PRESIDENCY UNIVERSITY
BENGALURU

SCHOOL OF ENGINEERING
END TERM EXAMINATION - JAN 2023

Semester : Semester III - 2021
Course Code : CIV2009
Course Name : Sem III - CIV2009 - Fluid Mechanics
Program : B.Tech. Civil Engineering

Date : 16-JAN-2023
Time : 1.00PM - 4.00PM
Max Marks : 100
Weightage : 50%

Instructions:
(i) Read all questions carefully and answer accordingly.
(ii) Question paper consists of 3 parts.
(iii) Scientific and non-programmable calculator are permitted.

PART A

ANSWER ALL THE TEN QUESTIONS   10 X 2 = 20M

1. The property is used to compare the density of any fluid to that of water. This property is_____
   a) Viscosity
   b) Density
   c) Specific gravity
   d) unit weight

   (CO1) [Knowledge]

2. Newton's law of viscosity relate_____
   a) shear stress, viscosity and temperature
   b) viscosity and rate of angular deformation
   c) shear stress and rate of angular deformation
   d) Intensity of pressure and rate of angular deformation

   (CO1) [Knowledge]

3. Raindrops are spherical in shape because of_____
   a) Density of the liquid
   b) Surface Tension of the liquid
   c) Temperature of the liquid
   d) Viscosity of the liquid

   (CO1) [Knowledge]

4. By which phenomenon does water rise from roots to leaves of plants?
   a) Capillary action
   b) Surface tension
   c) Viscosity
   d) Density

   (CO1) [Knowledge]

5. What is the force exerted on the surface by the column of air above it called?

  a) Wind   (CO1) [Knowledge]

  b) Pressure

  c) Stress

  d) strain

6. The pressure intensity at a point in a fluid is the same in all directions only when the fluid _____

  a) Is frictionless   (CO1) [Knowledge]

  b) Is frictionless and incompressible

  c) has zero viscosity and is at rest

  d) has no relative motion between adjacent fluid layers

7. The Bernoulli Equation can be considered to be a statement of the conservation of energy principle appropriate for flowing fluids. Bernoulli's equation is derived making assumptions that _____

  a) The flow is uniform and incompressible   (CO2) [Knowledge]

  b) The flow is non -viscous , uniform and steady

  c) The flow is steady, non -viscous, incompressible and irrotational

  d) Flow is non uniform and compressible

8. Venturimeter is a device that is used to measure the rate of flow of fluid through a pipe. This device is based on the principle of _____

  a) Bernoulli's equation   (CO2) [Knowledge]

  b) Archimedes principle

  c) Momentum equation

  d) Newton's third law

9. Pipes are said to be in parallel when they are so connected that the flow from a pipe branches or divides into two or more separate pipes and then reunite into a single pipe. When the pipes are connected in parallel, the total loss of head_____

  a) Is equal to the sum of the loss of head in each pipe   (CO3) [Knowledge]

  b) Is same as in each pipe

  c) Is equal to the reciprocal of the sum of loss of head in each pipe

  d) is equal to zero

10. The Reynolds number is the ratio of inertial forces to viscous force. The flow through pipe is laminar if the Reynolds number is _____

  a) Less than 4000   (CO3) [Knowledge]

  b) Less than 2000

  c) Greater than 2000

  d) In between 2000 to 4000

PART B

ANSWER ALL THE FIVE QUESTIONS   5 X 8 = 40M

11. The Bernoulli Equation can be considered to be a statement of the conservation of energy principle appropriate for flowing fluids. State Bernoulli's theorem and what are the assumptions made in the Bernoulli's Theorem?

                                                            (CO2) [Comprehension]

12. Venturimeter is a type of flowmeter that works on the principle of Bernoulli's Equation. This device is widely used in the water, chemical, pharmaceutical, and oil & gas industries to measure the flow rates of fluids inside a pipe. With neat diagram explain the working principle of Venturimeter.

(CO2) [Comprehension]

13. The head loss represents the additional height that the fluid needs to be raised by a pump in order to overcome the frictional losses in the pipe. List and explain the major and minor losses through pipe.

(CO3) [Comprehension]

14. A crude oil of kinematic viscosity 0.4 stoke is flowing through a pipe of diameter 300 mm at the rate of 300 liters/sec. Find the head loss due to friction for a length of pipe 50 m.

(CO3) [Comprehension]

15. Reynolds number is defined by the ratio of inertial forces to that of viscous forces. Give the classification of flow based on renynolds number and also show the flow pattern for each classification.

(CO2) [Comprehension]

PART C

ANSWER ALL THE FOUR QUESTIONS   4 X 10 = 40M

16. The difference in water surface levels in two tanks, which are connected by three pipes in series of lengths 300 m, 170 m and 210 m and of diameters 300 mm, 200 mm and 400 mm respectively, is 12 m. Determine the rate of flow of water if co-efficient of friction are 0.005 , 0.0052 and 0.0048 respectively, considering Minor losses also.

(CO3) [Application]

17. Find the head loss due to friction in a pipe of diameter 300 mm and length 50 m, through which water is flow at a velocity of 3 m/s using
a) Darcy formula, b) Chezy's formula for which C = 60. Take kinematic viscosity of water = 0.01 stoke.

(CO3) [Application]

18. A 0.3 m pipe carries water at a velocity of 24.4 m/s. At points A and B measurements of pressure and elevation were respectively 361 killo Newton/square meter and 288 killo Newton/square meter and 30.5 m and 33.5 m . For steady flow, find the loss of head between A and B

(CO2) [Application]

19. An orifice meter with orifice diameter 10 cm is inserted in a pipe of 20 cm diameter. The pressure gauges fitted upstream and downstream of the orifice meter gives readings of 19.62 Newton/square centimeter and 9.81 Newton/square centimeter respectively. Co-efficient of discharge for the orifice meter is given as 0.6. Find the discharge of water through pipe.

(CO2) [Application]

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