

REVISION 2021  
(3051)

# FUNDAMENTALS OF FLUID MECHANICS

CO 03

Prepared by  
Akhilesh T

Lecturer in Automobile Engg. Dept.  
Malabar polytechnic college, Kottakkal

## COURSE OUTCOMES - 3 :

Select the working, construction and performance of pumps.

# QUESTION PAPER PATTERN

**Total Marks: 75**

**Time: 3 Hrs**

**Part A (9 Marks)**

- 1 mark x 9 Questions

**Part B (24 Marks)**

- 3 marks x 8 Questions

**Part C (42 Marks)**

- 7 marks x 6 Questions

**A6. Name of valve we used in the suction pipe of a centrifugal pump**

**Ans. Foot valve**

**A7. The difference between theoretical discharge and the actual discharge of a reciprocating pump is known as .....**

- Ans. slip of the pump

# B6. What is meant by cavitation in centrifugal pumps

## Cavitation

- ❖ In pumps if the pressure of fluid flow reduces to vapour pressure, the liquid boils and small bubbles of vapour form in large numbers.
- ❖ These bubbles travel along the flow until a region of high pressure is reached. At this state, the bubbles suddenly collapse with a tremendous shock on the adjacent walls.
- ❖ This phenomenon is called cavitation.
- ❖ Due to cavitation The metallic surfaces are damaged and cavities are formed on the surfaces.

## B7. What is priming in centrifugal pumps?

### Priming in centrifugal pumps

- ❖ Priming is filling of casing and suction pipe of the pump with water.
- ❖ It is done to remove entrapped air in the pump.
- ❖ If air is present sufficient pressure cannot be developed.
- ❖ Pressure generated by the impeller is directly proportional to the density of fluid.
- ❖ If impeller is run in air, negligible pressure is generated because of low density of air and hence no water will be lifted by the pump.
- ❖ Hence, it is very much essential to remove air from suction pipe and casing. This is called priming.

## C5. Which are the different heads and efficiencies of centrifugal pump?

- 1. Suction Head (◆◆◆◆)
- It is the vertical height of the centre line of the centrifugal pump above the water surface in the tank.
- 2. Delivery Head (◆◆◆◆)
- The vertical distance between the centre line of the pump and the water surface in the tank to which water is delivered.
- 3. Static Head (◆◆◆◆)
- The sum of suction head and delivery head is known as static head. ◆◆◆◆ =  $h_{\text{◆◆◆◆}} + h_{\text{◆◆◆◆}}$
- 4. Manometric Head ( )
- Difference between static head and loss of head in pumps
- ◆◆◆◆ = Head imparted by the impeller to the water — Loss of head in the pump
- = ◆◆◆◆ -  $h_{\text{◆◆◆◆}}$



- 5. Efficiencies of a Centrifugal Pump

- (a) Manometric Efficiency (◆◆)  $\eta_{man}$

- The ratio of the manometric head to the head imparted by the impeller to the water.

$$\eta_{man} = \frac{\text{Manometric head}}{\text{Head imparted by impeller to water}}$$

- (b) Mechanical Efficiency ( )

- The ratio of the power available at the impeller to the power at the shaft of the centrifugal pump

$$\eta_m = \frac{\text{Power at the impeller}}{\text{Power at the shaft}}$$

- (c) Overall Efficiency (◆◆◆◆)

- It is defined as ratio of power output of the pump to the power input to the pump.

$$\eta_{\sigma} = \eta_{man} \eta_m$$

## C6. Explain with neat sketch the working of centrifugal

### Centrifugal pump

- A Centrifugal pump is a mechanical machine that pumps the fluids by converting the mechanical power into the pressure energy of the fluid flow.

- A centrifugal pump uses a centrifugal force to pump the fluids.

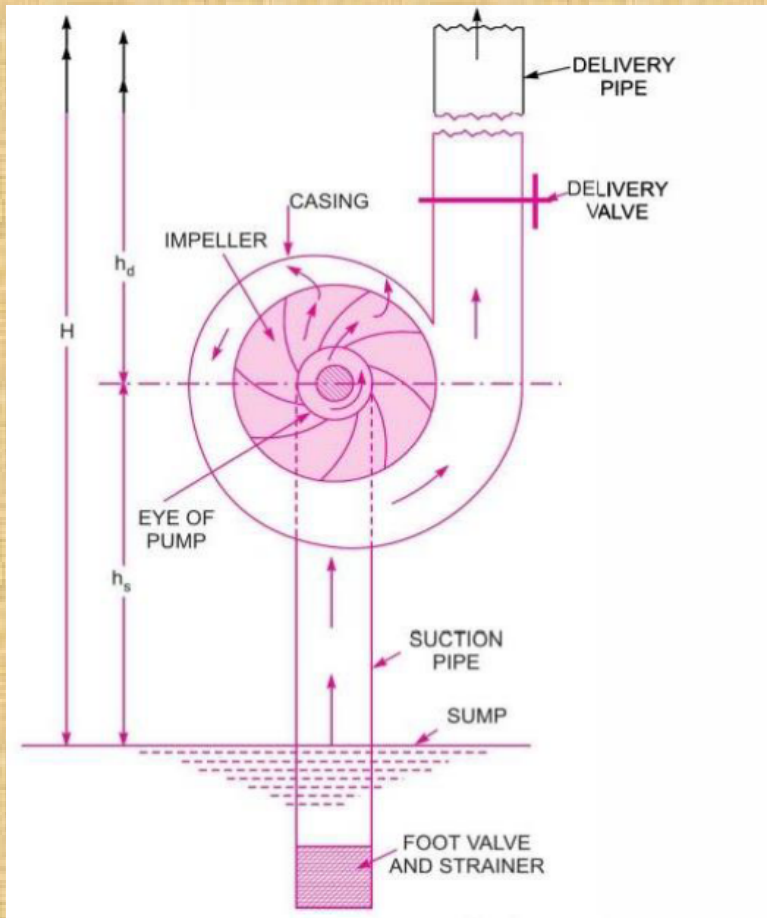
Therefore, it is known as a centrifugal pump.

*The following are the main parts of a centrifugal pump:*

1. Impeller.
2. Casing.
3. Suction pipe with a foot valve and a strainer.
4. Delivery pipe.

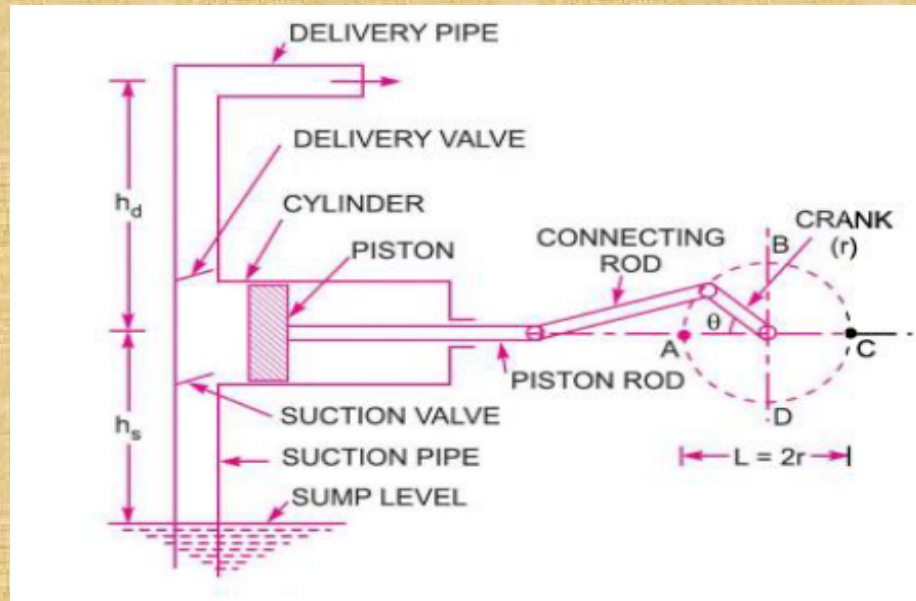
### Working of centrifugal pump

- Liquid enters the impeller axially at the 'eye' of a pump.
- The pump is driven by power from an external source (engine or motor) by means of which the impeller is rotated.
- This gives a centrifugal force to the water in the pump, and water will leave the outer circumference with a high velocity and pressure



# C7. Explain with neat sketch the working of reciprocating pump

## RECIPROCATING PUMPS



Main parts of reciprocating pumps

1. A cylinder with a piston, piston rod, connecting rod and a crank,
2. Suction pipe
3. Delivery pipe,
4. Suction valve and
5. Delivery valve.

### Working of Single acting reciprocating Piston pumps

During right side movement of piston a vacuum pressure is created inside the cylinder which opens the suction valve and water enters in to the cylinder.

When piston moves towards left side the water inside the cylinder is compressed which increases its pressure.

Thus suction valve closes and delivery valve opens which allow the pressurized fluid to flow through delivery line.

**Study well**