

Code No: RT21351

R13**SET - 1**

II B. Tech I Semester Supplementary Examinations, May/June - 2016
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) State and prove the Pascal's Law. What do you understand by vacuum pressure?
- b) Explain which of the forces are taken into consideration in Euler's equation of motion.
- c) What is vena contract? Explain.
- d) Define major energy loss and minor energy loss.
- e) Derive an expression for the discharge through a channel by Chezy's formula.
- f) What is a hydraulic jump? Where does it form? Explain in detail.

**PART -B**

2. a) Define total hydrostatic force and centre of pressure and find expression for both when the surface is vertically immersed.
  - b) A velocity profile of a flowing fluid over a flat plate is parabolic and given by  $u=ay^2+by+c$  where a, b and c are constants. The velocity of fluid is 1.2 m/s at 20 cm from the plate, which is the vertex point of the velocity distribution. Find out the velocity gradients and shear stresses at  $y = 0.10$  and 20 cm respectively. Take  $\mu=8$  poise for the flowing fluid.
3. a) Derive an equation for discharge of an orifice meter.
  - b) A venture meter has its axis vertical, the inlet and throat diameters being 15 cm and 7.5 cm respectively. The throat is 22.5 cm above inlet and  $K = 0.96$ . Petrol of specific gravity 0.78 flows up through the meter at a rate of  $0.029 \text{ m}^3/\text{sec}$ . Find the pressure difference between inlet and throat.

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4. a) Derive an expression for discharge over a Triangular Notch  
b) Water issues from an orifice 80 mm diameter under a head of 10m. Determine the velocity of the jet of water and discharge through the orifice. Also calculate coefficient of contraction. Take  $C_d = 0.6$  and  $C_v = 0.9$ .
5. a) Derive an expression for the loss of head due to:  
i) Sudden enlargement and  
ii) Sudden contraction of a pipe.  
b) An oil of sp.gr. 0.9 and viscosity 0.06 poise is flowing through a pipe of diameter 200mm at the rate of 60 liters/s. Find the head lost due to friction for a 500 m length of pipe. Find the power required to maintain this flow.
6. a) State Reyleigh's Theorem and discuss its applications Discuss geometric, dynamic and kinematic similarities between models and prototypes  
b) What are different types of flows in open channels? And what are different types of open channels?
7. a) State and explain Bazin's formula for uniform flow in open channels.  
b) What is rapidly varied flow? Derive the expression for energy dissipation in a hydraulic jump formation.

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