Roll No…….. **Total No. of Printed Pages: [01]**

Total No. of Questions: [09]

B. Tech Civil Engg. (Semester – 3rd)

FLUID MECHANICS

Subject Code: BCIES1322

Paper ID: [19110702]

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

Instruction for candidates:

1. Section A is compulsory. It consists of 10 parts of two marks each.
2. Section B consist of 5 questions of 5 marks each. The student has to attempt any 4 questions out of it.
3. Section C consist of 3 questions of 10 marks each. The student has to attempt any 2 questions.

Section – A **(2 marks each)**

Q1. Attempt the following:

a. What is the difference between dynamic viscosity and kinematic viscosity?
b. Distinguish between ideal fluids and real fluids?
c. What do you mean by vacuum pressure?
d. Define velocity potential function and stream function.
e. Distinguish between rotational and irrotational flow?
f. Define moment of momentum equation.
g. What are the limitations of Bernoulli's equation?
h. Define vena-contracta.
i. Define the terms dimensional analysis and modal analysis.
j. Name the different forces present in fluid flow. For the Euler's equation motion, which forces are taken into consideration?

Section – B **(5 marks each)**

Q2. The weight of gas is given as 17.658N/m3 at 30° C. & an absolute pressure of 29.43N/cm2. Determine the gas constant and also the density of the gas?

Q3. Explain how you would find the resultant pressure on a carved surface immersed in a liquid?

Q4. Find the discharge through the trapezoidal notch which is 1m wide at the top and 0.40m at the bottom and is 30cm in height. The head of water on the notch is 20cm. Assume Cd for rectangular portion as =0.62 while for triangular portion =0.60.

Q5. A wooden cylinder of sp. gr. =0.6 and circular in cross-section is required to float in oil (sp. gr. =0.90). Find the L/D ratio for the cylinder to float with its longitudinal axis vertical in oil, where L is the height of the cylinder and D is its diameter.

Q6. The velocity potential function is given by $\phi = 5(x^2-y^2)$. Calculate the velocity components at point (4,5).

Section – C **(10 marks each)**

Q7. A 300mm diameter pipe carries water under a head of 20 meters with a velocity of 3.5m/s. If the axis of the pipe turns through 45°, fluid the magnitude and the direction of the resultant force at the bend.

Q8. Find the convective acceleration at the middle of a pipe which converges uniformly from 0.6m diameter to 0.3m diameter over 3m length. The rate of the flow is 40 lit/s. If the rate of the flow changes uniformly through 40 lit/s to 80 lit/s in 40 seconds, find the total acceleration at the middle of the pipe at the 20th seconds.

Q9. State Buckingham's π-theorem. Why this theorem is considered superior over the Rayleigh's method for dimensional analysis.