(Following Paper ID and Roll No. to be filled in your Answer Book)

PAPER ID : 2124   Roll No. ☐☐☐☐☐☐☐☐☐☐

B. Tech.

(SEMESTER-V) THEORY EXAMINATION, 2012-13

FLUID MECHANICS

Time : 2 Hours]   *[Total Marks : 50*

Note :   This question paper contains **three** sections, Section – A, Section – B and Section – C with weightage of **10, 15** and **25** marks respectively. Follow the instructions as given in each Section.

Section – A

1.   This question contains **five** parts of **two** marks each. Attempt **all** parts of this question. $2 \times 5 = 10$

   (a)   Define the term specific weight and specific gravity.

   (b)   Write a small note on equation of motion for fluid flow.

   (c)   What is Stokes law ?

   (d)   Differentiate between Reynold's number and Froude's number.

   (e)   Give two major differences between pipe flow and open channel flow.

Section – B

2.   This question contains **five** parts of **five** marks each. Attempt any **three** parts. $5 \times 3 = 15$

   (a)   Briefly describe the conditions of equilibrium of a floating body and submerged body.

   (b)   A 30 cm diameter pipe carries water under a head of 15 m with a velocity of 4 m/s if the axis of the pipe turns through 45°, find the magnitude and direction of the resultant force at the bend.

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(c) State and explain Buckingham-π theorem. Write conditions when Buckingham-π theorem is applied.

(d) A laminar flow is taking place in a pipe of diameter 200 mm. The maximum velocity is 1.5 m/sec. Find the mean velocity and the radius at which this occurs.

(e) Enumerate the losses in pipe flow. Explain any two losses in pipe flow system.

Section – C

This section contains **five** questions of **five** marks each. **All** questions are compulsory.

$$5 \times 5 = 25$$

3. Attempt any **one** part of the following :

(a) Briefly explain the following terms :

(i)   Total acceleration

(ii) Convective acceleration

(iii) Local acceleration

(b) A wooden block of width 2 m, depth 1.5 m and length 4 m floats horizontally in water. Find the volume of water displaced if the specific gravity of wooden block is 0.70.

4. Attempt any **one** part of the following :

(a) What is the Euler's equation of motion ? How will you obtain Bernoulli equation from Euler's equation ?

(b) Derive the expression for discharge through a triangular notch.

5. Attempt any **one** part of the following :

(a) Explain the velocity profile of laminar flow between two parallel stationary plates.

(b) Explain Eddy viscosity, mixing length concept and velocity distribution in turbulent flow.

6. Attempt any **one** part of the following :

(a) Write short notes on following :

    (i) Total drag on a body

    (ii) Resultant force on a body

    (iii) Coefficient of drag and lift

(b) Explain different types of hydraulic similarities that must exist between a prototype and its model.

7. Attempt any **one** part of the following :

(a) A siphon of diameter 200 mm connects two reservoirs having a difference in elevation of 15 m. The total length of the siphon is 600 m and the summit is 4 m above the water level in the upper reservoir. If the separation takes place at 2.8 m of water absolute, find the maximum length of siphon from upper reservoir to the summit. Take f = 0.004 and atmospheric pressure = 10.3 m of water.

(b) Explain the principle of water hammer in pipes. Derive the expression for water hammer in case of sudden closure of valve and pipe being rigid.

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