

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

Time: 3 Hours

Total Marks: 70

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

SECTION A

1. Attempt all questions in brief. 2 x 7 = 14
- Draw the figure of shear stress VS Rate of Deformation.
 - Define perfect gas.
 - What do you understand by Stable equilibrium?
 - The velocity distribution between two parallel plate is given by $u=(a^2-y^2)$ where u is the velocity at a distance y from the middle of the two plates. Find the expression for stream function.
 - Define surface loss.
 - What do you understand by Dimensional Homogeneity?
 - Find the frequency of oscillation when a 72 Km/hr wind blows across a telephone wire of 3 mm diameter. take $\nu=1.5 \times 10^{-5} \text{ m}^2/\text{s}$

SECTION B

2. Attempt any three of the following: 7 x 3 = 21
- Explain the procedure of finding hydrostatic forces on curved surfaces.
 - What are the different laws on which models are designed for dynamic Similarity?
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 - Draw the pressure distribution, theoretical as well as experimental, on an airfoil in the fluid flow.
 - What is the difference between Eulerian and Lagrangian approach?

SECTION C

3. Attempt any one part of the following: 7 x 1 = 7
- What is the importance of Model Testing?
 - Determine the Bulk Modulus of elasticity and compressibility of a liquid. If the pressure of liquid is increased from 70N/cm² to 130N/cm². The volume of liquid decreases by 0.15%.
4. Attempt any one part of the following: 7 x 1 = 7
- A model boat, 1/50 of its prototype experienced 0.2 N when simulating a speed of 5 m/s. Find the corresponding resistance of the prototype considering resistance at free surface only. Water is used for model as well as prototype also
 - Mention the important dimensionless numbers used in fluid mechanics and their significance.

5. Attempt any *one* part of the following: 7 x 1 = 7
- (a) A 30 cm diameter horizontal pipe terminates in a nozzle with the exit diameter of 7.5cm. if the water flows through the pipe at a rate of $0.15\text{m}^3/\text{sec}$. What force will be exerted by the fluid on the nozzle?
- (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: 7 x 1 = 7
- (a) A kite 60cm x 60cm is size weighing 3 N makes an angle of 10° with the horizontal. The thread attached to makes an angle of 45° to the horizontal and pull on the string 25 N. the wind is flowing over the kite 15 m/s. Find C_L and C_D for the kite.
- (b) Explain the displacement thickness, momentum thickness to related to boundary layer.
7. Attempt any *one* part of the following: 7 x 1 = 7
- (a) A pipe tapers from 250 mm to 125mm the rate of flow of the liquid in the pipe is 24000 lit/min. Calculate average velocity of flow at the two sections.
- (b) Find the displacement thickness for velocity distribution in the boundary layer given by

$$\frac{u}{U} = 2\left(\frac{y}{\delta}\right) - \left(\frac{y}{\delta}\right)^2$$