



SE-6143
B. E. (Sem. III) Civil Examination
April / May – 2011
Fluid Mechanics - I

Time : 3 Hours]

[Total Marks : 100

Instructions :

(1)

<p>नीचे दशांशिक निशानीवाणी विगतो उत्तरवही पर अवश्य लपवी. Fillup strictly the details of signs on your answer book.</p> <p>Name of the Examination : B. E. (Sem. 3) (Civil)</p> <p>Name of the Subject : Fluid Mechanics - 1</p> <p>Subject Code No. : 6 1 4 3 Section No. (1, 2,.....) : 1&2</p>	<p>Seat No. : <input type="text"/><input type="text"/><input type="text"/><input type="text"/><input type="text"/><input type="text"/></p> <div style="border: 1px solid black; border-radius: 15px; padding: 10px; text-align: center; width: 100%;">Student's Signature</div>
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- (2) Attempt all the questions.
- (3) Write answers of both sections in one answer book.
- (4) Figures to the right indicate full marks.
- (5) Assume suitable necessary data if required.

SECTION - I

- 1 (a) What is difference between fluid kinematics and fluid dynamics ? 6
- (b) Determine the viscosity of fluid having kinematic viscosity 8 stokes and specific gravity 1.75. 4
- (c) Explain various types of fluids in brief and state Newton's law of viscosity. 6

OR

- (a) At mean sea level the barometric pressure is 760 mm of mercury while that on a mountain top is 730 mm; if the density of air is assumed constant as 1.1 kg/m^3 what is the elevation of the mountain top ? 4
- (b) Explain the conditions of equilibrium for floating and sub-merged bodies. 6

- (c) Explain analytical method to determine metacentric height. **6**
- 2** (a) The velocity vector in a fluid flow is given **24**
 $V = 7x^3i + 13x^2yj - 5tk$
 Find the velocity and acceleration of a fluid.
- (b) Explain Lagrangian method and Eulerian method of describing flow. **6**
- (c) The velocity potential function is given by **4**
 $\phi = 7(x^2 - y^2)$. Calculate the velocity components at the point (5,6).
- OR**
- (a) Derive continuity equation in three dimensions. **6**
- (b) The stream function for a two dimensional flow is given by $\psi = 2xy$, calculate the velocity at the point p(3,4). Find the velocity potential function ϕ . **6**
- (c) Explain single column manometer (vertical) with neat sketch. **4**
- 3** Write short notes on the following : **18**
- (i) Vapour pressure and cavitation.
- (ii) Compressibility and bulk modulus.
- (iii) Mechanical gauges for pressure measurement.

SECTION - II

- Instructions :** (1) Attempt all the questions.
 (2) Figures to the right indicate full marks.
 (3) Draw neat and labelled sketch where necessary.
 (4) Assume missing data suitably and mention them clearly if required.
- 4** (a) Derive the expression for rate of flow through Orificemeter fitted in a horizontal pipe. **8**
- (b) An oil of specific gravity 0.8 is flowing through a venturimeter having inlet diameter 20 cm and the throat diameter 10 cm. The oil mercury differential manometer shows a heading of 25 cm. Calculate the discharge of oil through the horizontal venturimeter. **8**

5 (a) With a neat sketch explain the experimental procedure for determination of coefficient of velocity for orifice. 10

(b) A pitot tube is inserted in a pipe of 300 mm diameter. The static pressure in pipe is 100 mm of mercury (vacuum). The stagnation pressure at the centre of the pipe, recorded by the pitot tube is 0.981 N/cm^2 . Calculate the rate of flow of water through pipe, if the mean velocity of flow is 0.85 times the central velocity. Take $C_v = 0.98$. 8

OR

(a) Prove that for viscous flow through a circular pipe the kinetic energy correction factor is equal to 2 while momentum correction factor = $4/3$. 10

(b) A right angled V-notch is used for measuring discharge of 20 lit/s. An error of 2.5 mm was made while measuring the head over the notch. Calculate the percentage error in discharge. Take $C_d = 0.65$ 8

6 Write any four : 16

- (1) Classification of orifice.
 - (2) Reynold's number and based on it types of pipe flow.
 - (3) Co axial cylinder Viscometer.
 - (4) Pitot-tube
 - (5) Kinetic energy correction and momentum correction factors.
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