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B. TECH.
(SEM III) THEORY EXAMINATION 2018-19
FLUID MECHANICS

Time: 3 Hours   *Total Marks: 100*

N o t e 1 . A t t e m p t l S e c t i o n h f s r e q u i a n r e y m i s s i d g t a h e n h o o s e u i t a b l y .

S E C T I O N A

1.   **A t t e m p t l q u e s t i o n s i n b r i e f .**   **2 x 10 = 20**

    a.   Distinguish between Rotational and Irrigational Flows.
    b.   Define Bernoulli's Equation for Real Fluid.
    c.   A flat plate of area $1.5m^2$ is pulled with a speed of 0.4m/s relative to another plate at a distance of mm from it. Find the Force and Power required to maintain this speed, if the fluid separating them is having viscosity as 1 poise.
    d.   Draw the figure of fully submerged orifice.
    e.   Draw the flow pattern around a two-dimensional flow.
    f.   What is Euler's Model Law?
    g.   Define Distortion of Hydraulic Quantities.
    h.   What is the Practical application of Mach Number?
    i.   Name the control of Separation of boundary Layer
    j.   Define Stokes Law.

SECTION B

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

    a.   Determine stream function at point (2,3) for a two-dimensional flow describe by $U=5x^3$, and $V=-15x^2y$.
    b.   Explain the procedure of finding hydrostatic forces on curved surfaces.
    c.   What are the different laws on which models are designed for dynamic Similarity.
    d.   Define following with sketch (i) Pitot Tube (ii) Orifice meter
    e.   The actual velocity in the contracted section of a jet liquid issuing from a 5 cm diameter orifice is 7.5m/s under a head of 4mtr.Calculate the coefficient of velocity. If the measured discharge is $0.008m^3/sec$. Determines C_d and C_v for this orifice.

SECTION C

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

    (a)   Prove that centre of pressure is always below the centre of gravity for vertical plane surfaces.
    (b)   Determine the Bulk Modulus of elasticity and compressibility of a liquid. If the pressure of liquid is increased from $70N/cm^2$ to $130N/cm^2$. The volume of liquid decreases by 0.15%.

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

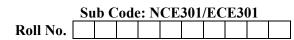   (a)   The resisting force F of a supersonic plane during flight can be considered as dependent upon the length of aircraft L, velocity V, air viscosity μ, air density ρ and bulk modulus K. Express the functional relationship between these

variables and resisting forces.

(b)   Mention the important dimensionless numbers used in fluid mechanics and their significance.

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

(a)   Prove that the viscous flow through a circular pipe the kinetic energy correction factor is equal to 2.

(b)   Find the discharge from an 80mm diameter external mouth piece fitted to a side of a large vessel if the head over the mouthpiece is 6mtr.

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

(a)   What are the causes of loss of energy in a pipe?

(b)   A horizontal pipe suddenly enlarges from a diameter250mm to 500mm. the discharge of water through the pipe is 0.3m ^{3}/s and the intensity of pressure in the smaller diameter pipe is 100kN/m^2. Determine

     (i)   The head loss due to sudden enlargement

     (ii)   Power loss due to enlargement

     (iii) Intensity of pressure in the larger diameter

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

(a)   Assuming the boundary layer to be turbulent over the entire length of a flat plate kept at zero indices in a stream of uniform velocity, determine the ratio of friction drag on the front half and the rear half of the plate.

(b)   Give the classification of boundaries-based roughness height with neat sketches.