

Roll No \_\_\_\_\_

Subject Code: BTME-403

MAY-2014

Time: 3 Hours

Maximum Marks: 60

Note: Section A is compulsory consisting of Ten questions carrying two marks each. Section B contains five questions carrying five marks each and students have to attempt any four questions. Section C contains three questions carrying ten marks each and students have to attempt any two questions.

**Section A**

1. (a) Define specific volume and specific gravity.
- (b) State Pascal's law.
- (c) What is vorticity.
- (d) Write Bernoulli's equation.
- (e) Define stream function and potential function.
- (f) What is the significance of dimensional less numbers.
- (g) What are various minor losses in pipes.
- (h) What are the various flow measurement devices.
- (i) Define Froude number.
- (j) What is Archimede's Principle.

**Section B**

2. A piece of wood (specific gravity= 0.6) of 10 cm square in cross section and 2.5 m long floats in water. How much lead (specific gravity = 12) need to be fastened at the lower end of the stick so that it flows upright with 0.5 m length out of water.

3. The velocity potential for a two dimensional flow is

$$\phi = x(2y - 1)$$

Determine the velocity at the point, P(4, 5). Also obtain the value of stream function at this point.

4. Derive the Euler's equation in Cartesian Coordinates.

5. Water is flowing in an open channel at a depth of 1.5 m with a velocity of 7.5 m/sec. At a particular location, a hydraulic jump is formed and the depth increases to 2.2 m. Another channel is built where a similar jump is formed. If the flow depth in the new dynamically similar channel is 6 m, estimate the flow velocity and height of jump.

6. Discuss the working of Venturimeter in detail with the help of diagram.

### Section C

7. Drive on the basis of dimensional analysis suitable parameters to present the thrust developed by a propeller. Assume that the thrust  $T$  depends upon the angular velocity, speed of advance, diameter, dynamic viscosity, density and elasticity of the fluid medium which can be represented by the speed of sound  $C$  in the medium.

8. Discuss major and minor head losses in pipes.

9. A hollow cylinder closed at both ends has an outside diameter of 1.25 m, length 3.2 m and specific weight  $75 \text{ kN/m}^3$ . If the cylinder is to float just in stable equilibrium in sea water, find the minimum permissible thickness. Presume that sea water weights  $10 \text{ kN/m}^3$ .

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