

BIRLA INSTITUTE OF TECHNOLOGY, MESRA, RANCHI
(MID SEMESTER EXAMINATION)

CLASS: BE
BRANCH: CEVIL

SEMESTER: IV
SESSION : SP/2019

SUBJECT : CE4007 FLUID MECHANICS - I

TIME: 1.5 HOURS

FULL MARKS: 25

INSTRUCTIONS:

1. The total marks of the questions are 30.
 2. Candidates may attempt for all 30 marks.
 3. In those cases where the marks obtained exceed 25 marks, the excess will be ignored.
 4. Before attempting the question paper, be sure that you have got the correct question paper.
 5. The missing data, if any, may be assumed suitably.
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- Q1 (a) Differentiate between ideal fluids and real fluids. [2]
(b) Draw a typical rheological diagram and describe various types of fluids on it. [3]
- Q2 (a) Define the following: [2]
(i) vapour pressure, (ii) bulk modulus of elasticity, and (iii) surface tension
(b) Through a very narrow gap of height h , a thin plate of large extent is pulled at a velocity V . On one side of the plate is oil of viscosity μ_1 and on the other side oil of viscosity μ_2 . Calculate the position of the plate so that (i) the shear force on the two sides of the plate is equal (ii) the pull required to drag the plate is minimum. [3]
- Q3 (a) Differentiate between a simple manometer and a differential manometer. [2]
(b) Derive the expression for hydrostatic force on a vertical plane surface. Also obtain the expression for centre of pressure. [3]
- Q4 (a) With the help of a sketch, define metacenter and metacentric height. [2]
(b) A circular plate 2.5 m diameter is immersed in water, its greatest and least depth below the free surface being 3 m and 1 m respectively. Find (a) hydrostatic force on one face of the plate and (b) the position of centre of pressure. [3]
- Q5 (a) Differentiate between steady flow and non-steady flow. [2]
(b) For the velocity components in a fluid flow given by [3]
$$u = 2xy$$
$$v = a^2 + x^2 - y^2$$
Show that the flow is possible. Obtain the relevant stream function.
- Q6 (a) What are the basic principles of fluid flow? Name the equations obtained from these basic principles of fluid flow. [2]
(b) If $\phi = 4(x^2 - y^2)$, determine the corresponding values of ψ . [3]

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