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KC-8055

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

November/December – 2012

Fluid Mechanics

(New Syllabus)

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. II (Sem. III) (Civil)

Name of the Subject :

☛ Fluid Mechanics (New)

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

Seat No. :

Student's Signature

(2) Assume suitable data wherever necessary.
(3) Make neat sketches.
(4) Figures to the right indicates full marks.
(5) Attempt all questions.

1 Answer any five : **25**

(a) Derive the unit of kinematic viscosity in MKS system and determine the viscosity of a fluid having kinematic viscosity of 8 stokes and specific gravity 1.8.

(b) Differentiate between Real fluid and Ideal fluid.

(c) State Pascal's law and derive it.

(d) Explain the different conditions possible when any object is thrown in water.

(e) State Archimede's principle. Explain the floating of a ship.

(f) Explain Surface Tension. Derive equation for

(i) Liquid droplet

(ii) Hollow bubble

(g) Derive the equation of forced vortex flow.

(h) (i) What do you mean by exponential line and a line of constant stream function ?

(ii) Under what conditions can one draw flow net ?

2 (a) Explain force on a curved surface due to hydrostatic pressure. Derive expression for resulting Horizontal, Vertical and resultant force on curved surface. **7**

OR

(a) Explain how would you find the resultant pressure on a curved surface immersed in a liquid. **7**

(b) The velocity vector in a fluid flow is given by $V = 2x^3 i - 8x^2 yj + 2tx^2 zk$. Find the acceleration of fluid particle at (2,1,3) at time, t=1. **7**

OR

(b) A rectangular block of size 3m long × 1.5 m wide × 1.0 m high floats in water such that its depth of immersion is 0.8 m. What is the weight of body ? Determine its metacentric height also. **7**

(c) A liquid weighs 8.0 N per litre. Calculate the specific weight, mass density and specific gravity of the liquid. **3**

3 Answer any two : (Short notes) **8**

(a) Types of fluids

(b) Sink, Source, Doublet

(c) Scales for pressure measurement

(d) Pressure diagrams for various plane surface immersed under water.

4 (a) Derive the expression for rate of flow through venturimeter fitted in a horizontal pipe. **9**

(b) The water is flowing through a pipe having diameters 20 cm and 10 cm at section 1 and 2 respectively. The rate of flow through pipe is 35 litres/s. The section 1 is 6 m above datum and section 2 is 4m above datum. If the pressure at section 1 is 39.24 N/cm^2, find the intensity of pressure at section 2. **9**

5 (a) Derive Birnoulli's equation from Euler's equation. Write the assumptions of Birnoulli's equation. **8**

(b) The head of water over an orifice of diameter 40 mm is 10 m. Find the actual discharge and actual velocity of the jet at Vena-Contracta. Take Cd = 0.6 and C_v = 0.98. **8**

OR

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 horizontal venturimeter with inlet and throat diameters 30 cm and 15 cm respectively is used to measure the flow of water. The reading of differential manometer connected to the inlet and the throat is 20 cm of mercury. Determine the rate of flow. Take C_d = 0.98. 8

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

(i) Classification of notches and weirs

(ii) Sonic velocity

(iii) Mach Number

(iv) Equivalent pipes

(v) Hydraulic Gradient line and Total energy line