

B.Voc Solar Technology
Subject: Fluid Mechanics
Subject Code: ME-605
Semester: Third
September 2022
Theory (External): 35 Marks
Time: 03 hours

Instructions to the Students

1. This Question paper consists of two Sections. All sections are compulsory.
2. Section A comprises 10 questions of objective type in nature. All questions are compulsory. Each question carries 1 mark.
3. Section B comprises 8 essay type questions out of which students need to do any 5. Each question carries 5 marks.
4. Read the questions carefully and write the answers in the answer sheets provided.
5. Do not write anything on the question paper.
6. Wherever necessary, the diagram drawn should be neat and properly labelled

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SECTION –A (OBJECTIVE TYPE QUESTIONS)
(10x1=10 Marks)

- A. If a person studies about a fluid which is at rest, what is called his domain of study?
- (a) Fluid Mechanics
 - (b) Fluid Statics
 - (c) Fluid Kinematics
 - (d) Fluid Dynamics
- B. How the viscosities of a liquid and a gas will change with temperature?
- (a) Viscosity of liquid increases with the increase in temperature and decreases with the increase in temperature for a gas
 - (b) Viscosity of liquid increases with the increase in temperature and increases with the increase in temperature for a gas
 - (c) Viscosity of liquid decreases with the increase in temperature and decreases with the increase in temperature for a gas
 - (d) Viscosity of liquid decreases with the increase in temperature and increases with the increase in temperature for a gas
- C. The property of liquid due to which a liquid opposes relative motion between its different layers is called as
- (a) Surface tension
 - (b) Coefficient of viscosity
 - (c) Viscosity
 - (d) Osmosis

- (d) Knudsen number
- I. Which among the following method is used to find a functional relationship with respect to a parameter?
- Rayleigh's method
 - Rutherford's method
 - Newton's laws
 - Doppler effect
- J. Dimensional analysis is useful in
- Checking the correctness of a physical equation
 - Determining the number of variables involved in a particular phenomenon
 - Determining the dimensionless groups from the given variables
 - The exact formulation of a physical phenomenon

SECTION -B (ESSAY TYPE QUESTIONS)
(5x5=25 Marks)

- What are the different types of pressure present in the fluid while it is in motion? Explain with the help of mathematical expressions. Also explain the different types of instruments used to measure different types of pressures with the help of neat and clean diagrams.
- What is Bernoulli's equation? Explain it with the help of suitable example. How Bernoulli's equation is used to measure or calculate the coefficient of discharge in venturi meter?
- What is the difference between laminar and turbulent flow? What is hydrodynamic boundary layer? What is the shape of laminar and turbulent hydrodynamic boundary layer? Explain with the help of

- diagrams. What is the dimensionless number used to analyze different flow regimes? Insert suitable data and diagrams where ever required.
- What is the difference between nozzle and diffuser? How the fluid flow is different inside the nozzle and diffuser when the fluid is changed from incompressible to compressible?
 - (a) What is difference between dynamic viscosity and kinematic viscosity? What are units used to measure these viscosities?

(b) What is the difference between Eulerian approach and Lagrangian approach of fluid flow analysis?
 - What do you mean by Prandtl mixing Length Theory? Find an expression for shear stress due to Prandtl.
 - The efficiency η of a 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 in terms of dimensionless parameters using Buckingham's π -theorem.
 - The diameter of a pipe at the section 1 and 2 are 15 cm and 20 cm respectively. Find the discharge through the pipe if the velocity of water at section 1 is 4 m/s. Determine also the velocity at section 2.

'END OF PAPER'

- D. What is the effect of temperature and pressure on the density of an incompressible fluid?
- (a) It varies for all temperature and pressure range
 - (b) It remains constant
 - (c) It varies only for lower values of temperature and pressure
 - (d) It varies only for higher values of temperature and pressure
- E. Which of the following is the cheapest device for measuring flow / discharge rate?
- (a) Venturimeter
 - (b) Pitot tube
 - (c) Orificemeter
 - (d) None of the mentioned
- F. Which of the following property of the fluid accounts for the major losses in pipes?
- (a) Density
 - (b) Specific gravity
 - (c) Viscosity
 - (d) Compressibility
- G. The laminar boundary layer over a flat plate is developed during
- (a) Smooth flow
 - (b) Rough flow
 - (c) Uniform flow
 - (d) Random flow
- H. Which among the following dimensionless numbers help us to determine whether the flow is laminar or turbulent?
- (a) Reynold's number
 - (b) Mach number
 - (c) Froude number