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Total No. of Questions : 09] [Total No. of Pages : 02

B.Tech. (Sem. - 4th)

FLUID MECHANICS - I

SUBJECT CODE : ME - 206

Paper ID : [A0810]

[Note : Please fill subject code and paper ID on OMR]

Time : 03 Hours **Maximum Marks : 60**

Instruction to Candidates:

1) Section - A is **Compulsory**.
2) Attempt any **Four** questions from Section - B.
3) Attempt any **Two** questions from Section - C.

Section - A

Q1) *(10 × 2 = 20)*

a) Give two differences between solids and liquids.

b) Define the term path line with an example.

c) Define the terms gauge pressure and absolute pressure.

d) Define the term kinematic viscosity? Why the word kinematic is used in it.

e) State the difference between an orifice and a mouthpiece.

f) Define Pascal's law? Also state its two applications.

g) Define the term coefficient of discharge. Whose coefficient of discharge is more : venturimeter or orifice meter.

h) State any two applications of Bernoulli's theorem.

i) Differentiate b/w laminar and turbulent flow.

j) Why do we use the kinetic energy and momentum correction factors?

Section - B

(4 × 5 = 20)

Q2) Derive the analytical expression for metacentric height of a floating body.

Q3) Explain Hydrostatic paradox with diagram along with the reasons of its occurance.

Q4) Explain with diagram the working of a pitot tube.

Q5) An ideal flow is given by

$$\vec{V} = 2x^3 i - 3x^2 y j.$$

Is this flow steady or unsteady. Is this flow 2 or 3 dimensional.

Make calculations for the velocity, local acceleration and convective acceleration of a fluid particle in this flow field at point P(x, y, z) = (2, 1, 3).

Q6) Derive the formulae of any two dimensionless no.s, and also state their applications and importance.

Section - C

(2 × 10 = 20)

Q7) An empty tank (with all sides closed) is rectangular in plan, side elevation and end elevation with sides 12.5m long, 0.7m broad and 0.6m high. If the sheet metal weighs 363 N/m^2 of the surface and the tank is allowed to float in fresh water with 0.6m edges vertical, find whether the equilibrium for both horizontal axes is stable or not. Specific weight of water is 9810 N/m^3.

Q8) Derive Darcy weisbach equation for friction losses in circular pipes.

Q9) The rate of water through a vertical conical draft tube of a Kaplan turbine is 17.5m^3/s. The diameter of the draft tube on the side connected to the outlet of the turbine runner is 2.5m and the average velocity at exit is 1.5m/s. If the pressure at inlet to the tube is not to be less than -0.7 bar, how far the tube should extend above the tail race. Neglect frictional effects and presume that exit of the draft tube lies 1.2m below the tail water level.

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