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**RN-8055**

**B. E. - II (Sem. III) (Civil) Examination**

**May / June - 2010**

**Fluid Mechanics**

*(As per GTU Syllabus)*

Time : 3 Hours]

[Total Marks : 100

**Instructions :**

(1)

नीचे दृशविले निशानीवाणी विगतो उत्तरवडी पर अवश्य लखवी. Fillup strictly the details of signs on your answer book.	Seat No. :
Name of the Examination :	<input type="text"/>
<input type="checkbox"/> B. E. - 2 (Sem. 3) (Civil)	<input type="text"/>
Name of the Subject :	<input type="text"/>
<input type="checkbox"/> Fluid Mechanics	<input type="text"/>
Subject Code No. : <input type="text"/> 8 <input type="text"/> 0 <input type="text"/> 5 <input type="text"/> 5	<input type="text"/>
Section No. (1, 2,.....) : <input type="text"/> 1&2	<input type="text"/>
	Student's Signature

- (2) All the questions are **compulsory**.  
(3) Figures to the right indicate full marks.  
(4) Assume necessary data where necessary.

**SECTION - I**

- 1 (a) Define the following :
- (i) Steady flow
  - (ii) Absolute pressure
  - (iii) Laminar flow
  - (iv) Sink
  - (v) Newtonian fluid
  - (vi) Capillarity.
- (b) Define surface tension and prove that the pressure inside a droplet (in excess of the outside pressure intensity) increases with decrease of diameter of the droplet. 4

- (c) (i) Discuss different types of fluids with figure. 5  
(ii) Derive the unit of dynamic viscosity and 5  
determine the fluid viscosity between two plates  
such that one plate is 0.03 mm distant from a  
fixed plate and moves at 60 cm/sec. It requires  
a force of 3N/m<sup>2</sup> to maintain this speed.
- 2 (a) Show that centre of pressure of a vertical plane 8  
surface submerged in liquid lies below the centre  
of gravity of the vertical surface.

**OR**

- (a) Define meta-centric height. Derive an expression for 8  
the meta-centric height of a floating body.
- (b) A fluid flow is given by 6
- $$V = x^2yi + y^2zj - (2xyz + yz^2)k$$
- Prove that it is a case of possible steady incompressible  
fluid flow. Calculate the velocity at the point (2,1,3)

- 3 (a) Attempt any two : 10
- (i) An open circular cylinder of 14 cm diameter and  
100 cm long contains water upto a height of  
75 cm. Find the maximum speed at which the  
cylinder is to be rotated about its vertical axis so  
that no water spills.
- (ii) Prove that in case of forced vortex, the rise of  
liquid level at the ends is equal to the fall of liquid  
level at the axis of rotation.
- (iii) A uniform flow with a velocity of 3 m/s is flowing  
over a source placed at the origin.  
The stagnation point occurs at (-0.45, 0). Determine  
(a) Strength of the source  
(b) Maximum width of Rankine half body
- (b) Differentiate the following : (any three) 6
- (i) Simple manometer and differential manometer.  
(ii) Stream line and streak line  
(iii) Linear translation and linear deformation  
(iv) Forced vortex flow and free vortex flow.  
(v) Steady and unsteady flow.

## SECTION - II

- 4 (a) Derive the expression for discharge over a triangular notch or weir. 10
- (b) Find the discharge through a trapezoidal notch which is 1 m wide at the top and 0.40 m at the bottom and is 30 cm in height. The head of water on the notch is 20 cm. Assume  $C_d$  for rectangular portion as 0.62 while for triangular portion as 0.60. 8
- 5 (a) Derive the expression for discharge through orifice meter in terms of coefficient of contraction  $C_c$ . 8
- (b) An oil of sp. grade 0.8 is flowing through a venturimeter having inlet diameter 20 cm and throat diameter 8 cm. The oil mercury differential manometer, shows a reading of 20 cm. Calculate the discharge of oil through the horizontal venturimeter 8
- Take  $C_d = 0.98$ .

OR

- 5 (a) Derive the expression for head loss for flow through three pipes in series when 8
- (i) Minor losses are neglected
- (ii) minor losses are taken into consideration
- Show with a neat sketch.
- (b) A main pipe is divided into two parallel pipes which again forms a pipe. The length and diameter for the first parallel pipe are 2000 m and 1.0 m respectively while the length and diameter of second parallel pipe are 2000 m and 0.8 m. Find the rate of flow, in each parallel pipe if total flow in the main pipe is  $3.0 \text{ m}^3/\text{s}$ . The coefficient of friction for each parallel pipe is same and equal to 0.005.

**6** Write short notes on the following : (any **four**) **16**

- (i) Hydraulic gradient line (HGL) and Total gradient line (TGL)
  - (ii) Classification of orifice and mouthpiece
  - (iii) Pitot tube
  - (iv) Mach number and on the basis of Mach no. various types of flow
  - (v) Flow through branched pipes.
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