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Total number of printed pages – 2

B. Tech
BEME 2209

Third Semester (Back/ Special) Examination – 2013
FLUID MECHANICS AND MACHINES
BRANCH : BIOTECH, ENV, PLASTIC
QUESTION CODE : D 212

Full Marks – 70

Time : 3 Hours

Answer Question No. 1 which is compulsory and any five from the rest.

The figures in the right-hand margin indicate marks.

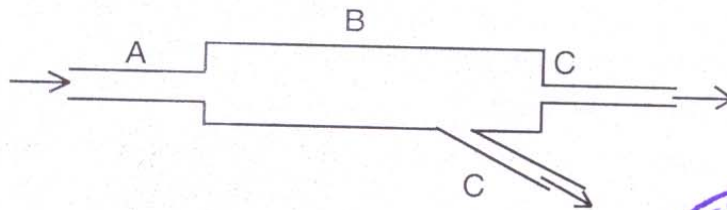
Assume suitable notations and any missing data wherever necessary.

Answer all parts of a question at a place.

1. Answer the following questions : 2×10
- Write the use of notches and weirs.
 - What are compressible and incompressible fluids ?
 - What is cavitation ? Write its effect on pump capacity.
 - Discuss in details about net positive suction head.
 - Why the angle of the downstream section of venturimeters is made small ?
 - Define uniform and non-uniform flow with suitable examples.
 - What are stability conditions for floating bodies ?
 - Correlate between C_d , C_v , and C_c .
 - What measures should be taken to prevent priming, cavitation ?
 - Differentiate between the reaction and impulse turbine.
2. (a) Explain meta center and metacentric height. What are the conditions of stability for floating and submerged body. 5
- (b) A space 25 mm wide between two large plane surfaces is filled with glycerin. What force is required to drag a very thin plate of area 0.75 m^2 between the surfaces at a speed of 0.5 m/s
- if this plate remains equidistant from two surfaces and
 - if it is at a distance of 10 mm from one of the surfaces.
- Take $\mu = 0.785 \text{ N.s/m}^2$. 5
3. (a) At a certain section A of a pipe line carrying water, the diameter is 1 m, the pressure is 98.1 kN/m^2 , and the velocity is 3 m/s . At another section B which is 2 m higher than A, the diameter is 0.7 m and the pressure is 59.2 kN/m^2 . What is the direction of flow ? 5

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- (b) Why the coefficient of discharge for orifice meter is less than that of a venture-meter? 5
4. (a) Derive an equation for the measurement of pressure difference using a simple U-tube manometer with a neat diagram. 6
- (b) Draw a plot of shear stress vs. velocity gradient for Newtonian and non-Newtonian fluids and then discuss about the different fluids. 4
5. (a) Discuss the principle, working, construction, advantages and disadvantages of a venture-meter with a neat diagram. 5
- (b) An orifice meter is used to measure the flow rate of water flowing in a pipe line of 78 mm ID. The orifice diameter is 15 mm. Mercury manometer reads 18 cm. The volumetric flow rate in this case is $719 \text{ cm}^3/\text{s}$. calculate:
- (i) Value of coefficient of discharge and
If the pressure drop is decreased to 9 cm of Hg, what will be the flow rate? 5
6. Crude oil, sp gr = 0.887, flows through the piping as shown in the figure. Pipe A is 50 mm, pipe B is 75 mm, and each of pipes C is 38 mm in internal diameter. An equal quantity of liquid flows through each of the pipes C. The flow through pipe A is $6.65 \text{ m}^3/\text{h}$. Calculate :
- (a) the mass flow rate in each pipe,
(b) the average linear velocity in each pipe, and
(c) the mass velocity in each pipe. 10



7. (a) Classify the turbines giving suitable examples in each category. 3
(b) Explain the construction of Pelton wheel with a neat diagram. 7
8. Write short notes on any **two** of the following : 5×2
- (a) Reciprocating pump
(b) Characteristic curves of centrifugal pumps
(c) 3-dimensional equation of continuity
(d) Pascal's law.

