Question Bank (Chapter wise)

Semester: 4th

Subject: Hydraulic and Irrigation Engineering (Th.2)

Prepared by: Padmabhusan Naik

PART: A (Hydraulics)

Chapter: 1 (Hydrostatics)

Short Type Questions: (2 Mark)

1. Define the fluid mechanics and its types.
2. Explain the characteristics of the fluid.
3. Differentiate the real fluid and ideal fluid.
4. Define the mass density.
5. Explain the weight density.
6. Define specific volume.
7. Explain the specific gravity.
8. Differentiate the cohesion and adhesion.
9. If the surface tension at air-water interface is 0.069 N/m, what is the pressure difference between inside and outside of an air bubble of diameter 0.009 mm?
10. A soap bubble 62.5 mm diameter has an internal pressure in excess of the outside pressure of 20 N/m^2. What is tension in the soap film?
11. Define the viscosity and its unit.
12. Explain the kinematic viscosity and its unit.
13. Define the Newton's law of viscosity.
14. Differentiate Newtonian fluids and Non-Newtonian fluids.
15. Define the pressure of a liquid.
16. Find the pressure at a depth of 15 m below the free surface of water in a reservoir.
17. Find the height of water column corresponding to a pressure of 54 kN/m^2.
18. Define the Pascal's law.
19. Explain the atmosphere pressure.
20. Define the gauge pressure.
21. Explain the vaccum pressure.
22. Define the absolute pressure.
23. Explain relationship between atmospheric pressure, absolute pressure and gauge pressure.

24. Define the manometer and its types.
25. Explain the hydrostatics.
26. Define total pressure and centre of pressure.

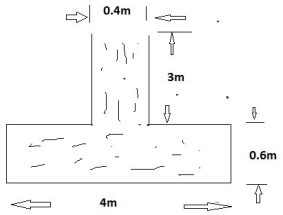
Long Type Questions: (5 Mark)

1. Calculate the specific weight, specific mass, specific volume and specific gravity of a liquid having a volume of 6 m^3 and weight of 44 kN.
2. Discuss the surface tension with diagram.
3. Describe the capillarity with sketch.
4. A clean tube of diameter 2.5 mm is immersed in a liquid with coefficient of surface tension =0.4 N/m. The angle of contact of the liquid with the glass can be assumed to be 135°. The density of the liquid=13600 kg/m^3. What would be the level of the liquid in the tube relative to the free surface of the liquid inside the tube.
5. Assuming that the interstices in a clay are of size equal to one tenth the mean diameter of the grain, estimate the height to which water will rise in a clay soil of average diameter of 0.048 mm. Assume surface tension at air-water interface as 0.074 N/m.
6. Determine the minimum size of glass tubing that can be used to measure water level, if the capillary rise in the tube is not to exceed 0.3 mm. Take surface tension of water in contact with air as 0.0735 N/m.
7. Describe the pressure head of a liquid with sketch.
8. The diameters of ram and plunger of an hydraulic press are 200 mm and 30 mm respectively. Find the weight lifted by the hydraulic press when the force applied at the plunger is 400 N.
9. Differentiate between the piezometer and u-tube manometer with sketch.
10. Distinguish between the single column manometer and differential manometer.
11. Derive expressions for total pressure for a horizontal immersed surface.
12. Figure shows A tank full of water, Find

    (i) total pressure on the bottom of the tank

    (ii) weight of water in the tank.

    Width of tank is 2m.



13. Derive expressions for total pressure and centre of pressure for a vertically immersed surface.

Long Type Questions: (10 Mark)

1. Discuss the details about the viscosity with diagram.
2. A plate 0.05 mm distant from a fixed plate moves at 1.2 m/s and requires a force of 2.2 N/m^2 to maintain this speed. Find the viscosity of the fluid between the plates.

3. The space between two square flat parallel plates is filled with oil. Each side of the plate is 720 mm. The thickness of the oil film is 15 mm. The upper plate, which moves at 3 m/s requires a force of 120 N to maintain the speed. Determine:

   (i) The dynamic viscosity of the oil;

   (ii) The kinematic viscosity of oil if the specific gravity of oil is 0.95.

4. Given that,

   Barometer reading = 740 mm of mercury;

   Specific gravity of mercury = 13.6; Intensity of pressure = 40 kPa.

   Express the intensity of pressure in S.I. units, both gauge and absolute.

5. The inlet to pump is 10.5 m above the bottom of sump from which it draws water through a suction pipe. If the pressure at the pump inlet is not to fall below 28 kN/m² absolute, work out the minimum depth of water in the tank.

   Assume atmospheric pressure as 100 kPa.

6. Fig. 3.7 shows a circular plate of diameter 1.2 m placed vertically in water in such a way that the centre of the place is 2.5 m below the free surface of water. Determine: (i) Total pressure on the plate. (ii) Position of centre of pressure.

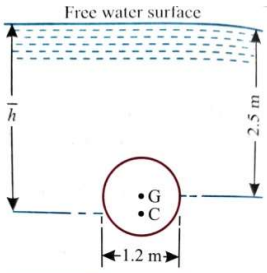


Fig. 3.7

7. A rectangular plate 3 metres long and 1 metre wide is immersed vertically in water in such a way that its 3 metres side is parallel to the water surface and is 1 metre below it. Find: (i) Total pressure on the plate, and (ii) Position of centre of pressure.

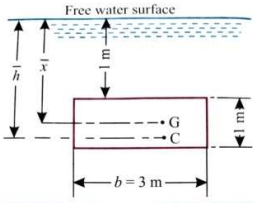


Fig. 3.8

Chapter: 2 (Kinematics Of Fluid Flow)

Short Type Questions: (2 Mark)

1. Define the fluid kinematics.
2. Differentiate Steady and unsteady flows.
3. Distinguish between Uniform and non-uniform flows.
4. Differentiate Laminar and turbulent flows.
5. Distinguish between Compressible & incompressible flows.
6. Explain rate of flow with unit.
7. Define velocity head.
8. Explain total head.
9. Define rotameter.

10. Explain Notch.
11. Define weir.
12. Explain the discharge over a notch.
13. Define Darcy-Weisbach formula.
14. Define Chezy's formula.

Long Type Questions: (5 Mark)

1. Derive expressions of continuity equation.
2. In a pipe of 90 mm diameter water is flowing with a mean velocity of 2 m/s and at a gauge pressure of 350 kN/m². Determine the total head, if the pipe is 8 metres above the datum line. Neglect friction.
3. Describe Bernoulli's equation with its assumptions.
4. Derive expressions of venturimeter.
5. Derive expressions of orificemeter.
6. Derive expressions of pitot tube.
7. A rectangular notch 2.0 m wide has a constant head of 500 mm. Find discharge over the notch, if co-efficient of discharge for the notch is 0.62.
8. Find the discharge over a triangular notch of angle 60° when the head over the triangular notch is 0.2 m. Assume C_d = 0.6.
9. In a pipe of diameter 350 mm and length 75 m water is flowing at a velocity of 2.8 m/s. Find the head lost due to friction using, Darcy-Weisbach formula; Assume kinematic viscosity of water as 0.012 stoke.
10. Water flows through a pipe of diameter 300 mm with a velocity of 5 m/s. If the co-efficient of friction is given by f = $0.015+\frac{0.08}{(\mathrm{Re})^{0.3}}$ where Re is the Reynolds number, find the head lost due to friction for a length of 10 m. Take kinematic viscosity of water as 0.01 stoke.
11. Explain Hydraulic gradient and total energy line with assumptions.
12. Derive expressions most economical rectangular channel section.

Long Type Questions: (10 Mark)

1. The diameters of a pipe at the sections 1-1 and 2-2 are 200 mm and 300 mm respectively. If the velocity of water flowing through the pipe at section 1-1 is 4m/s, find:
   (i) Discharge through the pipe, and (ii) Velocity of water at section 2-2

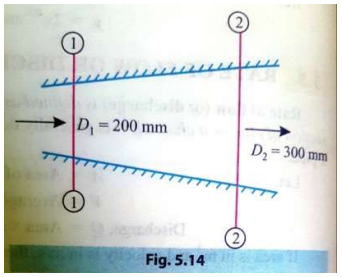


Fig. 5.14

2. A pipe (1) 450 mm in diameter branches into two pipes (2 and 3) of diameters 300 mm and 200 mm respectively as shown in Fig. 5.15. If the average velocity in 450 mm diameter pipe is 3 m/s find:
   (i) Discharge through 450 mm diameter pipe;
   (ii) Velocity in 200 mm diameter pipe if the average velocity in 300 mm pipe is 2.5 m/s.

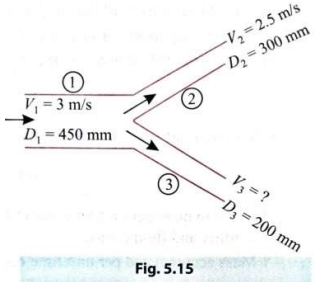
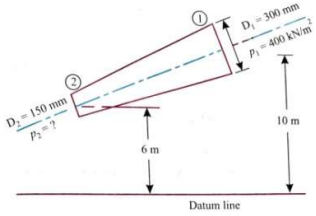


Fig. 5.15

3. The water is flowing through a tapering pipe having diameters 300 mm and 150 mm at sections 1 and 2 respectively. The discharge through the pipe is 40 litres/sec. The section 1 is 10 m above datum and section 2 is 6 m above datum. Find the intensity of pressure at section 2 if that at section 1 is 400 kN/m².



4. Find the discharge through a trapezoidal notch which is 1.2 m wide at the top and 0.50 m at the bottom and is 0.4 m in height. The head of water on the notch is 0.3 m. Assume C_d for rectangular portion = 0.62, while for triangular portion = 0.60.
5. Find the discharge over a stepped rectangular notch, as shown in Fig. 9-6. Co-efficient of discharge for all the portions as 0.62.

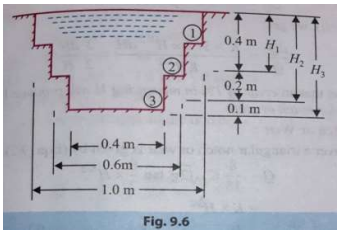


Fig. 9.6

Chapter: 3 (Pumps)

Short Type Questions: (2 Mark)

1. Define the Pump and its types.
2. Explain the impeller.
3. Explain manometric efficiency.
4. Define pump formulas.
5. Classify the reciprocating pump.

Long Type Questions: (10 Mark)

1. Describe centrifugal pump and its components.
2. Discuss the reciprocating pump and its working principle.

PART: B (Irrigation Engineering)

Chapter: 1 (Hydrology)

Short Type Questions: (2 Mark)

1. Define hydrology.
2. Explain the precipitation.
3. List out different types of rain gauges.
4. Define the cyclonic precipitation.
5. Explain the convective precipitation.
6. Define the orographic precipitation.
7. Explain the catchment area.
8. Define the run-off.
9. Explain the rainfall intensity.
10. Define the Dicken's and Ryve's formulas.

Long Type Questions: (5 Mark)

1. Explain the hydrology cycle.
2. Discuss the types of precipitation.
3. Explain the float type raingauge with sketch.

Long Type Questions: (10 Mark)

1. Explain the Simon's raingauge with sketch.
2. Discuss the tipping bucket raingauge with sketch.

Chapter: 2 (Water Requirement Of Crops)

Short Type Questions: (2 Mark)

1. Define the irrigation.
2. Write two benefits of irrigation.
3. Explain the lift irrigation and its groups.
4. Define sub-surface irrigation.
5. Explain the crop season.
6. Define duty of irrigation water.
7. Explain the overlap allowance.
8. Define gross command area.
9. Explain the intensity of irrigation.
10. Explain the time factor.
11. Define the crop ratio.

Long Type Questions: (5 Mark)

1. Explain the necessity of irrigation.
2. Classify the flow irrigation.
3. Define base, delta and duty and derive the relationship between them.
4. A channel is to be designed for irrigating 5000 hectares in Kharif crop and 4000 hectares in Rabi crop. The water requirement for Kharif and Rabi are 60 cm and 25 cm, respectively. The Kor period for Kharif is 3 weeks and for Rabi is 4 weeks. Determine the discharge of the channel for which it is to be designed.

Long Type Questions: (10 Mark)

1. Discuss the benefits of irrigations.

Chapter: 3 (Flow Irrigation)

Short Type Questions: (2 Mark)

1. Define the irrigation canal and its types.
2. Explain inundation canal.
3. Define perennial canal.
4. Explain the power canal.
5. Define the field channels.
6. Explain the free board.
7. Define the dowel.
8. Explain the cement mortar lining.
9. Define the shotcrete lining.

Long Type Questions: (5 Mark)

1. Discuss the types of canals.
2. Describe the different components of irrigation canals.
3. Explain the types of canal banks.
4. Classify the canals according to their alignment.

Long Type Questions: (10 Mark)

1. Explain the sketches of different canal cross sections.
2. Discuss the various types of canal lining.
3. Describe the advantages and disadvantages of canal lining.

Chapter: 4 (Water Logging And Drainage)

Short Type Questions: (2 Mark)

1. Define the water logging.

Long Type Questions: (5 Mark)

1. Describe the effects of water logging.

Long Type Questions: (10 Mark)

1. Discuss the causes of water logging.
2. Explain the control of water logging.

Chapter: 5 (Diversion Head Works And Regulatory Structures)

Short Type Questions: (2 Mark)

1. Define the storage head works.
2. Explain the diversion head works.
3. Define the divide wall.
4. Define spillway.
5. Explain the fish ladder.
6. Define the silt excluder.
7. Explain the guide bank.
8. Define the sheet pile.

Long Type Questions: (5 Mark)

1. Discuss the objects diversion head works.
2. Describe the selection of site for diversion head works.
3. Explain the regulatory structures.

Long Type Questions: (10 Mark)

1. Discuss the components of diversion head works.
2. Describe the components of barrage.

Chapter: 6 (Cross Drainage Works)

Short Type Questions: (2 Mark)

1. Define the cross drainage works.
2. Explain the aqueduct.
3. Define the super passage.
4. Explain the level crossing.

Long Type Questions: (5 Mark)

1. Discuss the necessity of cross drainage works.
2. Explain the siphon aqueduct with sketch.
3. Discuss the level crossing with operation.
4. Explain the inlet and outlet with sketch.

Long Type Questions: (10 Mark)

1. Discuss the types of cross drainage works.
2. Explain the types of cross drainage work with neat sketch.
3. Describe the aqueduct with sketch.
4. Discuss the super passage with sketch.

Chapter: 7 (Dams)

Short Type Questions: (2 Mark)

1. Classify the dam based on materials.
2. Classify the dam based on hydraulic behavior.
3. Define the earthen dam.
4. Explain the solid gravity dam.

Long Type Questions: (5 Mark)

1. Discuss the necessity of storage reservoirs.
2. Explain the classification of dam based on functions.
3. Discuss the diaphragm type dam.
4. Explain the causes of failure of gravity dam.
5. Discuss the precautions against failure.

Long Type Questions: (10 Mark)

1. Differentiate between the rolled fill dam and hydraulic fill dam with sketch.
2. Discuss the causes of failure of earthen dam.
3. Describe the forces acting on gravity dam with sketch.