

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

Time: 3 Hours

Total Marks: 100

Note: 1. Attempt all Sections. If require any missing data; then choose suitably.

SECTION A

- 1. Attempt all questions in brief. 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 $0.008\text{m}^3/\text{sec}$. 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 diameter 250mm to 500mm. the discharge of water through the pipe is $0.3\text{m}^3/\text{s}$ and the intensity of pressure in the smaller diameter pipe is $100\text{kN}/\text{m}^2$. 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.