Marks Scored:

KATHMANDU UNIVERSITY
End Semester Examination
February/March 2019

Level : B. E. | Course : CIEG 204
Year : II | Semester : I
Exam Roll No.: | Time: 30mins. | F. M. : 10
Registration No.: | Date : FEB 25 2019

SECTION "A"
[20Q × 0.5 = 10 marks]

Encircle the most appropriate answer.

1. If the volume of a liquid weighing 3000kg is 4 cubic metres, its specific gravity is
   a. 1 b. 1.25 c. 0.5 d. 0.75

2. In CGS system the unit of viscosity is
   a. Dyne b. Joule c. Poise d. Newton

3. Fluids change the volume under external pressure due to
   a. Plasticity b. Compressibility c. Viscosity d. Surface tension

4. For exerting a pressure of 4.8 kg/cm^2, the depth of oil (specific gravity 0.8), should be
   a. 40cm b. 41cm c. 56cm d. 60cm

5. The depth of Centre of pressure of on a vertical rectangular gate (4m wide, 3m high) with water up to top surface, is
   a. 2m b. 1m c. 1.5m d. 2.5m

6. The imaginary line drawn such that the tangents at its all points indicate the direction of the velocity of the fluid particles at each point, is called
   a. Path line b. Stream line c. Potential line d. Streak line

7. The continuity equation
   a. Expresses the relationship between work and energy
   b. Relates the momentum per unit volume between the two points on a stream line
   c. Relates mass rate of flow along a stream line
   d. Requires that Newton's second law of motion be satisfied at every point in fluid

8. The flow in which each liquid particle has a definite path and the paths of adjacent particles do not cross each other is called
   a. Stream line flow b. Uniform flow
   c. Steady flow d. Turbulent flow

9. The differential equation ρdp + gdz + vdv = 0 for a liquid in motion is suggested by
   a. Bernoulli b. Cauchy-Riemann
   c. Laplace d. Leonhard Euler

10. If v_1 and v_2 are the velocities of flow before and after sudden enlargement in a pipe, the head loss is given by
    a. $v_1^2/2g$ b. $v_2^2/2g$ c. $0.5v_1^2/2g$ d. $(v_1 - v_2)^2/2g$

11. The hydrostatic force acts through
    a. Centre of pressure b. Centre of top edge
    c. Centre of bottom edge d. Metacentre

12. Orifice meter is used to measure
    a. Pressure at point b. Discharge c. Average speed d. Velocity

13. Discharge Q over a rectangular weir of length L and height H, is given by the equation
    a. $(2/3) \times C_d \times \sqrt{2g} \times H^{2/3}$ b. $(2/3) \times C_d \times L \times \sqrt{2g} \times H^{2/3}$
    c. $(2/3) \times C_d \times L \times \sqrt{2g} \times H^{3/2}$ d. $(2/3) \times C_d \times g \times \sqrt{2L} \times H^{2/3}$

14. What is the correct formulae for absolute pressure?
    a. $P_{abs} = P_{atm} - P_{gauge}$ b. $P_{abs} = P_{vacuum} - P_{atm}$
    c. $P_{abs} = P_{vacuum} + P_{gauge}$ d. $P_{abs} = P_{atm} + P_{gauge}$

15. One liter of a certain fluid weighs 8N. What is its specific volume?
    a. 2.03×10^{-3} m^3/kg b. 20.3×10^{-3} m^3/kg
    c. 12.3×10^{-3} m^3/kg d. 1.23×10^{-3} m^3/kg

16. The component of the total force exerted by fluid on a body in the direction parallel to the direction of motion is called as
    a. Lift b. Drag c. Viscous force d. Surface tension

17. Shear stress in static fluid is
    a. Always zero b. Always maximum
    c. Between zero to maximum d. Unpredictable

18. The region in the turbulent boundary layer zone, adjacent to the solid surface of the plate is called
    a. Laminar sub layer b. Turbulent sub layer
    c. Solid sub layer d. Solid layer

19. When the net force acting on a fluid is the sum of only gravity force, pressure force and viscous force, the equation is called as
    a. Reynold's equation of motion b. Navier- Stoke's equation of motion
    c. Euler's equation of motion d. Bernoulli's equation

20. Newton's law of viscosity states that
    a. The shear stress applied to the fluid is directly proportional to the velocity gradient
    b. The shear stress applied to the fluid is inversely proportional to the velocity gradient
    c. The shear stress applied to the fluid is directly proportional to the specific weight
    d. The shear stress applied to the fluid is inversely proportional to the specific weight

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SECTION "B"

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

1. What is a differential manometer? Explain in brief the types of differential manometer with neat sketches. [1+4]

2. The curved face of a dam is shaped according to the relation $y = x^2/12.25$ as shown in the **Figure 1**. If the width of the dam is unit in length and height of water retained by the dam is 12m, determine the magnitude and direction of the resultant water pressure acting on the curved face of the dam. [5]

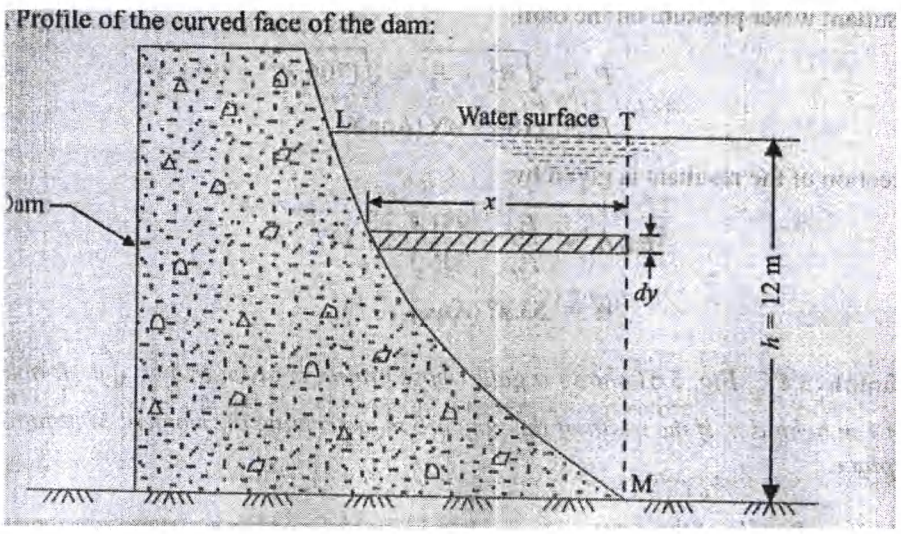

Figure 1

3. Explain briefly the types of equilibrium of floating bodies with neat sketches. [3]

4. A pipe 200m long slopes down at 1 in 100 and tapers from 600mm diameters at the higher end to 300mm diameter at the lower end, and carries 100 litres/sec of oil. The Specific Gravity of oil is 0.8. If the pressure gauge at the higher end reads 60 kN/m^2, determine the following. [5]
   i. Velocities at the two ends,
   ii. Pressure at the lower end
   Neglect all losses.

OR

A turbine has a supply line of diameter 45 cm and a tapering draft tube as shown in **Figure 2**. When the flow in the pipe is 0.6 m3/s the pressure head at point L upstream of the turbine is 35m and at a point M in the draft tube, where the diameter is 65 cm, the pressure head is -4.1m. Point M is 2.2m below the point L. Determine power output of the turbine by assuming 92% efficiency. [5]

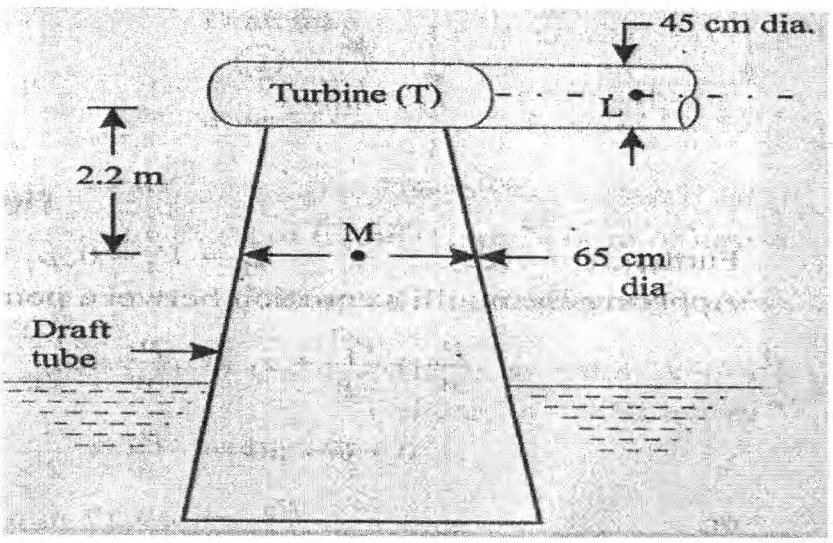

Figure 2

5. Derive Euler's equation of motion. How Bernoulli's equation are derived from Euler's equation. State the assumptions made. [3+1+1]

6. A rectangular Orifice 1.5m wide and 1.2m deep is fitted in one side of a large tank. The water level on one side of the orifice is 2m above the top edge of the orifice, while on the other side of the orifice, the water level is 0.4m below its top edge. Calculate the discharge through the orifice if $C_d = 0.62$ [5]

7. What is the difference between a 'notch 'and a 'weir'? How notches and weirs are classified? [2+2]

8. What is meant by boundary layer? Why does it increase with distance from the upstream edge? [2+1]

9. 250 litres/sec of water is flowing in a pipe having a diameter of 300mm. If the pipe is bent by 135°, find the magnitude and direction of the resultant force on the bend. The pressure of the water flowing is 400kN/m^2. Take specific weight of water as 9.81 kN/m^3. [5]