**KERALA AGRICULTURAL UNIVERSITY**
**B.Tech. (Agrl. Engg.) 2020 Admission**
**II Semester Final Examination-October 2021**

**Iden.1202** **Fluid Mechanics and Open Channel Hydraulics (2+1)** **Marks: 50**
**Time: 2 hours**

**I** **Fill in the blanks.** **(10x1=10)**

1. While calculating the capillary rise of water, the value of contact angle for water and glass is taken as _____
2. Continuity equation relates mass rate of flow along a_____
3. In_____flow through a pipe discharge varies inversely as the viscosity
4. Orifices as well as mouthpieces are used for measuring the_____ of fluid
5. The flow in channels may be considered to laminar if the Reynolds number is less than _____

**State True/False**

6. Compressibility is the reciprocal of the bulk modulus of elasticity
7. The flow is said to be 'irrotational' if the fluid particles while moving in the direction of flow rotate about their mass centres
8. The ratio between the actual discharge and theoretical discharge is coefficient of resistance
9. The channel having the same shape at various sections along its length and laid on a constant bottom slope is known as prismatic channel
10. When two systems are geometrically, kinematically and dynamically similar, then they are said to be completely similar

**II** **Write short notes on ANY FIVE of the following** **(5x2=10)**

1. Real fluid
2. Continuity equation
3. Flow net
4. Bernoulli's theorem
5. Energy gradient
6. Manning's formula
7. Hydraulic jump

**III** **Answer ANY FIVE of the following** **(5x4=20)**

1. Explain the three states of equilibrium of a floating body in terms of the magnitude and direction of righting couple acting on the body as a result of slight angular displacement.
2. What is Euler's equation of motion? How will you obtain Bernoulli's equation from it?
3. Define and distinguish between
   (a) kinematics and kinetics,
   (b) Lagrangian and Eulerian description of fluid motion
4. Derive the expression for the discharge through the orifice meter. Also explain the working principle of an orifice meter with neat diagram.

5. An irrigation channel of trapezoidal section, having side slopes 3 horizontal to 2 vertical, is to carry a flow of 10 cumec on a longitudinal slope of 1 in 5000. The channel is to be lined for which the value of friction coefficient in Manning's formula is $n = 0.012$. Find the dimensions of the most economic section of the channel.
6. Draw and explain the typical pattern of velocity distribution in
   (a) rectangular
   (b) trapezoidal,
   (c) triangular
   (d) circular open channel sections
7. Explain the construction of Parshall flume with neat sketch.

**IV** **Write an essay on ANY ONE of the following** **(1x10=10)**

1. Derive the continuity equation in three dimensions from fundamental principles. Also state the continuity equations for two dimensional and one-dimensional flows.
2. List all the variables that may influence the fluid flow through a small orifice discharging freely into atmosphere under a constant head, and by Rayleigh method of dimensional analysis, derive an expression for discharge through

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