

Answer to Question No. 1 & 2 are compulsory and to be answered first. This answer is to be made in separate loose script(s) provided for the purpose. Maximum time allowed is 30 minutes, after which the loose answer scripts will be collected and fresh answer scripts for answering the remaining part of the question will be provided. On early submission of answer scripts of Question No. 1 & 2, a student will get the remaining script earlier.

Answer any Eight (08) Questions from the rest.

1. Choose the correct answer from the given alternatives: (any ten):

1x10

- i) The discharge in an open channel corresponding to the critical depth is – (a) Maximum, (b) Zero (c) Minimum (d) None of these.
- ii) Loss of head at the entrance of a pipe – (a)  $v^2/2g$ , (b)  $0.5 v^2/2g$ , (c)  $k v^2/2g$ , (d) None of these.
- iii) A Pitot tube is an instrument for measuring – (a) Pressure of flow, (b) Discharge of fluid, (c) Velocity of flow (d) Total energy.
- iv) The Continuity equation is based on – (a) conservation of mass, (b) conservation of energy, (c) Velocity potential (d) None of these.
- v) Flow of water is said to be Turbulent flow when Reynold's number exceeds more than – (a) 2000, (b) 2400, (c) 4000, (d) none of these.
- vi) Bernoulli's theorem deals with the conservation of – (a) mass, (b) momentum, (c) energy, (d) none of these.
- vii) Darcy Weisbach formula for frictional head loss in pipe length L is expressed by – (a)  $h_f = 4fLv^2/2gd$ , (b)  $h_f = fLv^2/2gd$ , (c)  $h_f = fLv^2/gd$ , (d) none of these.
- viii) Open channel flow is caused by – (a) Gravity, (b) atmospheric pressure, (c) frictional forces, (d) none of these
- ix) The discharge through a V-notch varies as – (a)  $H^{1/2}$ , (b) H, (c)  $H^{3/2}$ , (d)  $H^{5/2}$
- x) Ideal fluid is one which is – (a) Compressible, possess viscosity & surface tension, (b) Incompressible and has no viscosity & surface tension, (c) Compressible and has no viscosity & surface tension, (d) All of the above .
- xi) Kinematic viscosity is defined as equal to – (a) dynamic viscosity / density, (b) pressure x density, (c) dynamic viscosity x density, (d) dynamic viscosity x pressure.
- (xii) Which of the following is dimensionless? – (a) Specific speed, (b) Specific Volume, (c) Specific gravity, (d) Specific weight.
- xiii) Manometer is suitable for measuring – (a) only low pressure (b) only high pressure (c) both high and low pressure (d) only negative pressure.
- xiv) Continuity equation deals with the law of conservation of – (a) mass, (b) energy, (c) momentum, (d) only negative pressure.
- xv) The path followed by a fluid particle in motion is called a – (a) stream line, (b) Streak line, (c) Path line, (d) none of these.



2. Fill in the blanks (Any ten):

1x10

- i) The phenomenon of rise or fall of a liquid in a thin tube relative to the adjacent general level of liquid is known as .....
- ii) Reciprocating pump is a type of ..... Pump.
- iii) A ..... is a short length of pipe fitted in a tank containing the fluid.
- iv) The point where total pressure acts is known as .....
- v) Area velocity method is used for measurement of ..... of a river at a point.
- vi) The flow in which fluid particles move in a zigzag path is called ..... Flow.
- vii) Flow of water is said to be Turbulent flow when Reynold's number exceeds more than.....
- viii) The ratio of actual velocity of jet at vena-contracta to the theoretical velocity is called.....
- ix) In a most economical trapezoidal channel section, half of the top width = .....
- x) ..... is that branch of hydraulics which deals with water at rest.
- xi) All pressure gauges when open to the atmosphere gives reading .....
- xii) The reciprocal of mass density is known as .....
- xiii) In a laminar flow , Reynold's number is .....
- xiv) The highest point in the pipe lying above the hydraulic gradient line is called .....
- xv) A channel is said to be prismatic channel if the cross section and bed slope do not change along the ..... of the channel.

3. i. What is vapour pressure? What is its significance in flow problems? 1+1
- ii. Explain the phenomenon of capillarity. 2
- iii. Define compressibility. 1

4. A tank 3m x 4m contains 1.2m deep oil of specific gravity 0.8. Find i) intensity of pressure at the base of the tank and ii) total pressure on the base of the tank. 5

5. i. A U-tube manometer containing Hg was used to find the vacuum pressure in a pipe containing water. The right limb was open to the atmosphere. Find the pressure in the pipe if the difference of Hg level in the two limbs was 100 mm and height of water in the left limb from the centre of pipe was found to be 40 mm below. 4

- ii. What is the use of a differential manometer? 1

6. A discharge of 30 l/s of oil (sp. Gr. 0.81) occurs downward through a converging pipe line held inclined at  $60^\circ$  to the horizontal. The inlet diameter is 20 cm and outlet diameter is 15 cm and the length of the pipe is 2m. If the pressure at the top of the inlet is  $0.8 \text{ kgf/cm}^2$ , find the pressure at the outlet. Assume head loss of 3m occurs between the inlet and outlet. 5

7. Two reservoirs with a difference in water surface elevation of 10 m are connected by a pipeline ABC which consists of two pipes of AB and BC joined in series. Pipe AB is 10 cm in diameter, 20 m long and has a value of  $f = 0.02$ . Pipe BC is 16 cm in diameter, 25 m long and has an  $f = 0.018$ . The junctions with the reservoirs and between the pipes are abrupt. Calculate the discharge. 5

8. A 30 cm x 15 cm venturimeter is provided in a vertical pipeline carrying oil of specific gravity 0.9 the flow being upwards. The difference in elevation of the throat section and entrance section of the venturimeter is 30 cm. The differential reading of the u tube mercury manometer shows the gauge deflection of 25 cm. Calculate the discharge of oil and the pressure difference between the entrance and throat section. Take coefficient of the metre is 0.98 5

9. i. What are the condition for maximum discharge through the channel of Trapezoidal section 1  
 ii. A trapezoidal channel has a bed width of 2 m and side slope of 1.5 H: 1 vertical. The channel has a longitudinal slope of 1 in 4000. If Manning's coefficient of the channel boundary is 0.018, calculate the mean velocity of flow and discharge for a depth of flow of 1.4m. 4
10. i. A rectangular channel 2.0 m wide carries a discharge of  $6.0 \text{ m}^3/\text{s}$ . Calculate the critical depth and specific energy at critical depth. 4  
 ii. What is meant by alternate depth? 1
11. i. In a hydraulic jump occurring in a rectangular horizontal channel the discharge per unit width is  $2.5 \text{ m}^3/\text{s}/\text{m}$  and the depth before the jump is 0.25 m. Calculate the sequent depth and the energy loss due to jump. 2+2  
 ii. What is meant by Supercritical Flow? 1
12. i. State the working principle of a centrifugal pump. 3  
 ii. What is a reciprocating pump? Name the main components of the reciprocating pump. 2