Uka Tarsadia University (Diwaliba Polytechnic)
Diploma in Mechanical Engineering
Assignment (Fluid Mechanics And Hydraulic Machines -020020304)

Unit-1

Fluid & Fluid Properties.

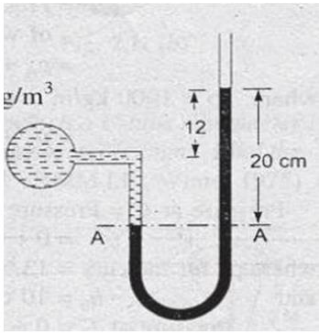
1. Define fluid. What do you mean by fluid mechanics?
2. What is the basic difference between solid and fluid?
3. Name and define three major groups of fluid mechanics.
4. Differentiate between Ideal fluid & Real fluid.
5. Differentiate between Newtonian & Non-Newtonian fluids.
6. Differentiate between Compressible & Incompressible fluid.
7. List and explain in short any three properties of fluid.
8. Define the terms fluid statics & fluid kinematics.
9. What do you mean by Ideal Fluid & Real Fluid?
10. Define the terms dynamic viscosity & kinematic viscosity.
11. List and explain the types of fluids.
12. Draw the graph of "stress – velocity gradient relationship" showing the characteristics of each type of fluid.
13. State Newton's Law of viscosity. Write the equation & name the terms involved in it.
14. Explain surface tension in short.
15. What do you mean by Mass Density & Weight Density?
16. Write one basic difference between Newtonian Fluid & Non – Newtonian Fluid.
17. Define specific gravity of liquid & specific gravity of gas.
18. Differentiate between liquid & gas.
19. Differentiate between solid & fluid.
20. How Newtonian fluid is different from Non – Newtonian fluid? Give some examples of each.
21. Calculate the density of an oil whose specific gravity is 0.8? Write its unit.
22. Write the units of dynamic viscosity & kinematic viscosity.
23. Write the units of shear stress & surface tension.
24. Give the relation between the following units.
    a. 1 poise = _____ $\frac{Ns}{m^2}$.
    b. 1 kgf = _____ N.

25. viscosity of fluid. What is the effect of temperature on the viscosity of liquid and viscosity of gas?
26. Calculate the specific weight, density and specific gravity of one litre of liquid which weights 8 N. (Take density of water = 1000 kg/m^3)
27. Calculate the specific weight, density and weight of one litre of petrol with specific gravity (S) = 0.7. (Take density of water = 1000 kg/m^3)
28. A plate at a distance of 3 x 10^{-5} m from a fixed plate moving with velocity of 0.5 m/s requires a shear stress of 2 N/m^2 to maintain the speed. Determine the fluid viscosity between the plates. Use $\tau = \mu(\frac{du}{dy})$
29. State whether following sentences are true or false:
    a. Specific Volume is the inverse of Density.
    b. Compressible fluid has variable density.
30. Define compressibility and how it is related to bulk modulus?
31. Define bulk modulus and write its unit.
32. A plate at a distance of 1 x 10^{-5} m from a fixed plate moving with velocity of 0.6 m/s requires a shear stress of 3 N/m^2 to maintain the speed. Determine the fluid viscosity between the plates. Use $\tau = \mu(\frac{du}{dy})$
33. How compressible fluid is different from incompressible fluid? Give some examples of each.
34. Explain bulk modulus in short.
35. Explain the concept of ideal fluid. How it is different from real fluid. Give some examples of each.

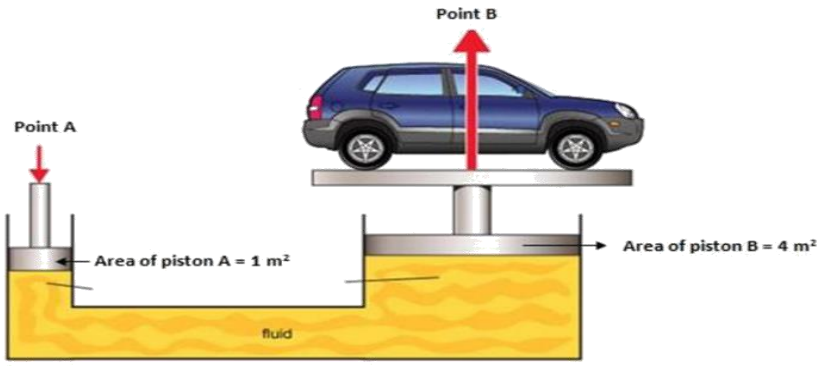
UNIT-2

Fluid Statics

1. Give the classification of Manometers.
2. State Pascal's law.
3. Write unit: (i)pressure (ii) pressure head
4. The right limb of a simple U-tube manometer containing mercury is open to atmosphere while the left limb if connected to a pipe in which a fluid of specific gravity 0.9 is flowing. The center of the pipe if 12cm below the level of mercury in the right limb.



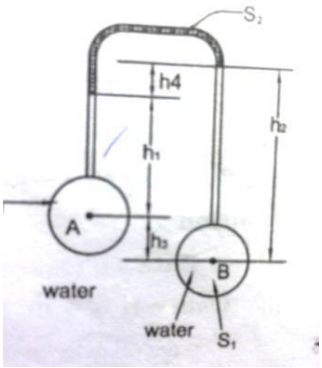
5. Find the pressure of fluid in the pipe if the difference of mercury level in the two limbs is 20cm.
6. Explain principle of operation and working of piezometer.
7. Explain the working of Bourdon tube pressure gauge with neat sketch.
8. A hydraulic press has a ram of 20cm diameter and a plunger of 3cm diameter. It is used for lifting weight of 30kN. Find the force required at the plunger.
9. Define: Atmospheric pressure, Absolute pressure.
10. Calculate the pressure head of oil of 0.75 specific gravity equivalent to intensity of pressure 294300 N/m^2.
11. Write the limitations of piezometer tube.
12. As shown in Figure , calculate the force to be applied at point A in order to lift a car having force of 100N.



13. Explain the working of Bellow pressure gauge with neat sketch.
14. Discuss factors affecting the selection of pressure measuring devices.
15. Plot the relation between Absolute, Gauge and Vacuum Pressure.
16. List out different Mechanical gauges.
17. Write function of pressure measuring devices.
18. A simple manometer is used to measure the pressure of diesel flowing through pipe line. The density of diesel is 850kg/m3.its right limb is open to atmosphere and left limb is connected to pipe. The center line of pipe is 105 mm. above the level of mercury in the right limb. the mercury in the left limb is 120mm below the center line of pipe. Determine absolute pressure of diesel in bar.
19. State Pascal's Law and prove it.
20. Define: Gauge pressure and Vacuum Pressure.
21. Write application of Pascal's law.
22. Give the relation between the following units:

    bar= _____N/m2

    760 Hg =_____meter of water
23. A differential Manometer gauge connected with two pipes A and B , of equal dimensions with an inverted U tube with vertical limbs. the pipe A and B contain water. the centre line of pipe A is 15 cm above pipe B. the surface separation of water and manomet5ric liquid oil of S.G.=0.8 in the left limb is 30cm above the centre line of pipe A. the surface separation of water and manometric liquid oil in the right limb is 601 cm. above the centre line of pipe B. determine the difference of pressure in kN/m^2.

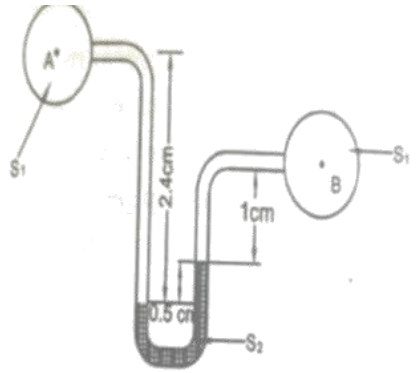


24. Explain the working of dead weight pressure gauge with neat sketch.
25. List out different mechanical gauges.
26. Define pressure intensity.
27. What is Manometer?

28. Calculate the pressure due to column of 4 m of (a) water,(b) kerosene of sp. Gr. 0.8 and (c)mercury of sp.gr. 13.6. take density of water ρ=1000kg/m3

29. A hydraulic press has a ram of 40cm diameter and a plunger of 4cm diameter. Find the weight lifted by the hydraulic press when the force applied at the plunger is 600N.

30. A differential Manometer having mercury is used to measure the difference of pressure between two pipes in which water is flowing as shown in figure. If the difference of mercury in manometer is 0.5cm. Find difference of pressure between two pipes.



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31. Explain the working of bourdon tube pressure gauge with neat sketch.

UNIT-3

Fluid Kinematics

1 By what mean is fluid kinematics different from fluid statics?
2 Define the terms stream line and stream tube.
3 Define the terms path line and streak/filament line.
4 Explain laminar flow and turbulent flow with a neat sketch.
5 Describe steady flow and unsteady flow.
6 Discuss rotational flow and irrotational flow with a neat sketch.
7 Explain uniform flow and non-uniform flow.
8 Define the terms velocity potential and flow net.
9 Define the terms steady flow and unsteady flow.
10 What do you mean by discharge or rate of flow? Write its units.
11 Describe one dimensional and two dimensional flow with a neat sketch.
12 Discuss two dimensional and three dimensional flow with a neat sketch.
13 Explain the concept of control volume with a neat sketch.
14 Explain with a neat sketch Langragian and Eulerian method, used for describing motion of fluid particles.
15 Define Reynolds Number (Re). What is the type of flow if the Re is less than 2000?
16 Define laminar flow. What is the range of Reynolds Number for laminar flow?
17 Define turbulent flow. What is the range of Reynolds Number for turbulent flow?
18 State and derive continuity equation.
19 Derive Steady Flow Energy Equation (SFEE).
20 Derive expression of the force due to impact of jet on stationary flat vertical plate, held normal to the direction of jet.
21 Derive expression of the force due to impact of jet on an inclined stationary flat plate.
22 Name and explain two methods by which the motion of fluid particles are described.
23 Name the different types of fluid flow.
24 Name the different types of pattern of fluid flow.
25 Derive expression of the force and work done due to impact of jet on a moving flat plate, held normal to the direction of jet.
26 Derive expression of the force and work done due to impact of jet on a moving inclined plate.
27 Derive the expression of the force and work done due to impact of jet on series of flat plate.
28 A water flow with discharge of 0.15 m^3/s in a pipe. The dia. of pipe is 0.250 m. Calculate the velocity of flow.
29 Give some examples of two dimensional flow.
30 Give some examples of three dimensional flow.
31 Write the equation of Steady Flow Energy Equation (SFEE) and name the terms involved in it.
32 Fluid is flowing in a pipe at 3 m/s velocity and 0.050 m^3/s mass flow rate. Find the diameter of pipe.
33 The diameter of a pipe at section A and section B are 0.2 m and 0.3 m respectively. Determine the velocity at section B if the velocity of water flowing through the pipe at section A is 6 m/s.
34 Write the expression of Reynolds Number. And name every terms involved in it.

35 A fluid is flowing in a pipe of diameter 0.2 m with a velocity of 6 m/s. Calculate the discharge through the pipe.

36 By which methods the motion of fluid can be described. Explain them.

37 Enlist the types of fluid flow.

38 What is the difference between steady flow and unsteady flow?

39 Derive the equation of continuity.

40 A jet is impacted on a moving flat plate, held normal to the direction of jet. Derive the equation of force and work done.

41 Fluid is flowing in a pipe at 5 m/s velocity and 0.075 m^3/s mass flow rate. Find the diameter of pipe.

42 A jet is impacted on a moving inclined plate. Derive the equation of force and work done.

UNIT-4

Fluid Dynamics and Flow Measurement

1 Define Co-efficient of velocity (Cv).
2 Give classification of notches.
3 Write assumption of Euler's equation.
4 Explain principle of working of venturimeter with a neat sketch.
5 A rectangular orifice 2m wide and 1.5 m deep is discharging water from a tank. If the water level in tank is 4 m above the top edge of the orifice. Find discharge through the orifice. Take Cd =0.6.
6 Write advantages and disadvantages of Rota meter.
7 Find out discharge through 6 cm diameter orifice having 8 meter constant head. take Cd=0.6.
8 Define Co-efficient of discharge (Cd).
9 Write assumptions for Bernoulli's equation.
10 Give classification of Orifice.
11 Derive Euler's equation of motion along a stream line.
12 Explain principle of working of Pitot tube with a neat sketch.
13 A horizontal venturimeter with the inlet diameter 30cm and throat diameter 15 cm is used to measure the flow of water. The reading of differential manometer connected to the inlet and throat is 20 cm of mercury. Find the discharge of water through venturimeter. Take Cd =0.98.
14 Water flow over rectangular notch having length 60cm under head of 30cm.find discharge in lit/sec. Take Cd =0.65
15 Name commonly used flow measuring devices.
16 Define Co-efficient of contraction (Cc).
17 What are different types of Pitot tube?
18 Derive the equation of discharge measurement by orifice meter.
19 Enlist the selection criteria for flow measurement devices.
20 Discharge through rectangular notch is 24 m3/min. when head of water is one third of length of notch. Take Cd =0.62
21 A horizontal venturimeter with the inlet diameter 20cm and throat diameter 10 cm is used to measure the flow of water. The pressure at the inlet is 17.658 N/cm^2 and vacuum pressure at throat is 30 cm of mercury. Find the discharge of water through venturimeter. Take Cd =0.98.
22 Name the forces present in fluid flow.
23 What do you mean by fluid dynamic?
24 Write practical application of Bernoulli's equation
25 Define orifice meter and classified it.
26 Derive the equation for discharge over a rectangular notch.
27 A jet of water is issued from 40cm. dia sharp edge orifice under a constant head of 3m.
28 vertical and horizontal co-ordinates of a point on the jet measured from venacontracta are 40
29 cm and 200 cm respectively. Calculate co-efficient of velocity and discharge.
30 Water flow over rectangular notch having length 70cm under head of 40cm.find discharge in lit/sec.take Cd =0.68
31 Write Advantages of Rotameter.
32 List out different flow measuring devices.
33 What is coroillis co-efficient?

34 Give Classification of flow measuring devices.

35 A horizontal venturimeter 160mm×80mm used to measure the flow of an oil of sp. gravity of 0.8.determine the deflection of the oil mercury gauge, if the discharge of the oil is 50 lit/sec

36 Discharge through rectangular notch is 30 m3/min .when head of water is one third of length of notch. Calculate length of notch. Take Cd =0.65

37 Calculate theoretical discharge and actual discharge in lit./sec. through 6 cm diameter orifice under head of 8 m. Assume Cd =0.6.

UNIT-5

Flow through pipes & Hydro pneumatic elements and devices

1 Write the range of Reynolds's number for: laminar flow, turbulent flow and transition flow.
2 Write the advantages of Moody's chart.
3 Draw the symbols for: single acting cylinder with spring return and double acting cylinder.
4 Oil having specific gravity 0.7 and viscosity 0.1 Ns/m2flowing through 200mm diameter pipe. Rate of oil flow is 50lit/sec. find out Reynolds number and type of flow.
5 Explain Reynolds's experiment with neat sketch.
6 Find friction head loss in a pipe having diameter 150mm and length 400 m. flow of water through pipe is 35.4lit./sec. take f=0.01.
7 Explain the construction and working of hydraulic press with a neat sketch.
8 Which factors are responsible for water hammer?
9 Draw graph of critical velocity verses head loss.
10 Draw the symbols for: uni-directional pneumatic motor and oscillating motor.
11 Explain the construction and working of hydraulic ram with a neat sketch.
12 Find the head loss due to friction in a pipe of diameter 200 mm and length 50 m, through which water is flowing at a velocity of 4 m/s using Darcy formula. Take kinematic viscosity for the water 0.01 stoke.
13 A pipe line is 6 km long and having 20 cm diameter connected two reservoir A and B. The rate of discharge in pipe is 30 lit/sec. Find out difference in reservoir level if friction factor f=0.0008
14 Discuss types of flow.
15 Define Critical velocity.
16 What is FRL unit in pneumatic system?
17 Draw symbol for hydro pump and variable displacement pump.
18 Write a short note on Reynolds number.
19 Oil at a rate of 8 lit/sec is flowing in a pipe. Kinematic viscosity of oil is 9×10-6m2/s. what should be the diameter of pipe if the flow is to be controlled as laminar flow?
20 Find the head loss due to friction in a pipe of diameter 150 mm and length 400 m. flow of water through pipe is 35.4 lit/sec. Take f= 0.01
21 Oil having specific gravity 0.92 and viscosity 2 poise is flowing through 200mm diameter pipe. Rate of oil flow is 50lit/sec. find out Reynolds number and state type of flow.
22 Define Reynolds number.
23 Draw symbol for single acting cylinder return with spring and single acting cylinder return by external force.
24 What are the effects of water hammer?
25 Explain Reynolds's Experimental with neat sketch.
26 Discuss selection criteria for pipe and pipe size.
27 A pipe line is 8 km long and having 30 cm diameter connected two reservoir A and B, the rate of discharge in pipe is 40 lit/sec. find out difference in reservoir level if friction factor f-0.0008
28 An oil of viscosity 0.15 Ns/m^2 and specific gravity 0.81, flows through a pipe of 140mm diameter at a flow rate of 0.03 m3/sec. determine whether the flow is laminar or turbulent?

UNIT-6

Hydraulic Pumps & Prime Movers

1 Define the terms pump and pumping.
2 What is positive displacement pump and Rotodynamic pump?
3 Name the types of positive displacement pump.
4 Explain construction and working of centrifugal pump with a neat sketch.
5 Name the different types of centrifugal pumps according to their casing. Explain Vortex casing pump with a neat sketch.
6 Describe different heads of centrifugal pump with a neat sketch.
7 Explain Impeller in series and Impeller in parallel with a neat sketch.
8 Define Impeller. Name the types of impeller
9 Name the type of turbine having specific speed – 10 to 35 rpm and that having 300 to 1000 rpm.
10 Write the difference between positive displacement pump and Rotodynamic pump.
11 Explain construction and working of single acting reciprocating pump with a neat sketch.
12 Name the types of rotary positive displacement pumps. Explain gear pump with a neat sketch.
13 Explain various pump losses and efficiencies of pump.
14 Describe various heads of reciprocating pump.
15 Give some applications of pump.
16 Write the equation of power required to drive the centrifugal pump and name each terms with their units.
17 Draw a neat sketch of impellers in series for multistage pump.
18 Explain the methods of priming.
19 Differentiate between centrifugal pump and reciprocating pump.
20 Differentiate between Impulse turbine and Reaction turbine.
21 Classify the turbines according to the direction of flow through vanes. Explain each with a neat sketch.
22 Draw a neat sketch of impellers in parallel for multistage pump.
23 Write the applications of vacuum pump.
24 Draw the characteristic curve of discharge v/s speed and head v/s speed for centrifugal pump.
25 Explain construction and working of Pelton wheel turbine with a neat sketch.
26 Write the names and use of different types of draft tubes and draw neat sketch of each.
27 Write the functions of draft tube in turbine
28 Describe various heads of prime movers.
29 Draw the characteristic curve of head v/s discharge and efficiency v/s discharge for centrifugal pump.
30 Draw the operating characteristic curve showing head, efficiency and power against discharge on a single plot.
31 Define draft tube used in turbine and name different types of draft tube.
32 Give the equation of specific speed for turbine and name the terms involved in it.
33 Give the equation of specific speed for pump and name the terms involved in it.
34 Give advantages and disadvantages of Pelton wheel turbine.
35 Give advantages and disadvantages of Francis turbine.
36 Give advantages and disadvantages of Kaplan turbine.

37 Give difference between Francis turbine and Kaplan turbine.
38 Write short note on various efficiencies of prime movers.
39 Write points to be considered during maintenance of turbine.
40 How can you differentiate positive displacement pump with Rotodynamic pump?
41 Write the classification of hydraulic turbines/prime movers.
42 How draft tube is useful in turbine?
43 Why priming is needed in centrifugal pump?
44 How can you differentiate Impeller in series and Impeller in parallel? Explain with a neat sketch.
45 Discuss about impellers in parallel for multistage pump with a neat sketch.
46 Write points to be considered during maintenance of turbine.
47 Explain the concept of Impulse turbine and Reaction turbine.