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SE-8055

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

May / June – 2011

Fluid Mechanics

(New Course)

Time : **3** Hours] [Total Marks : **100**

Instructions :

(1)

નીચે દર્શાવેલ ☛ નિશાનીવાળી વિગતો ઉત્તરવહી પર અવશ્ય લખવી.
Fillup strictly the details of ☛ signs on your answer book.

Name of the Examination :

☛ B. E. (SEM. - 3) (CIVIL)

Name of the Subject :

☛ FLUID MECHANICS (NEW COURSE)

☛ Subject Code No. : 8 0 5 5 ☛ Section No. (1, 2,.....) : 1&2

Seat No. :

Student's Signature

(2) Attempt **all** the questions.

(3) Write answers of each section in one answer book.

(4) Figures to the **right** indicate full marks.

(5) Assume suitable data if required.

SECTION - I

1 (a) Explain the following : **6**

(i) Newtonian and Non-Newtonian fluids.

(ii) Vapour pressure and compressibility.

(iii) Real fluid and Ideal fluid.

(b) Enunciate Newton's law of viscosity. Explain the importance of viscosity in fluid motion. What is effect of temp. on viscosity of water and that of air ? **6**

(c) A plate, 0.025mm distant from a fixed plate moves at 50 cm/s and requires a force of 2N per unit area of m^2 to maintain this speed. Determine the fluid viscosity between the plates. **6**

2 (a) Explain Lagrangian method and Eulerian method of describing fluid flow. **6**

(b) Define the following and give practical example for each. 4

(i) Laminar flow

(ii) Turbulent flow

(iii) Steady flow

(iv) Uniform flow

(c) The velocity vector in a fluid flow is given $V = 4x^3i + 10\ x^2yj + 2tk$. Find the velocity and acceleration of the fluid particle at (2,1,3) at time t=2. 6

OR

2 (a) Describe the uses and limitations of flownets. Under which conditions one can draw the flownets ? 6

(b) Define vortex flow and differentiate between forced vortex and free vortex flow. 6

(c) Define source, sink and doublet. 4

3 (a) Define centre of buoyancy, meta centre and meta centre height. 4

(b) Explain conditions of equilibrium of floating and submerged body. 6

(c) Derive an expression for the depth of centre of pressure from free surface of liquid of an inclined plane surface submerged in the liquid. 6

OR

3 (a) State and prove the Pascal's law. 6

(b) Distinguish between manometers and mechanical gauges. What are different types of mechanical pressure gauges ? Explain any one in brief. 6

(c) Differentiate between U-tube differential manometers and inverted U-tube differential manometers. 4

SECTION - II

4 (a) Derive the expression for rate of flow through orifice meter filled in a horizontal pipe. 10

(b) An oil of specific gravity 0.9 is flowing through a venturimeter having inlet diameter of 10 cm. The oil mercury differential manometer shows a reading of 20 cm. Calculate the discharge of oil through the horizontal venturimeter. Take Cd = 0.98. 8

5 (a) Name major and minor energy losses in pipe flow. Derive Chezy's formula for loss of head due to friction in pipes. 8

(b) A right angled V-notch is used for measuring a discharge of 30 lit/s. An error of 1.5 mm was made while measuring the head over the notch. Calculate the percentage error in the discharge. Take C_d=0.62. 8

OR

5 (a) Show that for compressible fluid under isothermal condition 8

$$\boxed{K = P}$$

where K = Bulk modulus
P = Pressure

(b) Find the head lost due to friction in a pipe of diameter 300 mm and length 50 m through which water is flowing at a velocity of 3 m/s using 8
(i) Darcy's formula
(ii) Chezy's formula for which C = 60
Take V for water = 0.01 stoke.

6 Write any **four** : **16**

(i) Mach cone

(ii) Major and minor losses in pipes

(iii) Total energy line and Hydraulic gradient line

(iv) Classification of Mouthpiece

(v) Pitet tube