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Paper Id | 3 | 0 | 3 | 1 | **Roll No.** | | | | | | | | | | |

B. TECH.
(SEM-5th) THEORY EXAMINATION 2017-18
FLUID MECHANICS

Time: 3 Hours   *Total Marks: 100*

Note: Attempt all Sections. If require any missing data; then choose suitably.

SECTION A

1.   Attempt *all* questions in brief.   **2 x10 = 20**

    a.   Explainthemethodsofdrawingflownets.
    b.   Explain laminar and turbulent law.
    c.   What do you mean by specific weight?
    d.   What do you mean by eddy viscosity?
    e.   Explain resistance coefficient.
    f.   Explain two and three dimension flow.
    g.   Define equipotential line.
    h.   What do you mean by model studies?
    i.   What do you mean by siphon?
    j.   What do you mean by resistance coefficient?

SECTION B

2.   Attempt any *three* of the following: **10 x 3 = 30**

    a.   What is Stoke's law? Calculate the diameter of avertical pipe needed for flow of a liquid at a Reynolds number of 1200 when the pressure remains constant throughout the pipe. Kinematic viscosity of fluid $v=1.92\times10^{-3}m^2/s$.

    b.   What do you mean by U-Tube manometer? Whatis theadvantageofaU-tubemanometeroveranordinary manometer?

    c.   A horizontal pipe of diameter 500mm is suddenly contracted to a diameter of 250mm. The pressure intensities in the large and smaller pipe is given as $13.734N/cm^2$ and $11.772N/cm^2$ respectively. Find the loss of head due to sudden contraction if Cc=0.62.

    d.   Explain in detail phenomenon of boundary layer flow with explanation of displacement, momentum and energy thickness.

    e.   A horizontal pipe, 100 mm in diameter, has a nozzle   attached toit at the discharge end, the diameter of the nozzle is 50mm. Therate of discharge of water through nozzle is 20 liters/s and the pressure at the base of the nozzle is $5.886N/cm^2$. Calculate the coefficient of discharge.

SECTION C

3.   Attempt any *one* part of the following: **10 x 1= 10**

    (a)   If for a 2-d flow, the velocity potential is given by Φ= x(2y-1) Determine the velocity at the point p(4,5). Determine also the value of stream function ψ at the point p.

(b) Discuss the relationship between shear stress and pressure gradient. Two horizontal parallel flat plates 10 cm apart have laminar flow of oil between them with a maximum velocityof2 m/s. Calculate the discharge per meter width , the shear stress at the plates ,and the difference of pressure between two sections 40 m apart. $\mu = 0.25$kg-sec/m^2.

4. **Attempt any *one* part of the following:** **10 x 1= 10**

(a) In a turbulent flow through a pipe of radius r_O, at what distance from the boundary would the local velocity:
   i. Be equal to the meanvelocity.
   ii. Be equal to half the mean velocity if the shear velocity is 1/20 ofthe mean velocity.

(b) Discuss the relationship between shear stress and pressure gradient. Two horizontal parallel flat plates 10 cm apart have laminar flow of oil between them with a maximum velocity of 2 m/s. Calculate the discharge per meter width, the shear stress at the plates, and the difference of pressure between two sections 40 m apart. $\mu = 0.25$ kg-sec/m^2.

5. **Attempt any *one*part of the following:** **10 x 1= 10**

(a) A rectangular plane surface is 2m wide and 3m deep. It lies in vertical plane in water. Determine the total pressure and position of centre of pressure on the plane surface when its upper edge is horizontal and 1)when it coincides with water surface 2) 2.5m below the free watersurface.

(b) Write short notes on following:
   (i) Drag and lift force in detail.
   (ii) Equivalent length
   (iii) Hot-wire anemometer.

6. **Attempt any *one* part of the following:** **10 x 1= 10**

(a) What do you mean by flow net? Describe its uses and limitations**.**

(b) Explain phenomenon of capillarity in detail with sketch of all the conditions.

7. **Attempt any *one* part of the following:** **10 x 1= 10**

(a) Explain the transmission of pressure waves in rigid pipe and its uses.

(b) Derive continuity equation in 3-d with neat diagram. State its assumptions also.