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# Paper ID [CE203]

(Please fill this Paper ID in OMR Sheet)

## B.Tech. (Sem. - 3rd)

## FLUID MECHANICS - I (CE - 203)

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 x 2 = 20)*

a) Differentiate between (i) Liquid and gases (ii) Real fluids and ideal fluids.

b) What do you mean by vacuum pressure?

c) Define the terms 'buoyancy' and 'centre of buoyancy'.

d) Explain the terms 'Stream line' and 'stream tube'.

e) Define an orifice-meter.

f) Explain the term 'dimensionally homogenous equation'.

g) Define the terms : nappe and crest.

h) Explain the term coefficient of friction.

i) What is the difference between orifice and a mouthpiece?

j) What is a venturimeter?

## Section - B

*(4 x 5 = 20)*

*Q2)* What are the conditions of equilibrium of a floating body and a submerged body?

*Q3)* State Bernoulli's theorem. Mention the assumptions made. How is it modified while applying in practice? List out its engineering application.

*Q4)* The velocity potential function is given by $\phi = 5(x^2 - y^2)$. Calculate the velocity components at the point (4,5).

*Q5)* Water is flowing through a pipe having diameter 300mm and 200 mm at the bottom and upper end respectively. The intensity of pressure at the bottom end is 24.525 N/cm$^2$ and the pressure at the upper end is 9.81N/cm$^2$.Determine the difference in datum head if the rate of flow through pipe is 40 lit/s.

*Q6)* State Buckingham's $\Pi$ - theorem. Why this theorem is considered superior over the Rayleigh's method for dimensional analysis?

## Section - C

***(2 x 10 = 20)***

*Q7)* Distinguish between (a) External mouthpiece and internal mouthpiece, (b) Mouthpiece running free and mouthpiece running full.

*Q8)* (a) The throat and exit diameters of convergent-Divergent mouthpiece are 5 cm and 10 cm respectively. It is fitted to the vertical side of a tank, containing water. Find the maximum head of a water for steady flow. The maximum vacuum pressure is 8m of water and take atmospheric pressure = 10.3 m water.

(b) Define the terms : meta centre, centre of buoyancy, meta-centric height, gauge pressure and absolute pressure.

*Q9)* (a) A jet of water from a 25 mm diameter nozzle is directed vertically upwards. Assuming that the jet remains circular and neglecting any loss of energy, that will be the diameter at a point 4.5 m above the nozzle, if the velocity with which the jet leaves the nozzle is 12 m/s.

(b) Derive Darcy-weisbach equation.