

Marks Scored:

KATHMANDU UNIVERSITY
End Semester Examination
February/March 2018

Level : B. E

Year : II

Exam Roll No.:

Time: 30mins.

Course : CIEG 204

Semester : I

F. M. : 10

Registration No.:

Date MAR 07 2018

SECTION "A"

[20Q × 0.5 = 10 marks]

Tick (✓) the most appropriate answer.

- The property by virtue of which a liquid opposes relative motion between its different layers is called _____
a. Surface tension
b. Resistivity
c. Viscosity
d. Viscous Damping
- In an immersed body, Centre of pressure is _____
a. At the center of gravity
b. Below the center of gravity
c. Above the center of gravity
d. At the metacenter
- Coefficient of velocity is defined as the ratio of _____
a. Actual velocity of jet at vena contracta to the theoretical velocity
b. Area of jet at vena contracta to the area of orifice
c. Actual discharge through an orifice to the theoretical discharge
d. Product of coefficient of discharge and coefficient of contraction
- A liquid compressed in cylinder has a volume of 0.04 m^3 at 50 kg/cm^2 and a volume of 0.039 m^3 at 150 kg/cm^2 . The bulk modulus of elasticity of liquid is _____
a. 400 kg/cm^2
b. 4000 kg/cm^2
c. $40 \times 10^5 \text{ kg/cm}^2$
d. $40 \times 10^6 \text{ kg/cm}^2$
- What is the correct formula for absolute pressure?
a. $P_{\text{abs}} = P_{\text{atm}} - P_{\text{gauge}}$
b. $P_{\text{abs}} = P_{\text{vacuum}} - P_{\text{gauge}}$
c. $P_{\text{abs}} = P_{\text{vacuum}} + P_{\text{gauge}}$
d. $P_{\text{abs}} = P_{\text{atm}} + P_{\text{gauge}}$
- The component of total force exerted by a fluid on a body in the direction parallel to the direction of motion is called _____
a. Lift
b. Drag
c. Shear force
d. Pressure force
- If the Reynold's number is less than 2000, the flow in a pipe is _____
a. Laminar
b. Turbulent
c. Transition
d. Steady
- The dynamic viscosity of a liquid is $1.2 \times 10^{-4} \text{ Ns/m}^2$, whereas, density is 600 kg/m^3 . The kinematic viscosity in m^2/s is _____
a. 72×10^{-3}
b. 7.2×10^3
c. 20×10^{-8}
d. 70×10^6
- The condition for the stable equilibrium of a floating body are _____
a. $BM < BG$
b. $BM = BG$
c. $BM = 2 BG$
d. $BM > BG$

10. Differential manometer is used to measure _____.
- Pressure in pipes, channels etc.
 - Atmospheric pressure
 - Very low pressure
 - Difference of pressure between two points
11. The flow in which each liquid particle has definite path and paths of particles do not cross each other is called _____
- Uniform flow
 - Steady flow
 - Turbulent flow
 - Streamline flow
12. The upper surface of a weir over which water flows is known as _____
- Nappe
 - Contracta
 - Sill
 - Weir top
13. All the terms of energy in Bernoulli's equation have dimension of _____
- Depth
 - Energy
 - Work
 - Mass
14. The fluid forces considered in Navier Stokes equation are _____
- gravity, pressure and turbulent
 - gravity, pressure and viscous
 - pressure, viscous and turbulent
 - gravity, viscous and turbulent
15. In dimensional analysis the Buckingham's π - theorem is widely used and expresses the resulting equation in terms of _____
- The repeating variables
 - Geometric, kinematic and dynamic variables
 - (n-m) dimensionless parameters
 - n dimensionless parameters
16. Discharge over a triangular notch or weir is given by _____
- $(2/3) \cdot C_d \cdot \sqrt{2g} \cdot \tan(\theta/2) \cdot H^{3/2}$
 - $C_d \cdot \sqrt{2g} \cdot \tan(\theta/2) \cdot H^{5/2}$
 - $(1/2) \cdot C_d \cdot \sqrt{2g} \cdot \tan(\theta/2) \cdot H^{5/2}$
 - $(8/15) \cdot C_d \cdot \sqrt{2g} \cdot \tan(\theta/2) \cdot H^{5/2}$
17. The Metacentric height (GM) experimentally is given as _____
- $GM = (W \cdot \tan \theta) / (w \cdot x)$
 - $GM = (w \cdot \tan \theta) / (W \cdot x)$
 - $GM = (w \cdot x) / (W \cdot \tan \theta)$
 - $GM = (W \cdot x) / (w \cdot \tan \theta)$
18. Continuity equation can take the form of _____
- $\rho_1 A_1 V_1 = \rho_2 A_2 V_2$
 - $\rho_1 V_1 = \rho_2 V_2$
 - $A_1 V_1 = A_2 V_2$
 - $\rho_1 A_2 V_1 = \rho_2 A_1 V_2$
19. Which of the following equations is known as momentum principle?
- $F = d(m^2 v) / dt$
 - $F = dv / dt$
 - $F = d(mv) / dt$
 - $F = d(mv) / dt^2$
20. A vertical wall is subjected to a pressure due to one kind of liquid on one of its sides. The total pressure on the wall acts at a distance _____ from the liquid surface.
- $h/3$
 - $2h/3$
 - $h/2$
 - $3h/4$

Level : B.E
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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. Figure 1 below shows an inverted differential manometer having an oil of specific gravity 0.8 connected to two different pipes carrying water under pressure. Determine the pressure in the pipe B. The pressure in pipe A is 2m of water. [3]

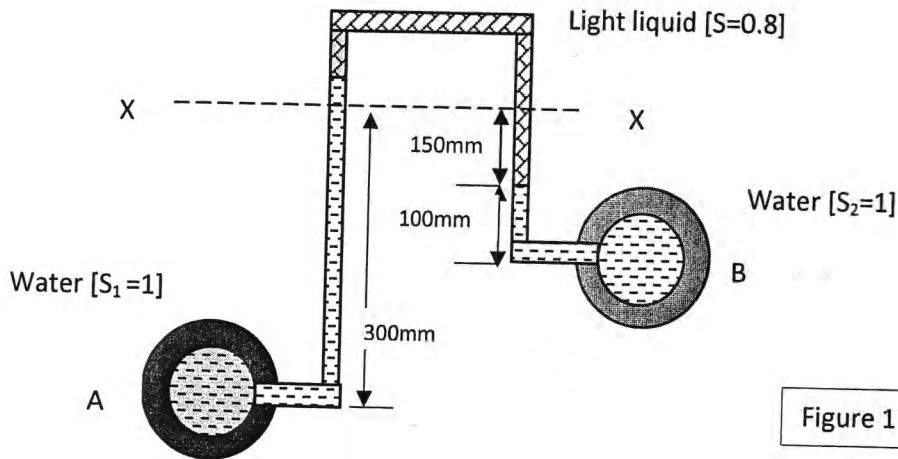


Figure 1

2. A 400mm diameter shaft is rotating at 200 rpm in a bearing of length 120mm. If the thickness of oil film is 1.5 mm and the dynamic viscosity of the oil is $0.7 \text{ N}\cdot\text{s}/\text{m}^2$, determine: [4]
- i. Torque required to overcome friction in bearing
 - ii. Power utilized in overcoming viscous resistance
- Assume a linear velocity profile.

3. Find the resultant force due to water pressure acting on the gate shown in Figure 2 per m run. At what angle will it be acting to the horizontal? Prove that the resultant forces passes through the hinge. [4]

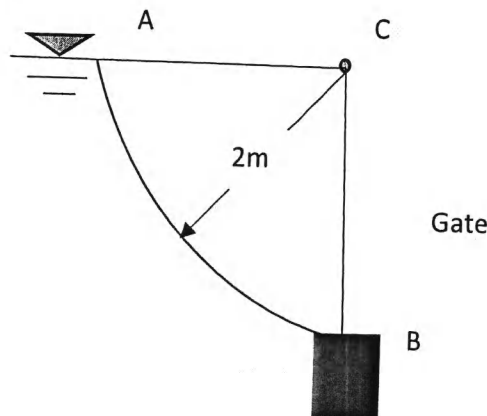


Figure 2

4. Write short notes on (*ANY THREE*) [2 × 3 = 6]
 a. Drag and Lift forces b. Losses of energy in pipes
 c. Types of equilibrium of floating body d. Types of fluid flow e. Rayleigh's method

5. Differentiate between a large and a small Orifice. Obtain an expression for discharge through a triangular notch. [1+3]

OR

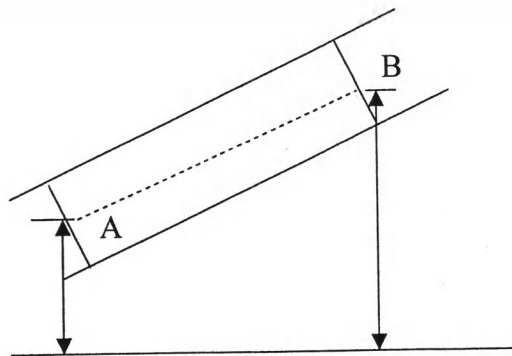
Find an expression for the discharge over a rectangular weir in terms of head of water over the crest of the weir.

6. A 45° reducing bend is connected in a pipeline, the diameter at the inlet and outlet of the bend being 600mm and 300mm respectively. Find the force exerted by water on the bend if the intensity of pressure at inlet to bend is 8.829 N/cm² and rate of flow of water is 600 liter/sec. [4]

7. Find the discharge over a rectangular weir of length 80m. The head of water over the weir is 1.2 m. The velocity of approach is given as 1.5m/s. Take $C_d = 0.6$ [3]

8. The following data relate to an Orifice meter [4]
 Diameter of the pipe = 240mm
 Diameter of the orifice = 120mm
 Sp. Gravity of oil = 0.88
 Reading of differential manometer = 400mm of mercury
 Coefficient of discharge of Orifice meter = 0.65
 Determine the rate of flow of oil.

9. A pipe of diameter 400mm carries water at a velocity of 25 m/s. The pressure at the points A and B are given as 29.43 N/cm² and 22.563N/cm² respectively, while the datum head at A and B are 28m and 30m. Find the loss of head between A and B. [3]



10. State Bernoulli's theorem. Mention the assumptions made. Derive Euler's equation of motion along a streamline for an ideal fluid. [1+1+3]