(a)The efficiency η of fan depends on density ρ, dynamic viscosity μ of the fluid, angular velocity ω , diameter D of the rotor and the discharge Q. Express efficiency η of fan in terms of dimensionless parameters. (06)

(b) Define Displacement thickness. Derive an expression for displacement thickness. (06)

OR

(b)What do you understand by: Total drag on the body,Resulant force on a body, co-efficient of drag and co-efficient of lift. (06)