B.TECH,2014
FLUID MECHANICS & MACHINERY
PAPER CODE:AE 206
PAPER ID:[A0711]

Time allowed: 3 Hrs. **Max. Marks: 60**

Note: All the questions from section A are compulsory. Attempt any 4 questions from section B and attempt any 2 questions from section C.
Question 1 consists of 10 parts and each part carries 2 marks.
Each question in section B is of 5 marks.
Each question in section C is of 10 marks.

Section A

Q1. (a) Differentiate b/w solids, liquids & gases?
(b) State the conditions under which the stream lines, path lines & streak lines are all same and the conditions under which they may all be different?
(c) Give one example each of a rotational flow and an irrotational flow?
(d) Define stream function in relation to its physical meaning?
(e) Explain the principle of impulse turbine?
(f) Show graphically the velocity profile for a laminar flow and a turbulent flow?
(g) Define twin eddy secondary flow in case of bends.
(h) Prove that stream lines and the equipotential lines are orthogonal to each other.
(i) What is the function of a diffuser in a centrifugal pump?
(j) State Archimedes's principle?

(2 x 10)

Section B

Q2. Prove that a stream line and an equipotential line are orthogonal to each other.
Q3. Make the diagram for the venturi meter and derive the formula for the coefficient of discharge?
Q4. A square surface 3m × 3m lies in a vertical plane. Determine the position of the centre of pressure and the total force on the square surface, when the upper edge is (a) on water surface (b) 15 m below the water surface.
Q5. A conical reducer forms a part of piping system and rests on a support; its diameter changes from 30 cm at inlet to 20 cm at exit. Water enters the inlet with a constant average velocity of 4 m/s at an absolute pressure of 3.5 bar. The absolute pressure at the exit is 3.15 bar. The reducer weighs 100 N and contains 0.03 m^3 of water inside it. Determine the total force on the support due to reducer and the fluids in contact with it. Take atmospheric pressure = 1.03 bar.
Q6. Define the phenomena of cavitation in detail?

(5 x 5)

Section C

Q7. Show by dimensional analysis, that the power P developed by a hydraulic turbine is given by:

$$p = \rho N^3 D^5 f\left[\frac{N^2 D^2}{gH}\right]$$

Where ρ is the mass density of liquid, N is the rotational speed, D is the diameter of runner, H is the working head and g is the gravitational acceleration.

Q8. When a sudden contraction is introduced in a horizontal pipeline from 50cm diameter to 25cm diameter, the pressure changes from 105kPa to 69kPa. If the coefficient of contraction is assumed to be 0.65, calculate the flow rate. The contraction is subsequently followed by a sudden enlargement from 25cm diameter to 50cm diameter. If the pressure at the 25cm section is 69kPa, work out the pressure at the 50cm enlarged section.

Q9. Derive the Darcy weisbach's equation for head loss due to friction in circular pipes?

(10 x 3)

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