



**KERALA AGRICULTURAL UNIVERSITY**  
**B.Tech.(Food Technology) 2023 Admission**  
**II Semester Final Examination – July 2024**

Pafe.1207

**Fluid Mechanics (2+1)**

**Marks: 50**  
**Time: 2 hours**

**I State True or False**

**(10x1=10)**

1. For Newtonian fluid, stress v/s strain curve is cubic in nature.
2. Density constant is one and only the factor we consider the given fluid is incompressible.
3. Quick sand is a dilatant fluid.
4. A stream line is a curve that is everywhere tangent to the instantaneous local velocity vector.

**Fill in the blanks**

5. The S I unit of specific heat is.....
6. .... is the study of the motion of fluids considering the forces or energy causing the motion.
7. The pressure at which pure substance changes phase is called.....
8. Gravitational force: froude's law::surface tension: .....
9. The force a flowing fluid exerts on a body in the flow direction is called .....
10. The transition from laminar to turbulent flow typically occurs at a Reynolds number greater than.....

**II Write short notes on ANY FIVE of the following**

**(5x2=10)**

1. Define center of pressure of submerged body undergoing hydrostatic forces.
2. State Archimedes principle.
3. Explain Reynolds number.
4. State Pascal's law.
5. What is rotameter?
6. What is the vena contracta in fluid dynamics?
7. Determine the atmospheric pressure at a location where the barometric reading is 740 mm of Hg and the gravitational acceleration is  $9.81 \text{ m/s}^2$ . Assume the temperature of mercury to be  $10^\circ\text{C}$ , at which its density is  $13570 \text{ kg/m}^3$ .

**III Answer ANY FIVE of the following**

**(5x4=20)**

1. Derive Bernoulli's equation.
2. Air flows over a flat horizontal boundary. The velocity distribution in the fluid is given by:  $u = \text{velocity in m/s at a distance } y \text{ meters normal to the boundary}$ . If the dynamic viscosity of air is  $1.8 \times 10^{-4}$  poise determine the viscous shear stress at  $y=0.1 \text{ m}$ .
3. Explain trapezoidal channel.
4. How the surface roughness affects the drag co-efficient in turbulent flow?
5. Determine the fundamental dimension at the following quantities and express their units in S I systems.
  - (i) Discharge
  - (ii) Viscosity
  - (iii) Power
  - (iv) Specific speed of a hydraulic turbine
6. A rectangular notch has a discharge of  $21.5 \text{ m}^3/\text{min}$ , when the head of water is half the length of the notch, find the length of the notch. Assume  $C_d = 0.6$ .
7. Discuss Ergun equation.

**IV**

**Write an essay on ANY ONE of the following**

**(1x10=10)**

1. Derive Navier-Stokes equation for an incompressible, isothermal flow.
2. James found an old centrifugal pump in his garage. Initially, he tried to use it to lift water to the terrace, but it didn't work. However, when he began to fill the pump with water from the suction side, the pump began to function, leaving him filled with joy and mesmerization. As a fluid mechanics student, could you explain to James, in technical terms, why the pump is working?

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