B.Tech. Mechanical Engineering / B.Tech Civil Engineering (BTMEVI/BTCLEVI)

Term-End Examination

June, 2013

BIME-004 : FLUID MECHANICS

Time : 3 hours   *Maximum Marks : 70*

Note: *Attempt all **five** questions. Each question carry **equal** marks. Answer questions in English only.*

1.   Attempt **any two** questions :

   (a)   Explain the terms :   2x7=14
      (i)   Dynamic Viscosity
      (ii)   Kinematic Viscosity. Give their dimensions
      (iii)   Differentiate between absolute and gauge pressure

   (b)   Define pressure. State and prove the Pascal's law.

   (c)   A rectangular pontoon is 5 m long, 3 m wide and 1.20 m high. The depth of immersion of the pontoon is .80 m in sea water if the centre of gravity is .6 m above the bottom of the pontoon. Determine the meta - centric height. The density for sea water = 1025 kg/m^3.

2. Attempt **any two** questions :   2x7=14

(a) Explain the terms :
   (i)   Path line   (ii) Streak line
   (iii) Stream line   (iv) Stream tube

(b) Define the equation of continuity. Obtain an expression for continuity equation for a three dimensional flow.

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

3. Attempt **any two** questions.   2x7=14

(a) What is Fuler's equation of motion ? Derive it, how will you obtain Bernoulli's equation from it ?

(b) What is pitol tube ? How will you determine the velocity at any point with the help of pitol tube ?

(c) The head of water over a rectangular notch is 900 mm. The discharge is 300 litres/s. Find the length of the notch, when $C_D = .62$

4. Attempt **any two** questions :   2x7=14

(a) What do you mean by Dimensionless number ? Explain any two Dimensionless numbers.

(b) What is meant by geometric, kinematic and dynamic similarities ? Are these similarities truly attainable ?

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(c)   The variables controlling the motion of a floating vessel through water are the drag force F, the speed V, the length L, the density P and the dynamic viscosity μ of water and acceleration due to gravity g. Derive an expression for F by dimension of analysis.

5.   Write short notes on the following :   **14**

   (a)   Venturimeter

   (b)   Water hammer

   (c)   Syphon

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