Q.1 Define fluid? What is the difference between gas & liquid?

Ans: Any substance which has the tendency of flow is called fluid.

'OR'

A fluid is a substance that deforms continuously in the face of tangential or shear stress, irrespective of the magnitude of shear stress.

Difference between gas and liquid:

A liquid is a nearly incompressible fluid that conforms to the shape of its container but retains a constant volume independent of pressure. It is one of the fundamental state of matter and is the only state with a definite volume but no fixed shape.
e.g. water, oil, mercury, Honey etc.

A pure gas may be made up of individual atoms, elemental molecules made from one types of atom or compound molecules made from variety of atoms.
A gas is a fluid, which is compressible and possesses no definite volume but always expand until its volume is equal to that of the container.

Imp. **Q.2 Define the following properties:**
<a> Density <b> Weight density <c> Specific volume
<d> Specific gravity.

Ans:
<a> Density (ρ): It is defined as mass per unit volume. It is denoted by symbol 'ρ'

Density, $\boxed{\rho = \frac{\text{Mass}}{\text{Volume}}}$, unit: kg/m^3, gm/cm^3 & gm/cc

b) Weight Density (w):
It is defined as weight per unit volume.

$$w = \frac{\text{weight of fluid}}{\text{volume of fluid}} = \frac{m \cdot g}{V} = \rho \cdot g \quad [\because \rho = \frac{m}{V}]$$

$\boxed{w = \rho \cdot g}$, Unit N/m3

c) Specific volume (v): It is defined as volume per unit mass.
It is reciprocal of mass density.

$$v = \frac{\text{Volume }(V)}{\text{mass }(m)}$$

$\boxed{v = \frac{1}{\rho}}$ $\quad [\because \rho = \frac{m}{V}]$

Unit m³/kg

d) Specific gravity (S): It is defined as density of fluid w.r.t. density of standard fluid.

$$S = \frac{\text{Density of fluid}}{\text{Density of standard fluid}}$$

$\boxed{S = \frac{\rho}{\rho_{std}}}$

* For liquid, standard fluid is water [at 4°c, 1 atm, $\rho_w = 1000$ kg/m³]
* For gases, standard fluid is 'air'.

Imp. Q.3 What is the difference between dynamic viscosity and kinematic viscosity?

Ans:
① Dynamic viscosity:- when viscosity of fluid is studied w.r.t. force, it is called dynamic viscosity.

When the fluid flows, two adjacent layers of the fluid resist the motion of each other such a fundamental property of the fluid is known as viscosity or dynamic viscosity.
It is also defined as the shear stress required to produce unit rate of shear strain. The unit of viscosity is 'poise' in CGS.

$\boxed{\frac{gm}{cm\text{-}s} = 1 \text{ poise} = 0.1 \frac{N\text{-}s}{m^2}}$

Kinematic viscosity:- when viscosity of fluid is studied w.r.t motion of fluid, it is called kinematic viscosity.
→ It depends upon density & absolute viscosity of fluid.
→ Kinematic viscosity is defined as the ratio of dynamic viscosity to the density.

$$\nu = \frac{\text{Dynamic viscosity}}{\text{Density}}$$

$\boxed{\nu = \frac{\mu}{\rho}}$

The unit of kinematic viscosity is 'stoke' in CGS. The S.I unit is m²/s.

$\boxed{1 \text{ cm}^2/s = 10^{-4} \text{ m}^2/s = 1 \text{ stoke}}$

Q.4 Calculate the density, sp. weight & weight of one litre of petrol of specific gravity = 0.7.

Sol: Given volume = 1 litre = $\frac{1}{1000}$ m3 = 0.001 m³
sp. gravity, S = 0.7

Density: $\because S = \frac{\rho}{\rho_{std}} \Rightarrow \rho = S \times \rho_{std}$

$\rho = 0.7 \times 1000$

$\boxed{\rho = 700\ Kg/m^3}$

Sp. weight $\because w = \rho . g$

$w = 700 \times 9.81$ $\quad [\because \rho = 700\ Kg/m^3]$

$\boxed{w = 6867\ N/m^3}$ Ans

weight $\because$ Sp. weight $= \frac{weight}{Volume}$

$\therefore$ weight $=$ Sp. wt $\times$ volume

$= 6867 \times 0.001$

$\boxed{weight = 6.867\ N}$ Ans

Q.5 Calculate the specific weight, density & sp. gravity of one liter of a liquid which weighs 7N.

Sol' Given: volume $= 1$ litre $= 0.001\ m^3$

weight $= 7N$

Sp. weight: $w = \frac{wt}{Volume} = \frac{7}{0.001} = 7000\ N/m^3$ Ans

$\because w = \rho . g$

$\therefore \rho = \frac{w}{g} = \frac{7000}{9.81} = 713.5\ Kg/m^3$ Ans

Sp. gravity $S = \frac{\rho}{\rho_{std}}$

$= \frac{713.5}{1000}$ $\quad [\because \rho_{std} = 1000$ for liq.$]$

$\boxed{S = 0.7135}$ Ans

Q.6 Define Pressure. What do you understand by atmospheric pressure?

Ans: Pressure is defined as normal force per unit area. It is a scalar quantity.

$\boxed{P = \frac{F}{A}}$

Unit of pressure : N/m^2 [Pascal]

$1\ Pa = 1\ N/m^2$

& $\boxed{1\ N/mm^2 = 1\ MPa}$

Other units: → Bar $(1\ bar = 10^5 Pa = 10^5 N/m^2)$

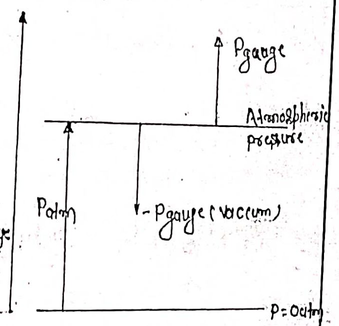
→ Atm $(1\ atm = 101325\ Pa = 101.325\ KPa)$

Atmospheric Pressure :- Also known as barometric pressure, is the pressure within the atmosphere of earth. The standard atmosph (atm) is a unit of pressure defined as 101325 Pa, which is equiva to 760 mm of Hg.

Q.7 What is the difference between gauge pressure and absolute pressure?

Ans: Gauge pressure is the pressure relative to atmospheric pressure. Gauge pressure is positive for pressure above the atm pressure and negative for below it.

$\boxed{P_{abs} = P_{atm} + P_{gauge}}$



Absolute pressure is the sum of gauge pressure and atmospheric pressure

Absolute pressure = Atm. Pressure + Gauge Pressure

$$\boxed{P_{abs} = P_{atm} + P_{gauge}}$$

V. Imp.

Q.8 What are Newtonian and Non-Newtonian fluids?

Ans: Newtonian fluid are those which obey Newton's law of viscosity. These fluids have a linear relationship between viscosity and shear stress.

eg. water, Petrol, Mineral oil etc.

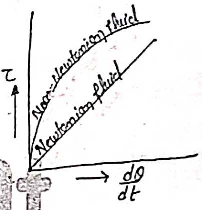
Non-Newtonian fluid are those which do not follow Newton's law of viscosity.

e.g. paint, glue, blood etc.

$$\boxed{\tau = \mu \frac{d\theta}{dt}}$$

or

$$\boxed{\tau = \mu \frac{du}{dy}}$$



V. Imp.

Q.9 State Newton's law of viscosity.

Ans: According to Newton's law of viscosity - "shear stress between the layers of fluid is directly proportional to rate of shear deformation."

Mathematically, $\boxed{\tau \propto \frac{d\theta}{dt}}$

or $\tau \propto \frac{du}{dy}$ $\quad [\because \frac{d\theta}{dt} = \frac{du}{dy}]$

$$\boxed{\tau = \mu \frac{du}{dy}}$$

where μ is proportionality constant, which is known as viscosity or dynamic viscosity, and it is a property of fluid.

Q.10 Differentiate between Real & ideal fluids?

Ans: An ideal fluid has no viscosity and surface tension. It is incompressible. However such fluid does not exist in nature and thus the concept of ideal fluid is imaginary.

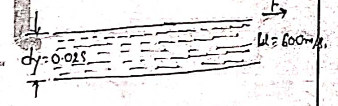
Real fluid is one which possesses viscosity and surface tension. It is compressible and can be seen in nature.

All the fluids, in actual practice, are real fluids.

e.g: water, kerosene, petrol etc.

Q.11: Plate 0.025 mm distance from a fixed plate, move at 60 cm/sec and requires a force of 2 N/m2 to maintain its speed. Determine the fluid viscosity between the plates.

Sol^n: Given:



$dy = 0.025\,mm$

$= 0.025 \times 10^{-3}\,m$

Velocity, $u = 60\,cm/s = 0.6\,m/s$

& $F = 2\,N/m^2$

Let the fluid viscosity between the plates is μ

∵ we know, $\tau = \mu \frac{du}{dy}$ [Newton's law of viscosity]

$\Rightarrow 2 = \mu \frac{0.60}{0.025 \times 10^{-3}} \Rightarrow \mu = \frac{2 \times 0.025 \times 10^{-3}}{0.60}$

$\Rightarrow \boxed{\mu = 8.33 \times 10^{-5}\ \frac{N\text{-}s}{m^2}}$ Ans.

or $\mu = 8.33 \times 10^{-5} \times 10$ poise

$\boxed{\mu = 8.33 \times 10^{-4}\ \text{poise}}$ Ans

Q.12 State Pascal's law and give examples where it is applied.

Ans: – In a fluid at rest, the intensity of pressure is same in all directions.

In other words, when a certain pressure is applied in a fluid at rest, the pressure is equally transmitted in all the directions.

Examples where Pascal's law is applied:-

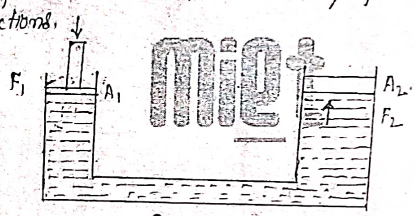
<i> Hydraulic Press <ii> Hydraulic Jack

<iii> Hydraulic Brakes <iv> Hydraulic pumps. <v> Hydraulic lift.

V. Imp.

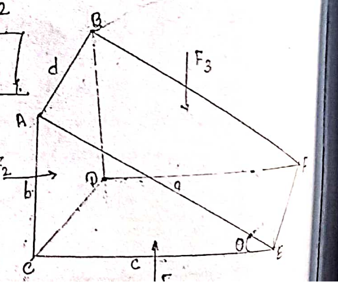
Q.13 State and prove Pascal's law:.

Ans: If a fluid is at rest, the intensity of pressure is same in all directions.



According to Pascal's law $P_1 = P_2$

$\boxed{\frac{F_1}{A_1} = \frac{F_2}{A_2}}$



Let ad, bd and cd be the area of ABFE, ABDC, CDFE respectively.

Let P_1, P_2 and P_3 be the pressures on ABFE, ABDC and CDFE.

$\therefore F_1 = P_1 \times$ Area of ABFE $= P_1 \cdot ad$.

$F_2 = P_2 \times$ Area of ABDC $= P_2 \cdot bd$

$F_3 = P_3 \times$ Area of CDFE $= P_3 \cdot cd$

Also, $\sin\theta = \frac{b}{a}$ & $\cos\theta = \frac{c}{a}$

The net force the prism will be zero since the prism is in equilibrium

$F_1 \sin\theta = F_2$

$F_1 \cos\theta = F_3$

$P_1 ad \frac{b}{a} = P_2 \cdot bd$ —— (1)

$P_1 ad \frac{c}{a} = P_3 \cdot cd$ —— (2)

from eqn (1) & (2)

$P_1 = P_2$ & $P_1 = P_3$

$\therefore \boxed{P_1 = P_2 = P_3}$ H.P

Q.14 Hydraulic press has the ram of 30cm diameter and a plunger of 4.5cm diameter. Find the weight lifted by the hydraulic press when the force applied at the plunger is 500N.

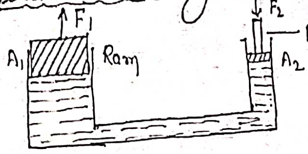
Soln:

$D_1 = 30cm$

$D_2 = 4.5cm$

$F_2 = 500N$

$F_1 = ?$



According to pascal's law

$\frac{F_1}{A_1} = \frac{F_2}{A_2}$, $F_1 = \frac{F_2}{A_2} \times A_1 \Rightarrow F_1 = \frac{500}{\frac{\pi}{4}(0.045)^2} \times \frac{\pi}{4}(0.3)^2$

$\boxed{F_1 = 22.222\ KN}$ Ans

Q.15 Hydraulic press has a ram of 20cm diameter and a plunger of 3cm diameter. It is used for lifting a weight of 30KN. Find the force required at the plunger.

Soln Given: Dia of Ram, $D = 20cm = 0.20m$

$\therefore$ Area of Ram, $A_1 = \frac{\pi}{4} D^2$

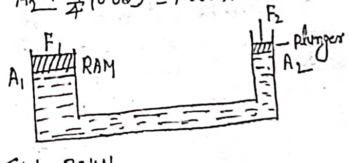
$A_1 = \frac{\pi}{4}(0.2)^2 = 0.0314\ m^2$

& Dia of plunger, $d = 3cm = 0.03m$

$\therefore$ Area of plunger, $A_2 = \frac{\pi}{4} d^2$

$A_2 = \frac{\pi}{4}(0.03)^2 = 7.068 \times 10^{-4}\ m^2$

By using pascal's law



$\frac{F_1}{A_1} = \frac{F_2}{A_2}$

$F_2 = \frac{F_1}{A_1} \times A_2$

$= \frac{30000 \times 7.068 \times 10^{-4}}{0.0314}$ [W = 30KN = 30,000N]

$\boxed{F_2 = 675.2\ N}$ Ans

Q.16 What is conservation of mass principle?

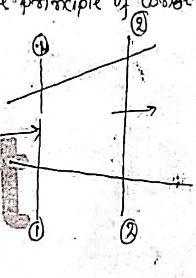
Ans: Conservation of mass principle states that the quantity of fluid per second is constant at all the cross-sections through the pipe.

$$\boxed{A_1 V_1 = A_2 V_2}$$

V. Imp

Q.17 Write the continuity equation for incompressible & compressible fluids.

Ans: Continuity equation is based on the principle of conservation of mass.



Let V_1 = Avg. velocity at section 1-1

ρ_1 = density at section 1-1

A_1 = Area of pipe at section 1-1

& V_2, ρ_2, A_2 are corresponding values at section 2-2

∴ Rate of flow at section 1-1 = $\rho_1 A_1 V_1$

& Rate of flow at section 2-2 = $\rho_2 A_2 V_2$

According to law of conservation of mass-

Rate of flow at section 1 - 1 = Rate of flow at sec 2 - 2

$$\boxed{Q = \rho_1 A_1 V_1 = \rho_2 A_2 V_2 = \text{Constant}}$$

This equation is called as Continuity Equation.

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This continuity equation is applicable for the compressible as well as incompressible fluids.

If the fluid is incompressible then $\boxed{\rho_1 = \rho_2}$ then continuity equation becomes

$$\boxed{A_1 V_1 = A_2 V_2 = \text{constant}}$$

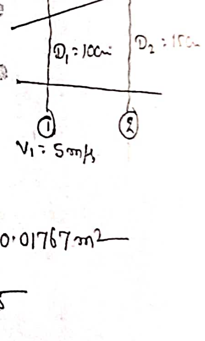
Q.18 The diameter of pipe at a section 1 & 2 are 10cm and 15cm respectively. Find the discharge through the pipe if the velocity of water flowing through a pipe at section 1 is 5m/s. Also determine the velocity at section-2.

Soln. Given: $D_1 = 10cm = 0.1m$

$A_1 = \frac{\pi}{4} D_1^2 = \frac{\pi}{4}(0.1)^2$

$A_1 = 0.007854 \ m^2$

$V_1 = 5m/s$



& At section-2,

$D_2 = 15cm = 0.15m$

$A_2 = \frac{\pi}{4}(D_2)^2 = \frac{\pi}{4}(0.15)^2 = 0.01767 \ m^2$

<i> Discharge: $Q = A_1 V_1 = 0.007854 \times 5$

$$\boxed{Q = 0.03927 \ m^3/s}$$

<ii> Velocity; using continuity equation $A_1 V_1 = A_2 V_2$

$$V_2 = \frac{A_1 V_1}{A_2} = \frac{0.007854}{0.01767} \times 5 = 2.22 \ m/s \ \text{Ans}$$

Q.19 30cm diameter pipe conveying water, branches into two pipes of diameter 20cm & 15cm respectively. If the average velocity in the 30cm diameter pipe is 2.5 m/s. Find the discharge in this pipe. Also determine the velocity in 15cm pipe if the average velocity in 20cm diameter pipe is 2m/s.

Sol: Given $D_1 = 30cm = 0.3m$

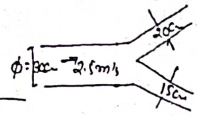
$A_1 = \frac{\pi}{4}(0.3)^2 = 0.07068\ m^2$

$V_1 = 2.5\ m/s$

$D_2 = 20cm = 0.2m$

$A_2 = \frac{\pi}{4}(0.2)^2 = 0.0314\ m^2$

$V_2 = 2\ m/s$



& $D_3 = 15cm = 0.15m$

$A_3 = \frac{\pi}{4}(0.15)^2 = 0.01767\ m^2$

i) Discharge Q_1 in pipe-1

$Q_1 = A_1V_1 = 0.07068 \times 2.5$

$\boxed{Q_1 = 0.1767\ m^3/s}$ Ans

ii) Velocity, V_3: According to continuity equation

$Q_1 = Q_2 + Q_3$

$0.1767 = 0.0628 + Q_3$

$\Rightarrow Q_3 = 0.1139\ m^3/s$

$Q_3 = A_3V_3 \Rightarrow V_3 = \frac{Q_3}{A_3}$

$\boxed{V_3 = 6.44\ m/s}$ Ans

V. Imp.

Q.22 What are hydraulic turbines? How are they classified? Write their advantages and disadvantages?

Ans. The hydraulic machines which convert hydraulic energy into mechanical energy are called as hydraulic turbines.

Classification of hydraulic turbines:

1) According to the type of energy at inlet:
 a) Impulse turbine b) Reaction turbine.

2) According to the direction of flow through Runner:
 a) Tangential flow turbine i.e. Pelton turbine
 b) Radial flow turbine i.e. Francis turbine
 c) Axial flow turbine i.e. Kaplan turbine
 d) Mixed flow turbine i.e. Modern Francis turbine

3) According to the head at the inlet of turbine.
 a) High head turbine i.e. Pelton turbine
 b) Medium head turbine i.e. Francis turbine
 c) Low head turbine i.e. Pelton turbine.

4) According to the specific speed of turbine:
 a) High sp. speed turbine
 b) Medium sp. speed turbine
 c) Low sp. speed turbine.

5) According to position of shaft of turbine:
- a) Horizontal shaft turbine
- b) vertical shaft turbine

6) According to name of originator.
- a) Pelton turbine
- b) Francis turbine
- c) Kaplan turbine

Advantages of Hydraulic turbine

1) The running cost of hydraulic turbine is less as compared to other turbines.
2) The environment pollution is negligible.
3) This is easy to maintain.
4) This turbine having high efficiency.
5) This is a renewable energy source.

Disadvantages:

1) The installation or initial cost is very high.
2) It can be develop at only a few sites where the proper amount of water is available.
3) Flood risk.

Imp

Q.23 Differentiate between impulse and reaction turbines.

Ans: If at the inlet of the turbine, the energy available is only kinetic energy, the turbine is known as impulse turbine. As the water flows over the vanes, the pressure is atmospheric from inlet to outlet of the turbine. eg: Pelton turbine.

And if at the inlet of the turbine, the water possesses kinetic energy as well as pressure energy, the turbine is known as reaction turbine. eg: Francis turbine, Kaplan turbine.

In reaction turbine, the casing and runner are always full of water.

Imp

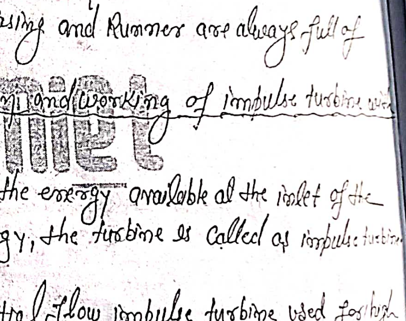
Q.24 Explain the construction and working of impulse turbine with neat sketch.

Ans: Impulse turbine: If the energy available at the inlet of the turbine is only kinetic energy, the turbine is called as impulse turbine. eg. Pelton turbine.

Pelton turbine is a tangential flow impulse turbine used for high head.

The main parts of impulse (Pelton) turbine are:

1) Nozzle & Flow regulating device
2) Runner & Buckets
3) Casing.



1) **Nozzle & flow Regulating device** : It is provided to convert the pressure energy into kinetic energy in the form of a jet and it also regulate the quantity of water according to the load on turbine.

2) **Runner** : A wheel of the turbine consist of series of blades/ buckets/vanes mounted on its periphery. The buckets of runner are made of cast iron, cast steel, Bronze or stainless steel (SS) depending upon the head at the inlet of the turbine.

3) **Casing**: It is used to avoid accident and prevents the splashing of water. It does not perform any hydraulic function. It is made of cast iron or fabricated steel plates.

Working:

Water coming from penstock pipe is passed through the nozzle which converts the pressure energy of water into kinetic energy in the form of a jet.

This jet strikes the vanes/bucket of runners and strike same forces due to which vane moves [∵ $W = F \times D$]

After striking, the water goes into sump level or tail race.

→ The pressure throughout the turbine from inlet to outlet is atmosphere in case of impulse turbine.

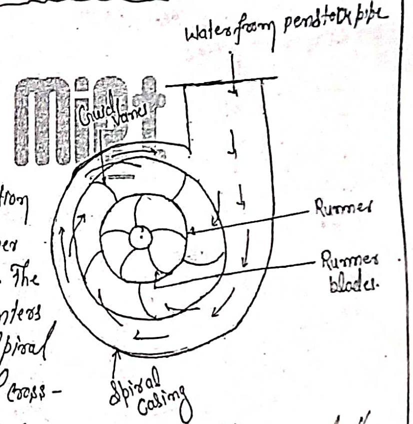
V. Imp

Q.24 Explain the construction and working of reaction turbine with neat sketch.

Ans. Reaction turbine means that the water at the inlet of the turbine possesses kinetic energy as well as pressure energy. As the water flows through the runner, a part of pressure energy goes on changing into kinetic energy. Thus the water through the runner is under pressure. The runner is completely enclosed in an air-tight casing and the runner is always full of water.

The main parts of a reaction turbine are:

1) Casing
2) Guide mechanism
3) Runner &
4) Draft tube.



1) **Casing** : In case of reaction turbine, casing and runner are always full of water. The water from penstock enters the casing which is of spiral shape in which area of cross-section of casing goes on decreasing gradually. The casing completely surrounds the runner of the turbine. The water enters the runner at constant velocity throughout the circumference of the runner.

2) Guide mechanism: It Consist of a Stationary circular wheel all around the runner of the turbine. The Stationary guide vanes are fixed on the guide wheel. The guide vanes allows the water to strike the vanes fixed on the runner without shock at inlet. Also by suitable arrangement, the width between two adjacent vanes of guide wheel can be altered so that the amount of water striking the runner can be varied.

3) Runners: It is a circular wheel on which a series of radial curved vanes are fixed. The surfaces of vanes are made very smooth and are so shaped that the water enters & leaves the runner without shock.

4) Draft tube: The pressure at the exit of turbine is generally less than the atmospheric pressure. The water at exit cannot be directly discharge to the tail race. A tube or pipe of gradually increasing area is used for discharging the water from outlet of the turbine to the tail race. This tube of increasing area is called as draft tube.

Q.25 What are hydraulic pump? Enlist the various types of pumps.

Ans: The hydraulic machines which convert the mechanical energy into hydraulic energy are called as pump. The hydraulic energy is in the form of pressure energy. → The hydraulic energy achieved from the pump

Classification of pump: – There exist a wide variety of pumps that are designed for various specific applications. However, most of them can be broadly classified into two categories as mentioned below:

1) Dynamic Pressure pumps.
2) positive displacement pumps.

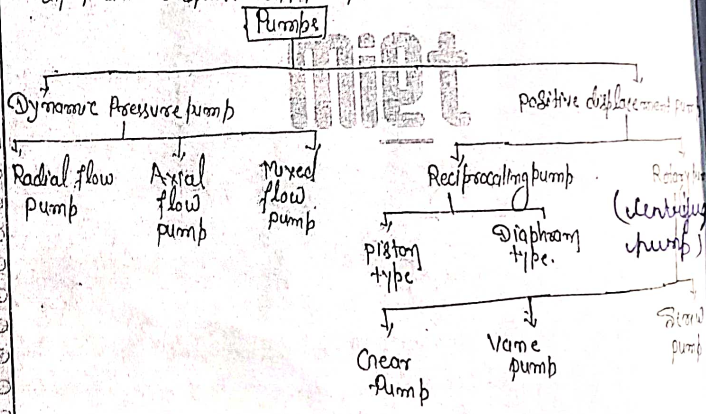


fig. Classification of pump.

Imp'

Q.26 Explain the Construction and working of centrifugal pump with neat sketch.

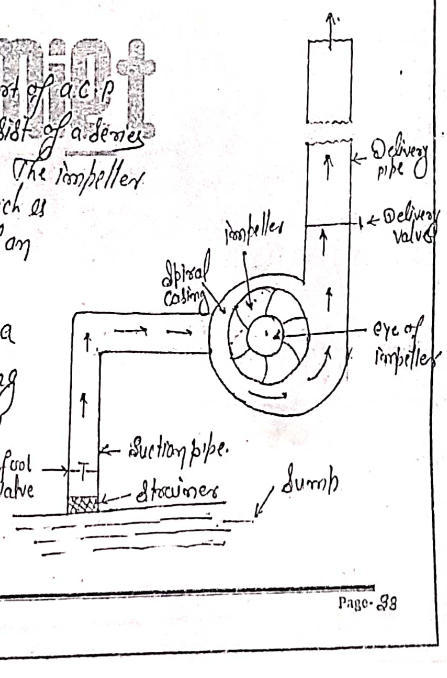
Ans: A centrifugal pump is a mechanical device which works on the principle principal of forced vortex flow which means that when a certain mass of liquid is rotated by an external torque ~~[the rise in pressure head of the rotating liquid takes place.]~~ it will experience centrifugal force, which radially outward the fluid is sucked axially. from the sump

The main parts of a centrifugal pump are:

1) Impeller.
2) Casing
3) Suction pipe with foot valve & Strainer
4) Delivery pipe.

1) Impeller: The rotating part of a c.p. is called impeller. It consist of a series of backward curved vanes. The impeller is mounted on a shaft which is connected to the shaft of an electric motor.

2) Casing: The casing of a c.p. is similar to the casing of reaction turbine. It is an air-tight passage surrounding the impeller & is designed in such a way that the



Kinetic energy of the water discharged at the outlet of the impeller is converted into pressure energy before the water leaves the casing & enters the delivery pipe.

The following three types of casing are commonly used:

a) volute b) vortex (c) casing with guide blades

3) Suction pipe with foot valve & strainer: A pipe whose one end is connected to the inlet of the pump & other end dips into water in a sump is known as suction pipe. The foot valve is a non-return valve & opens only in upward direction. A strainer is also fitted at the lower end of suction pipe, to remove particles from water.

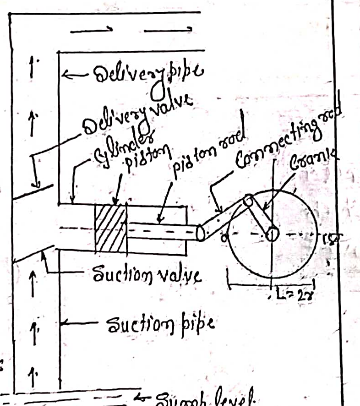
4) Delivery pipe: A pipe whose one end is connected to the outlet of the pump & other end delivers the water at the required hight is known as delivery pipe.

V. Imp.

Q.27 Explain the Construction and working of reciprocating pump with neat sketch.

Ans. The main components of a reciprocating pump are:

1) Cylinder
2) piston & piston rod
3) Crank & Connecting rod
4) Suction pipe
5) Suction valve
6) Delivery pipe
7) Delivery valve.



Working: when the power supply is given to the reciprocating pump, the crank rotates through an electric motor.

A partial vaccum in the cylinder takes place when the piston moves from extreme left to the extreme right ($\theta = 0$ to $180°$) and that makes the liquid enter into the suction pipe.

There is due to presence of atmospheric pressure on the sump liquid which is quite less than the pressure inside the cylinder. Therefore due to difference in the pressure, the water enters into the cylinder through a non-return valve.

when piston moves from extreme left, the pressure increases inside the cylinders which is greater than the atmospheric pressure [$\theta = 180°$ to $360°$]. This results in the opening of the delivery valve & closing the suction valve.

LECTURE - 29

→ Hydraulic accumator is an intermittent device which is used for storing energy and supplied it when required.

→ Hydraulic lift work on the principle of pascal's law.

→ Hydraulic lift / Crane uses accumulator to supply the additional energy when required.

→ when the lift / Crane moves upward, they require large amount of energy, which is supplied by accumulator.

→ And, when lift / Crane moves downwards, they do not require energy due to gravity factor. At this time the energy is stored in the accumulator.

Imp.

Q.29 With the help of neat sketch, explain the working of hydraulic lift.

Ans:- Hydraulic lift is a device used for carrying passengers & goods from one floor to another in multistoried building to raise heavy objects. It works on the principle of Pascal's Law.
The hydraulic lifts are of two types.

1) Direct acting hydraulic lift
2) Suspended hydraulic lift

1) Direct acting hydraulic lift:

It consist of ram, sliding in the fixed cylinder. At the top of sliding Ram, a cage is fitted, on which the person may be stand or goods may be placed.
The liquid under pressure flows into a fixed cylinder. The liquid exerts force on sliding Ram, which moves vertically up & thus raises the cage to the required height.

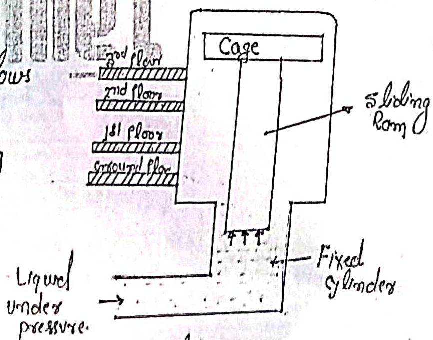
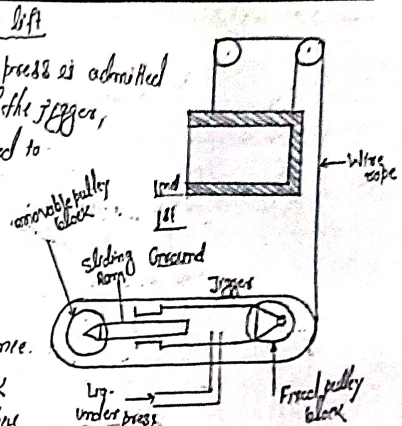


fig.

2) Suspended Hydraulic lift

When water under high press is admitted into the fixed cylinder of the jigger, the sliding ram is forced to move towards left.
As one of the end of the sliding ram is connected to the movable pulley block, Hence the movable pulley block moves towards left, thus increasing the distance between two pulley blocks.

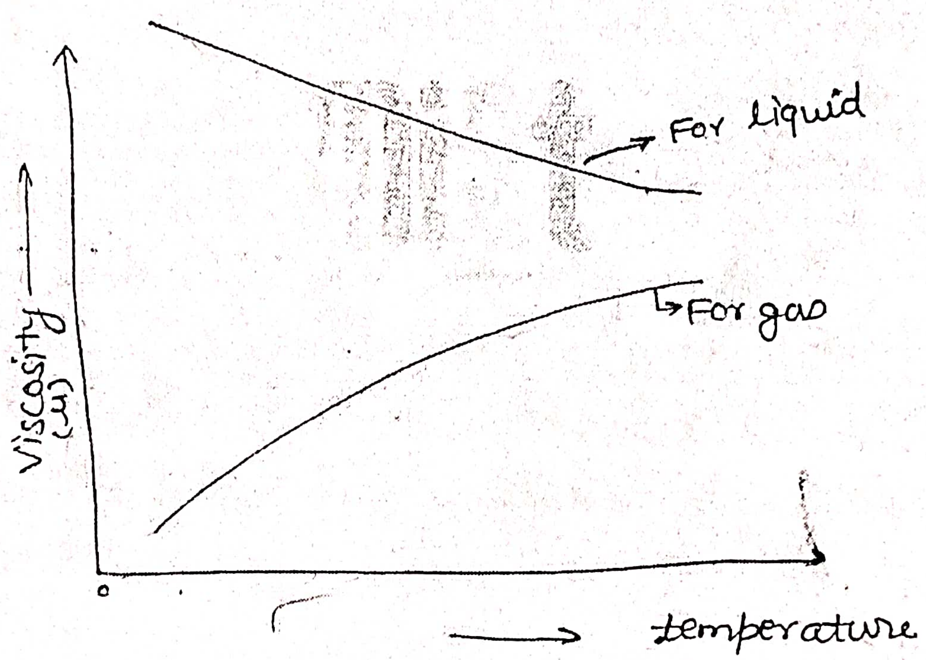


The wire rope connected to cage is pulled & the case is lifted.
For lowering the cage, water from fixed cylinder is taken out. The sliding ram moves towards right and hence movable pulley block also moves towards right. This decrease the distance between two pulley block and cage is lowered due to increased length of the rope.

Effect of temperature on viscosity:-

- In liquid viscosity is decreas as increasing the temperature of the liquid because the cohesive force decreases.

- In gases viscosity is increas as increasing the temperature of the gases. because momentum exchange.



5 Years AKTU University Examination Questions		Unit-4	
S. No	Questions	Session	Lecture No
1	Define fluid and what is difference between gas and liquid?		
2	Define the following fluid properties: Density, weight density, Specific volume and specific gravity of a Fluid.		
3	What is the difference between dynamic viscosity and kinematic viscosity? State their units of measurement.		
4	Calculate the density, specific weight and weight of one liter of petrol of specific gravity = 0.7		
5	Define pressure. What do you understand by atmospheric pressure?		
6	Calculate the specific weight, density and specific gravity of one liter of a liquid which weights 7 Newton.		
7	What is the difference between gauge pressure and absolute pressure?		
8	Convert the following readings of pressure to kPa assuming that barometer reads 760 mm of Hg. a. 80 cm of Hg b. 30 cm Hg vacuum c. 1.35 m H_2O gauge d. 4.2 bar		
9	What are Newtonian and non-Newtonian fluids?	2020-21	
10	State the Newton's law of viscosity.		
11	Differentiate between Real and Ideal fluids.		
12	Plate 0.025 mm distance from a fixed plate, move at 60 cm/second and requires a force of 2 Newton per unit area (2 N/m^2) to maintain this is speed determines the fluid viscosity between the plates.		
13	State Pascal's law and give examples where it is applied.	2020-21	
14	Hydraulic press has the ram of 30 cm diameter and a plunger of 4.5 cm diameter. Find the weight lifted by the hydraulic press when the force applied at the plunger is 500 N.		
15	Hydraulic press has a ram of 20 cm diameter and a plunger of 3 cm diameter. It is used for lifting a weight of 30 N. Find the force required at the plunger.		
16	What is conservation of mass principle?		
17	Write the continuity equation for incompressible and compressible fluids.		
18	The diameter of a pipe at a section 1 and 2 are 10 cm and 15 cm, respectively. Find the discharge through the pipe if the velocity of water flowing through a the pipe at section 1 is 5 m/s. Determine also the velocity at section 2		
19	30 cm diameter pipe conveying water, branches into two pipe of diameter 20 cm and 15 cm respectively. If the average velocity in		

	the 30 cm diameter pipe is 2.5 m/s, find the discharge in this pipe. Also determine the velocity in 15 cm pipe if the average velocity in 20 cm diameter pipe is 2 m/s.		
20	What are hydraulic turbines? How are they classified? Write their advantages and disadvantages?	2020-21	
21	Write the classification of the hydraulic turbines.		
22	Differentiate between impulse and reaction turbines.		
23	Explain the construction and working of impulse (Pelton) turbine with neat sketch.		
24	Explain the construction and working of reaction(Francis) turbine with neat sketch.		
25	What are hydraulic pump? Enlist the various types of pumps.	2020-21	
26	Write the classification of the pumps.		
27	Explain the construction and working of centrifugal pump with neat sketch.		
28	Explain the construction and working of reciprocating pump with neat sketch.		
29	Differentiate between centrifugal and reciprocating pump.		
30	With the help of neat sketch, the working of hydraulic lift.		