

Code No: RT21351

**R13****SET - 1**

**II B. Tech I Semester Supplementary Examinations, May/June - 2017**  
**FLUID MECHANICS AND OPEN CHANNEL HYDRAULICS**  
(Agricultural Engineering)

Time: 3 hours

Max. Marks: 70

Note: 1. Question Paper consists of two parts (**Part-A** and **Part-B**)  
2. Answer **ALL** the question in **Part-A**  
3. Answer any **THREE** Questions from **Part-B**

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**PART -A**

1. a) Define the term viscosity and explain the significance of the same.
- b) Define and explain the terms: i) Hydraulic gradient line and ii) Total energy line.
- c) What is meant by an orifice? Give the complete classification of orifices.
- d) Explain how the Series pipe connection flow problem is analyzed.
- e) Discuss geometric, dynamic and kinematic similarities between models and prototypes.
- f) What do you mean by most economical section of a open channel? Discuss in detail.

**PART -B**

2. a) A plate, 0.5 mm distance from the fixed plate moves with 50 cm/sec and requires 5 N/m<sup>2</sup> force to maintain the speed of moving plate. Determine the viscosity of the oil between the plates.
- b) A 1.8 m diameter cylindrical tank is laid with its axis horizontal on a level ground. Each of its ends is closed by a hemispherical dome. The tank contains oil of relative density 0.9 under pressure. If a pressure guage on the top of the tank reads 22 kPa, calculate the resultant force on the spherical end.
3. a) What is Euler's equation of motion? How will you obtain Bernoulli's equation from it?
- b) Find the difference in drag force exerted on a flat plate of size 2 m x 2 m when the plate is moving at a speed of 4 m/s normal to its plane in : i) water, ii) air of density 1.24 kg/m<sup>3</sup>, Co-efficient of drag is given as 1.15.

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4. a) Define coefficient of discharge, coefficient of contraction and coefficient of velocity. What is the relation among them?
- b) A sharp- crested weir is 1 m high and provided to a rectangular channel of 6 m wide. The discharge measured by the weir is  $3\text{ m}^3/\text{s}$ . Find the depth of the water upstream of the weir Take  $C_d = 0.62$
5. The rate of flow of water through a horizontal pipe is  $0.25\text{ m}^3/\text{sec}$ . The diameter of the pipe which is 200 mm is suddenly enlarged to 400 mm. the pressure intensity in the smaller pipe is  $11.772\text{ N/cm}^2$ . Determine: i) loss of head due to sudden enlargement, ii) pressure intensity in the large pipe, iii) power lost due to enlargement
6. a) How does the velocity vary across the cross section of an open channel? What is an energy and momentum correction factor? Derive their equations
- b) Assuming that the viscous force  $F$  exerted by a fluid on a sphere of diameter  $D$  depends on the viscosity  $\mu$ , mass density of the fluid " $\gamma$ ", and the velocity of the sphere  $V$ , obtain an expression for the viscous force.
7. a) Derive the condition for depth of flow of a most economical circular channel section subject to the condition for maximum velocity
- b) Water flows in a channel of the shape of isosceles triangle of bed width ' $a$ ' and sides making an angle of  $45^\circ$  with the bed. Determine the relation between depth of flow ' $d$ ', and the bed width ' $a$ ' for maximum velocity and for maximum discharge condition. Use Manning's formula and note that ' $d$ ' is less than 0.5.