Register No:.....

B.E. DEGRE EXAMINATIONS : OCTOBER / NOVEMBER-2008

Third Semester

CIVIL ENGINEERING

U07CE304: MECHANICS OF FLUIDS

Time: Three Hours **Maximum Marks: 100**

(Answer ALL questions. Missing data may be appropriately assumed as per SI Units).

PART –A (20 x 1 = 20 Marks)

1. Which one among the following is an ideal fluid?
   A. Air B. Water C. Mercury D. Kerosene
2. The specific mass has the dimensions of .....
   A. $ML^{-2}T^{-2}$ B. ML^{-3} C. M D. Dimensionless
3. Capillary phenomenon is due to .....
   A. Compressibility B. Vapour Pressure C. Surface tension D. Viscosity
4. In SI System, one Stoke is ..... m^2/s.
   A. 10^{-1} B. 10^{-2} C. 10^{-3} D. 10^{-4}

66 KN

5. The hydrostatic pressure at a depth 10m below sea level is..... kpa.
   A. 18 B. 68 C. 98 D. 108
6. In any fluid static problem, which one among the following is treated as zero?
   A. Viscosity B. Shear Stress C. Surface tension D. Mass density.
7. For inclined planes submerged in fluid, the center of pressure is always.... the center of gravity.
   A. Below B. Above C. Coincide D. Either A or B.
8. The most popular gauge liquid used in manometers is .....
   A. Water B. Mercury C. Oil D. Silver
9. The flow in a small diameter and very long pipe can be treated as..... dimensional flow.
   A. Two B. Three C. One D. Non
10. If the tangent drawn at any point of the path of a molecule is in the direction of velocity vector, then the path is .....line
    A. Flow B. Path C. Streak D. Stream
11. If the potential function, Ø= 2xy exists, then the velocity of flow in x direction is .....
    A. -2x B. 2x C. -2y D. 2y

12. The product of slopes of intersecting stream line and equipotential line in a flow net is .....

A. 1 B. -1 C. 0 D. Infinity

13. Bernoulli's equation is based on ..... equation.

A. Euler B. Haen-Poiseuilli C. Stoke D. Darcy

14. The inlet cone angle of venturi meter is – degree.

A. 6 B. 20 C. 45 D. 30

15. If the frictional coefficient of a pipe material is 0.006, its friction factor is.....

A. 0.006 B. 0.002 C. 0.024 D. 0.001

16. In any long pipe, the frictional loss is ..... loss

A. Minor B. Moderate C. Negligible D Major

17. Rayleigh's method is difficult and cumbersome, if the No. of independent variables is greater than ...

A. 2 B. 3 C. 4 D. 1

18. Reynold's number is the ratio of inertial force to ..... force

A. Frictional B. Viscous C. Surface tension D. Turbulent

19. In a geometrically similar model, if the linear scale ratio is 0.1, then the area scale ratio is .....

A. 0.01 B. 0.001 C. 0.05 D. 1

20. Distorted models basically does not satisfy .. similarity.

A. Kinematic B. Geometric C. Dynamic D. Similitude.

PART – B (5 x 16 = 80 Marks)

21 a) i) Enlist the six basic properties of a fluid and explain any three. (9)

ii) A 100 x 100 x 1 cm^3 flat of 10 N weight slides down a 30° inclined plane smeared with 1 mm thick oil of viscosity 0.05 Ns/m^2. What is its steady state velocity? (7)

(OR)

21 b) i) With usual notations, derive Newton's law of viscosity. (8)

ii) With a neat sketch explain why mercury forms a convex meniscus in a glass tube. Find the bulk modulus of elasticity of a liquid, if its volume is reduced by 1% by increasing the pressure from 5 to 125 Atm. (8)

22 a) i) A trapezoidal plate of parallel sides a and 2a and height h is immersed vertically in water with its side of liength 'a' horizontal and topmost. The top edge is at a depth of h below the water surface. Determine the total force on one side of plate and the location of center of pressure (10)

ii) Discuss the application of simple manometers in fluid pressure measurement (6)

(OR)

22 b) i) A hemispherical bowl of 1m diameter is completely filled with oil of specific gravity 0.9. Find the total force, center of pressure, and direction of force. (8)

iii) A solid wooden prism 0.7 x 0.7 x 2m^3 of specific gravity 0.65 is placed vertically in still water. Check its stability. (8)

23 a) Give an account of classification of fluid flows . (16)

(OR)

23 b) i) What are stream and potential functions? Also, state their properties (8)

ii) The velocity potential function ($\emptyset$) is given by $\emptyset = x^3y/3 - xy^3/3 - x^2 + y^2$. Find the velocity components in x and y direction, and also check the possibility of flow. (8)

24 a) i) Derive the Euler's equation for one dimensional flow and hence, the Bernoulli's equation. (10)

ii) Discuss the various minor losses in a typical pipe network. (6)

(OR)

24 b) i) Derive the Haggen–Poisuille equation for a circular pipe. (10)

ii) Bring out the contrasting features of venturi and orifice meters. (6)

25 a) i) State the Buckingham-Π theorem. Also, explain the procedure of selecting the repeating variables. (8)

ii) Water is flowing through a pipe of diameter 10 cm at a velocity of 4 m/s. Find the velocity of oil flowing in another pipe of diameter 10cm , if the condition of dynamic similarity is satisfied between the two pipe flows. The viscosity of water and oil are given as 0.01 and 0.025 poise, respectively. Take specific gravity of oil as 0.8 . (8)

(OR)

25 b) i) Mention the drawbacks of Rayleigh's index method. The discharge through the horizontal small tube is thought to depend upon the pressure drop per unit length, the diameter, and the viscosity. Find the form of the equation using Rayleigh's method. (8)

ii) What do you mean by distorted model? The discharge through a prototype weir is 1.5m^3/s. Find the discharge through the model of the weir, if the respective horizontal and vertical scale ratios are 1/50 and 1/10 . (8)

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