Marks Scored:

KATHMANDU UNIVERSITY
End Semester Examination [C]
June 2018

Level : B. E
Year : II

Course : CIEG 204
Semester : I

Exam Roll No.: Time: 30mins. F. M. : 10

Registration No.: Date JUN 11 2018

SECTION "A"
[20Q × 0.5 = 10 marks]

Tick (√) the most appropriate answer.

1. An ideal fluid is
   a. One which obeys Newton's law of viscosity
   b. Frictionless and incompressible
   c. Very viscous
   d. Frictionless and compressible

2. The unit of kinematic viscosity is
   a. $gm/cm\text{-}sec^2$ b. $dyne\text{-}sec/cm^2$ c. $gm/cm^2\text{-}sec$ d. cm^2/sec

3. Newton's law of viscosity relates
   a. Intensity of pressure and rate of angular deformation
   b. Shear stress and rate of angular deformation
   c. Shear stress, viscosity and temperature
   d. Viscosity and rate of angular deformation

4. The position of center of pressure on a plane surface immersed vertically in a static mass of fluid is
   a. At the centroid of the submerged area
   b. Always above the centroid of the area
   c. Always below the centroid of the area
   d. At the free surface level of water

5. Center of buoyancy always
   a. Coincides with the center of gravity
   b. Coincides with the centroid of the volume of fluid displaced
   c. Remains above the center of gravity
   d. Remains below the center of gravity

6. What is the correct formula for Euler's equation of motion?
   a. $(\partial p/\rho) + (\partial g/\rho) + (\partial v/\rho) = 0$
   b. $(\partial p/\rho) + (\partial g/\rho) + v.dv = 0$
   c. $(\partial p/\rho) + g.dz + v.dv = 0$
   d. $p.dp + g.dz + v.dv = 0$

7. The horizontal component of force on a curved surface is equal to the
   a. Product of pressure intensity at its centroid and area
   b. Force on a vertical projection of the curved surface
   c. Weight of liquid vertically above the curved surface
   d. Force on the horizontal projection of the curved surface

8. Equation of continuity is based on the principle of conservation of
   a. Mass
   b. Energy
   c. Linear momentum
   d. Angular momentum

9. The major loss of energy in long pipes is due to
   a. Sudden enlargement
   b. Sudden contraction
   c. Gradual contraction and enlargement
   d. Friction

10. The discharge of a liquid of kinematic viscosity $4cm^2/sec$ through a 8 cm diameter pipe is $3200\ cm^3/sec$. The type of flow is
    a. Laminar b. Transition c. Turbulent d. Uniform

11. Specific weigh of water in SI unit is
    a. $1000N/m^3$ b. $10000N/m^3$ c. $9.81*10^3\ N/m^3$ d. $9.81N/m^3$

12. When the flow parameter at any given instant remains same at every point, then flow is said to be
    a. Steady state b. Laminar c. Static d. Uniform

13. Which of the following is dimensionless ?
    a. Specific weight b. Specific speed c. Specific volume d. Specific gravity

14. The bulk modulus of elasticity with increase in pressure
    a. Increases
    b. Decreases
    c. Remains constant
    d. Increase up to certain limit and then decreases

15. Falling drop of water becomes spheres due to the property of
    a. Cohesion
    b. Surface tension
    c. Viscosity
    d. Compressibility

16. Liquid transmits pressure equally in all direction. This is
    a. Archimedes' principle
    b. Pascal's law
    c. Newton's Formula
    d. Chezy's equation

17. All the terms of energy in Bernoulli's equation have dimension of
    a. Energy b. Mass c. Height d. Time

18. The fluid forces considered in the Navier Stokes equation are
    a. Gravity, pressure and viscous
    b. Gravity, pressure and turbulent
    c. Pressure viscous and turbulent
    d. Gravity, viscous and turbulent

19. When is an orifice called "large orifice"?
    a. If the head of liquid is less than 5 times the depth of orifice
    b. If the head of liquid is less than 2.5 times the depth of orifice
    c. If the head of liquid is less than 4 times the depth of orifice
    d. If the head of liquid is less than 1.5 times the depth of orifice

20. Trapezoidal weir has another popular name. What is it?
    a. Rectangular weir b. Triangular weir
    c. Cipolletti weir d. Circular weir

KATHMANDU UNIVERSITY
End Semester Examination [C]
June, 2018

JUN 11 2018.

Level : B.E
Year : II
Time : 2 hrs. 30 mins.

Course : CIEG 204
Semester : I
F.M. : 40

SECTION "B"

Attempt *ALL* the questions. Make suitable assumptions wherever needed. The figures in the parenthesis indicate the marks allocated for the question.

1. Explain the concept of continuum and control volume in fluid mechanics. [2]

2. 2 liter of petrol weighs 14 N. Calculate the specific weight, mass density, specific volume and specific gravity of petrol with respect to water. [3]

3. Two large horizontal plane surfaces are 20 mm apart. This space is filled with glycerin. Find what force is required to drag a very thin plate of area $0.6m^2$ between the two surfaces at speed of 0.7 m/s. i) If the plate is equidistant from the two surfaces. ii) If the plate is 7.5 mm from one of the surfaces. Take dynamic viscosity of glycerin equal $0.804\ Ns/m^2$. [3]

4. Find the pressure difference between the pipe A and B as shown in the **Figure 1** [4]

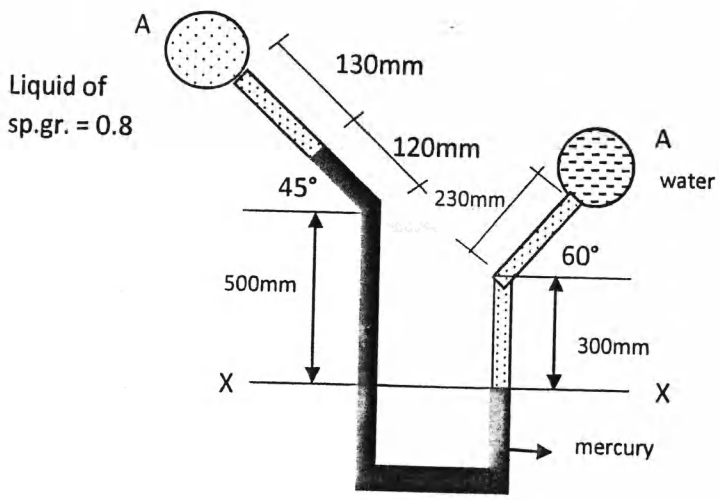

Figure 1

5. Explain Metacenter and Metacentric height. [2]

6. Find the volume of water displaced and position of center of buoyancy for a wooden block of width 2.5m and of depth 1.5m, when it floats horizontally in water. The density of wooden block is $650\ Kg/m^3$ and its length 6 m [3]

7. Derive the expression for Centre of pressure on a plane inclined surface immersed in liquid. [4]

8. Define continuity equation. Derive continuity equation for three dimensional flow using Cartesian co-ordinate. [5]

9. Define orifice and classify them. Explain the physical meaning of the different hydraulic coefficients (Cc, C_v and C_d) and mention the way of finding them. [5]

10. A reducing bend is incorporated in a pipeline so that the direction of flow is turned through 60° in the horizontal plane and the pipe diameter is reduced from 0.25m to 0.15m. The velocity and pressure at the entry to bend are 1.5 m/s and 300 kN/m^2 gauge respectively and at the exit, the pressure is 287. 2 kN/m^2 gauge. Find the magnitude and direction of the reaction force in the bend in the horizontal plane due to the flowing water. [5]

11. Define boundary layer concept and its phenomenon. Write down the characteristics of boundary layer formation on a thin plate, kept in a flowing fluid. [4]