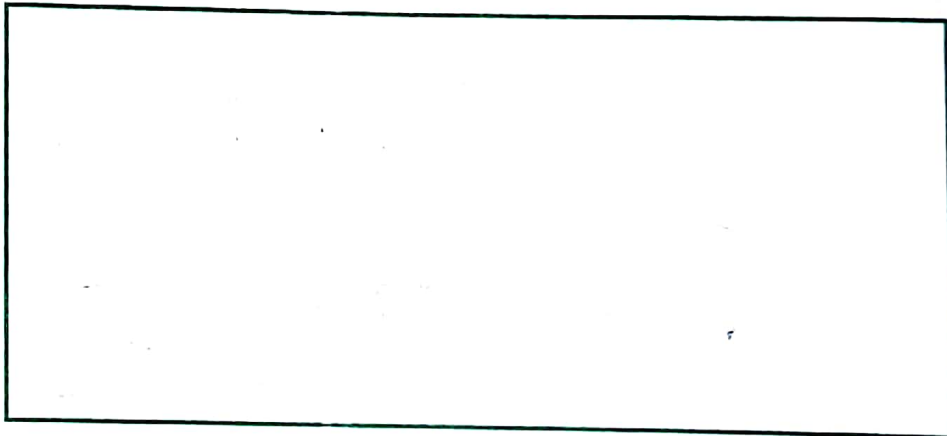


GOVERNMENT POLYTECHNIC, BALANGIR



LARKIPALI, BALANGIR



State Council Regd. No. F20110004049

Name. Sumit kumar Padhan

Roll No. 4049 Semester. 5th Session.

Branch. Mechanical Engg. Group

Subject. Hydraulic Machine & Industrial Fluid Power Lab

GOVERNMENT POLYTECHNIC, BALANGIR

DEPARTMENT OF ...Mechanical Engg.....



INDEX PAPER

Sl. No.	Name of the Department	Date	Sheet Used	Remarks
01	To conduct performance test on given pelton wheel turbine.	23/09/22	1-9	<i>[Signature]</i>
02	To conduct performance test on given Francis turbine.	14/10/22	10-15	<i>[Signature]</i>
03	To conduct performance test on given Kaplan Turbine.	28/10/22	16-21	<i>[Signature]</i>
04	To conduct a test at various heads of given centrifugal pump and efficiency its efficiency.	11/11/22	22-27	<i>[Signature]</i>
05	To conduct a test at various heads of given reciprocating pump and its efficiency.	18/11/22	28-32	<i>[Signature]</i>
06	Direct operation of single and double acting pneumatic cylinder.	02/12/22	33-34	<i>[Signature]</i>



AIM OF THE EXPERIMENT:-

To conduct performance test on the given Pelton wheel turbine.

APPARATUS:-

Pelton wheel turbine test rig

THEORY:-

Hydraulic (or water) Turbines are the machines that use the energy of water (Hydro-power) and convert it into Mechanical energy. Thus the turbines become the prime over to run electrical generators to produce electricity, viz, Hydro electric power.

Turbines are classified as Impulse and Reaction Types. In Impulse Turbine, the head of the water is completely converted into a jet which imparts the force on the Turbine. In Reaction, it is the pressure of the flowing water, which rotates the runner of the Turbine. Of many types of turbine, the pelton wheel, most commonly used, falls into this category of Impulse Turbine while the francis and kaplan fall into the category of Reaction Turbines.



Normally, Pelton wheel requires high Heads and Low Discharge while the Francis and Kaplan (Reaction Turbines) requires relatively low heads and high Discharge. These corresponding Heads and Discharges are difficult to create in a laboratory size turbines from the limitation of the pumps availability in the market. Nevertheless, at least the performance characteristics could be obtained within the limited facility available in the laboratories. Further, understanding of various elements associated with any particular Turbine is possible with this kind of facility. The unit essentially consists of casting, with a circular transparent window kept at the front for the visual inspection of the impact of the jet on buckets. a bearing pedestal, a rotor assembly of shaft, Runner and brake drum, all mounted on a suitable sturdy iron base plate.

A rope brake arrangement is provided to load the turbine. The input to the turbine can be controlled by adjusting the spear position by means of a hand wheel fitted. The water inlet pressure is measured by a pressure gauge and for the measurement of speed a digital tachometer is used. An optimum



Size is provided to store sufficient water for independent circulation through the unit for experimentation.

Pour adequate water in the sump. Make sure before starting that pipe lines are free from foreign matter. Also note wheater all the joints are water tight and perfectly matched. Prime the pump and start it with closed gate valve. Then slowly open the gate valve situated above the turbine and open the cock fitted to the pressure gauge and so that the pump develops the rated head. If the pump develops the required head, slowly open the turbine spear by rotating the hand wheel until the turbine attains the normal rated speed (1000 RPM). Run the turbine at the normal speed for about 10 min and carefully note the following:

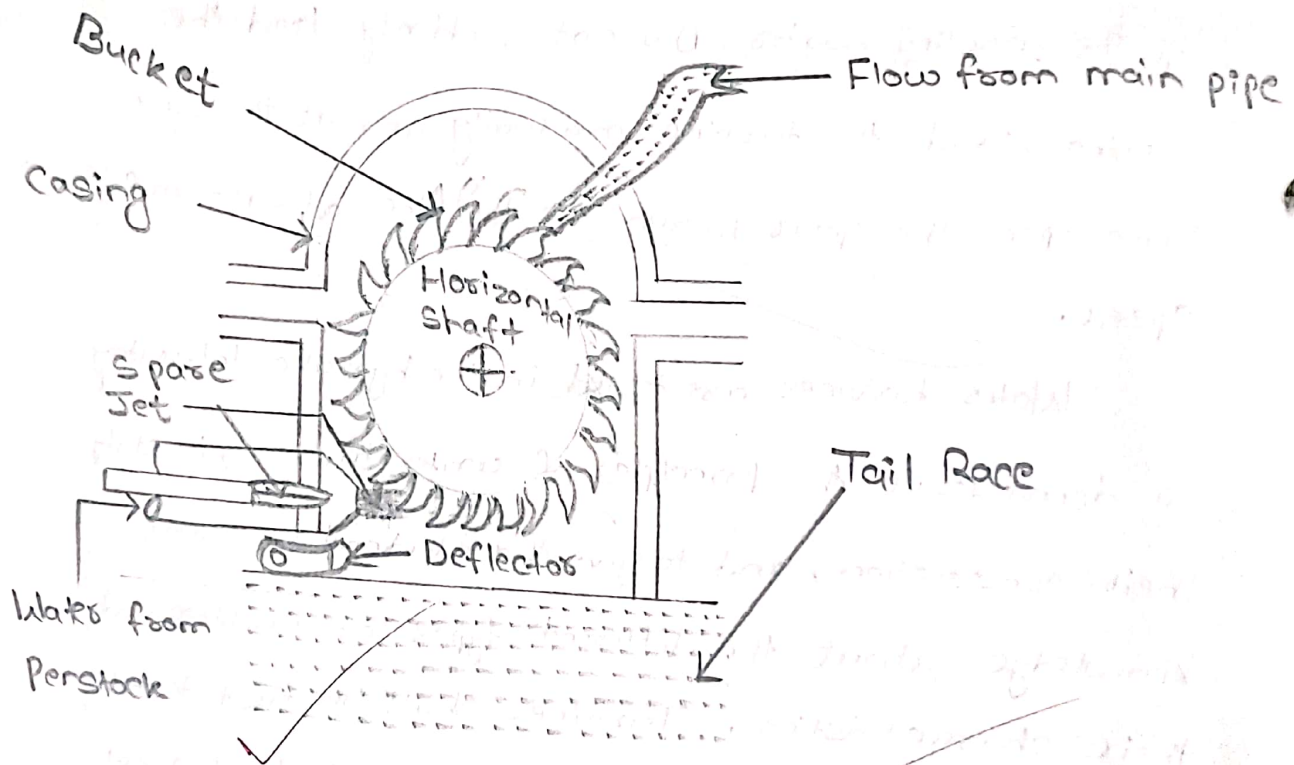
- Operation of the bearings, temperature rise, noise etc.
- Vibration of the unit.
- Study constant speed and speed fluctuations if any.



In addition to this, on the sump side note the operation of the stuffing box. The stuffing box should show an occasional drip of water.

If the water through the brake drum is carried away by the cooling water. Do not suddenly load the turbine, load the turbine gradually and at the same time open the spear to run the turbine at a normal speed.

Water turbines are tested in the hydraulic laboratory to demonstrate the principles of water turbines, to study their construction, and to give the students a clear knowledge about the different types of turbines and their characteristics. Turbines shall be first tested at constant net supply head by varying the load, speed and spear setting. However the net supply head on the turbines tested in which case the power developed by the turbine and the best efficiently speed will also be reduced. The output power from the turbine is calculated from the readings taken on the brake and the speed of the shaft. The input power supplied to the turbine is calculated from the net supply





head on the turbine and discharge through the turbine. Efficiency of the turbine being the ratio between the output and input and can be determined from these two readings. The discharge is measured by the 50 mm Venturimeter and with pressure gauges. Supply head is measured with the help of the pressure gauge. The speed of the turbine is measured with digital tachometer fitted to the turbine. After starting and running the turbine at the normal speed for the sometime, load the turbine and take readings.

Specifications:-

Casing: of an iron having a large circular transparent window.

Runners: of electroplated MS disc fitted with accurately finished electroplated buckets.

Shaft: of stainless steel for rust free operation and for high strength.

Nozzle: designed for smooth flow and efficient operation.

GOVERNMENT POLYTECHNIC, BALANGIR



Pelton Turbine:-

Supply pump set:-

- 1) Power outputs :
- 2) No. of Buckets:
- 3) Capacity :
- 4) Type :

Flow Measuring Unit:-

Procedure:-

- 1) Connect the supply water pump - water unit to 3 phase 440V, 30A, electrical supply, with neutral and earth connections and ensure the correct direction of the pump motor unit.
- 2) Check whether all the joints are perfectly matched and all the electric connections are connected correctly.
- 3) Keep the gate valve and sphere valve closed position and the Brake Drum loading at zero.

GOVERNMENT POLYTECHNIC, BALANGIR



- 4) Press the green button of the supply pump starter.
Now the pump picks up the full speed and becomes operational.
- 5) Slowly open the sphere valve so that the turbine rotor picks the speed and conduct experiment on constant speed. Note down the readings of speed, load and pressure gauge readings are tabulated below.
- 6) Press the green button of the supply pump starter.
Now the pump picks up the full speed and becomes operational.
- 7) Slowly open the sphere valve so that the turbine rotor picks the speed and conduct experiment on constant speed.
- 8) Note down the readings of speed, load and pressure gauges readings and tabulated below.
- 9) For any particular setting of the spear first run the turbine at light load and then gradually load it. Thereby supply head on the turbine shall be maintained constant at the rated value and this can be done by adjusting the gate valve fitted just above the turbine. A typical tabular form is given below for the convenience during experiment.



PRECAUTIONS:-

- 1) Do not start Pump set if the supply voltage is less than 300 V (phase to phase voltage).
- 2) Do not forget to give electrical earth and neutral connections correctly; otherwise the RPM indicator gets burnt.
- 3) Initially, fill in the tank with clean water to foreign material change the water every six months.
- 4) Frequently, at least once in three months, grease all visual moving parts.
- 5) At least every week, operate the unit for five minutes to prevent any clogging of moving parts.
- 6) To start and stop supply pump, always keep Gate valve closed.
- 7) It is recommended to keep sphere Rod setting at close positions before starting the turbine. This is to prevent racing of the propeller shaft without load.



g) In case of any major faults, please write to the manufacturers and do not attempt to repair.

CONCLUSION:-

Submitted by

Name - Sumit Kumar Padhan

Roll no - F20110004049

Branch - Mechanical Engg

Semester - 5th

GOVERNMENT POLYTECHNIC, BALANGIR



AIM

The experiment is conducted to obtain constant Head and speed characteristics. (Francis Turbine)

APPARATUS

- 1) Monobloc Centrifugal pump of Kirloskar Make
- 2) Turbine Unit,
- 3) Sump Tank,
- 4) Venturimeter with pressure tapings.

THEORY:-

Hydraulic (or water) Turbines are the machines that use the energy of water (Hydro-power) and convert it into Mechanical Energy. Thus the turbines become the prime mover to run Electrical generators to produce electricity, viz, Hydro electric power.

Turbines are classified as Impulse and Reaction Types. In impulse Turbine, the head of the water is completely converted into a jet, which imparts the force on the turbine. In Reaction Turbine, it is the pressure of flowing water, which rotates the runner of this Turbine. Of many types of Turbine, the Pelton

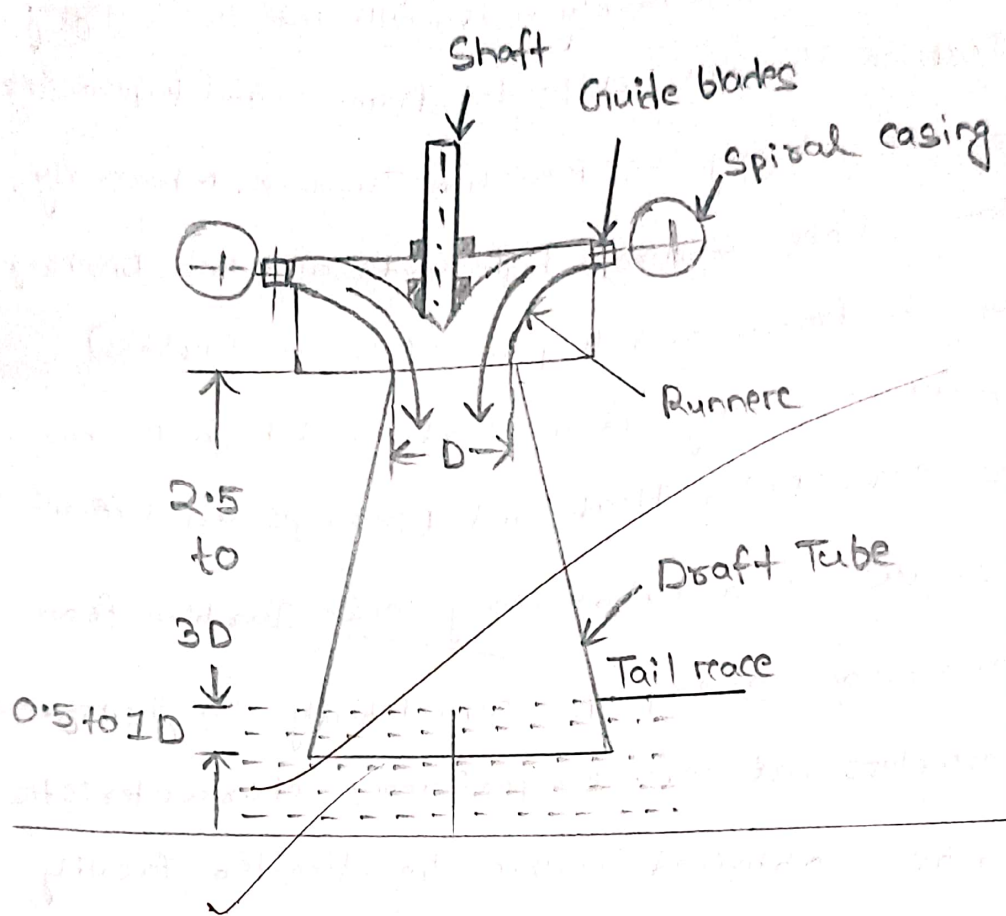


wheel, most commonly used, falls into this category of Impulse Turbine while the francis and kaplan falls into the category of Reaction Turbines. Normally, pelton wheel requires high heads and low Discharge while the francis and kaplan (Reaction Turbines) require relatively low Heads and high Discharge. These corresponding Heads and Discharges are difficult to create in a laboratory size Turbine from the limitation of the pumps availability in the market.

Nevertheless, at least the performance characteristics could be obtained within the limited facility available in the laboratories. Further, understating of various elements associated with any particular Turbine is possible with this kind of facility.

The apparatus consists of the following major parts

- a) Monobloc Centrifugal pump of kirlaskar Make.
- b) Turbine Unit
- c) Sump Tank
- d) Venturimeter with pressure tappings.
- e) All are arranged in such a way that the whole unit works as a re-circulating water system.





- f) Centrifugal pump set supplies water from sump Tank to the turbine through control valve.
- g) Water re-enters the sump Tank after passing through the Turbine unit.
- h) Loading of the turbine is achieved by a rope brake drum connected to spring balance.
- i) Provisions for measurement of turbine speed (digital RPM indicator), Head on Turbine (pressure gauge) are built in on the control panel.
- j) The whole arrangement is mounted on an aesthetically designed sturdy frame made of MS angle with all the provisions for holding the tanks and accessories.

PROCEDURE:-

To obtain constant head characteristics:

- Set the vane position.
- Keep the Delivery valve open at Maximum
- Set the head at required value.
- Now apply the load.
- Operating the delivery valve, maintain the head to the set value.
- Repeat the step 4 and 5 till the maximum load the turbine can take.

GOVERNMENT POLYTECHNIC, BALANGIR



To obtain constant speed characteristics :

- 1) Set the vane position.
- 2) keep the Delivery valve opened Maximum.
- 3) Set the speed to the required value using the same delivery value.
- 4) Now apply the load.
- 5) ~~operating~~ the delivery value, maintain the speed to the.
- 6) Set value.
- 7) Repeat the steps 4 and 5 till the maximum load the turbine can take.
- 8) In the meantime, Note down the turbine speed, vacuum head and venturimeter readings for each loadings.

Performance under unit head - unit quantities:

In order to predict the behavior of a turbine working under varying conditions and to facilitate comparison between the performances of the turbines of the same type but having different output and speed and working under different heads, it is often convenient to express



The test results in terms of certain unit quantities. From the output of the turbine corresponding to different working heads, it is possible to compute the output, which would be developed if the head was reduced to unity; the speed being adjusted so that the efficiency remains unaffected.

a) Unit speed, $N_u = \frac{N}{\sqrt{H}}$

b) Unit Power, $P_u = \frac{P}{H^{3/2}}$

c) Unit Discharge, $Q_u = \frac{Q}{\sqrt{H}}$ ✓

d) Specific speed, N_s

The specific speed of any Turbine is the speed in rpm of a turbine geometrically similar to the actual turbine but of such a size that under corresponding conditions it will develop 1 metric horse power when working under unit head. The specific speed is usually computed for the operating conditions corresponding to the maximum efficiency.

$$N_s = \frac{N\sqrt{P}}{H^{5/4}}$$



Precautions:-

- 1) Do not start pump set if no supply voltage is less than 300 V (phase to phase voltage).
- 2) Do not forget to give electrical earth and Neutral connections correctly; otherwise the RPM indicator gets burnt.
- 3) Initially, fill in the tank with clean water free foreign material, change the water every six months.
- 4) Frequently, at least once in three months, grease all visual moving parts.
- 5) At least every week, operate the unit for five minutes to prevent any clogging of moving parts.
- 6) To start and stop supply pump, always keep Gate Valve closed.

CONCLUSION:-

[Signature]

Submitted by
Name- Sumit kumar
Padhan
Roll no- F20110004049
Branch- Mechanical Engg
Semester- 5th



AIM

The experiment is conducted to obtain Constant Head and speed characteristics. (Kaplan Turbine)

APPARATUS

- 1) Mono bloc centrifugal pump of Kirloskar Make
- 2) Turbine Unit
- 3) Sump Tank
- 4) Venturimeter with pressure tappings.

THEORY:-

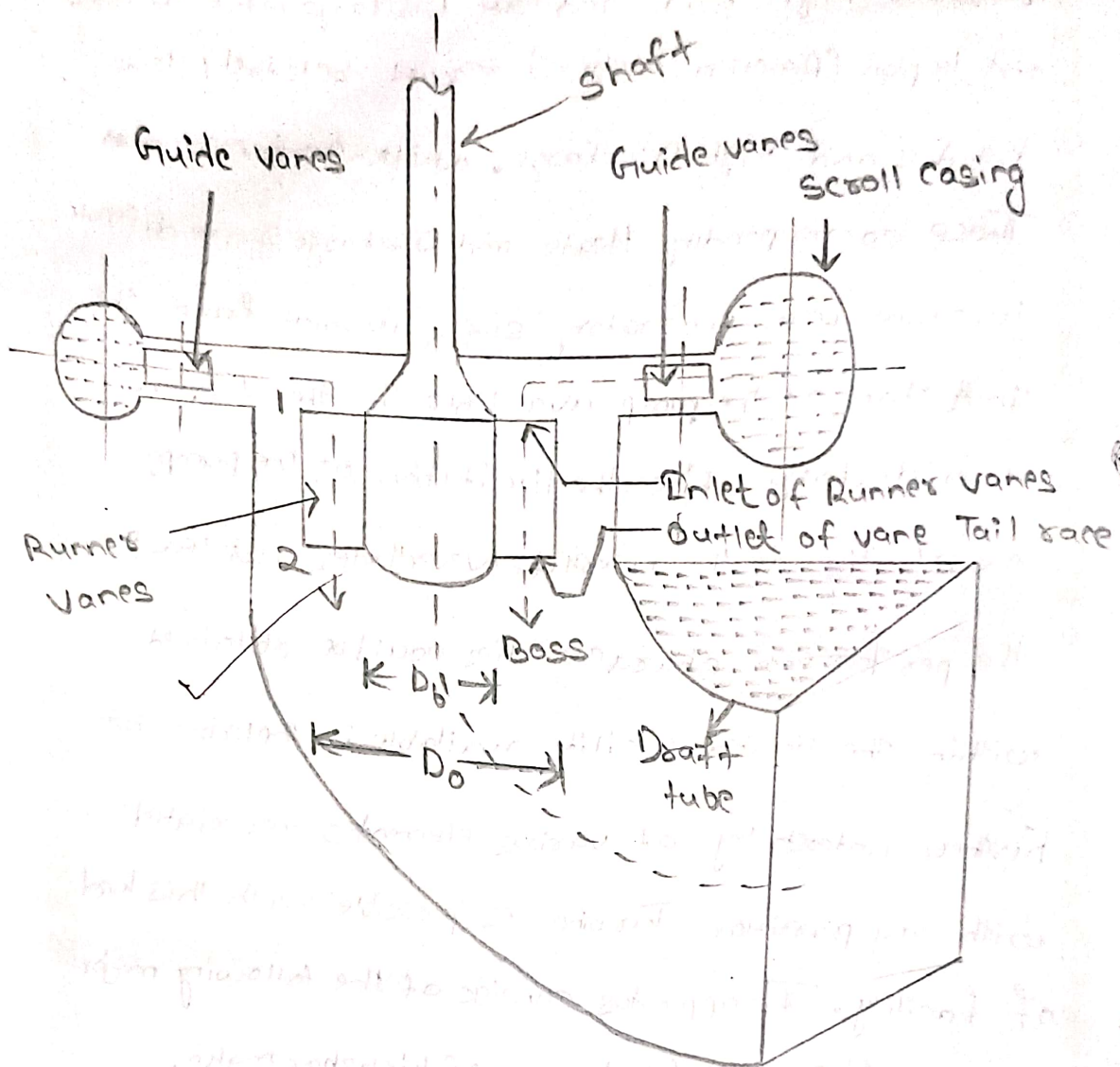
Hydraulic (or water) Turbines are the machines that use the energy of water (Hydro-power) and convert it into Mechanical Energy. Thus the turbines become the prime mover to run Electrical Generators to produce electricity, viz., Hydro electric power. Turbines are classified as Impulse Turbine, the head of the water is completely converted into a jet, which impulse the force on the turbine, ~~the head of the water~~. In Reaction Turbine it is the pressure of flowing water, which rotates the runner of the Turbine. Of many types of Turbine, the Pelton wheel, most commonly used, falls into this category of Impulse Turbine while the Francis and Kaplan fall into the category of Reaction Turbines. Normally, Pelton



requires high heads and low Discharge while the Francis and Kaplan (Reaction Turbines) requires relatively low heads and high Discharge. ~~while the Francis and~~ These corresponding Heads and Discharges are difficult to create in a laboratory size Turbine from the limitation of the pump available in the turbine low discharge while the limitation of the pumps availability in the market. Nevertheless, at least the performance characteristics could be obtained within the limited facility available in the laboratory.

Further, understanding of various elements associated with any particular Turbine is possible with this kind of facility. The apparatus consists of the following major parts namely centrifugal pump of kirlashor make.

- a) Turbine Unit
- b) Sump tank ✓
- c) Venturimeter with pressure tappings.
- d) All are arranged in such a way that the whole unit works as a re-circulating water system.
- e) Centrifugal pump set supplies water from sump Tank to the Turbine control valve. ✓





f) Water re-enters the sump Tank after passing through the turbine unit.

g) Loading of turbine is achieved by a rope brake drum connected to spring balance.

h) Provisions for measurement of turbine speed (digital RPM indicator), Head on Turbine (pressure gauge) are built in on the control panel.

i) The whole arrangement is mounted on an aesthetically designed sturdy frame made of MS angle with all provisions for holding the tanks and accessories.

Procedure:-

To obtain constant head characteristics

- Set the vane position.
- Keep the delivery valve open at Maximum.
- Set the head at required value.
- Now apply the load.
- Operating the delivery valve, maintain the head.
- Set value.
- Repeat the steps 4 and 5 till the maximum load the turbine can take.

To obtain constant speed characteristics:-

- 1) Set the vane position.
- 2) Keep the delivery valve open at Maximum.



- 3) Set the speed to the required value using the same delivery value.
- 4) Now apply the load.
- 5) Operating the delivery valve, maintain the speed to
- 6) Set value
- 7) Repeat the step 4 and 5 till the maximum load the turbine can take.
- 8) In the meantime, Note down turbine speed, vacuum head and Venturimeter readings.

Performance under unit head - unit quantities:-

In order to predict the behavior of a turbine working under varying conditions and to facilitate comparison between the performances of the turbines of the same type but having different outputs and speed and working under different heads it is often convenient to express the test results in terms of certain unit quantities. From the output of the turbine corresponding to different working heads, it is possible to compute the output, which could be developed if the head was reduced to unity the speed being adjustable so that the efficiency remains unaffected.



a) Unit speed,

$$N_u = \frac{N}{\sqrt{H}}$$

b) Unit power,

$$P_u = \frac{P}{H^{3/2}}$$

c) Unit Discharge,

$$Q_u = \frac{Q}{\sqrt{H}}$$

d) Specific speed,

The specific speed of any Turbine is the speed in rpm of a turbine geometrically similar to the actual turbine but of such a size that under corresponding conditions it will develop 1 metric horse power when working under unit (1mtr).

The specific speed is usually computed for the operating conditions corresponding to maximum efficiency.

$$N_s = \frac{N\sqrt{P}}{H^{5/4}}$$

Constant head / speed



Precautions:

- 1) Do not start pump set if the supply voltage is less than 380V (phase to phase voltage).
- 2) Do not forget to give electrical earth and neutral connection correctly: otherwise the RPM indicators get burnt.
- 3) Initially, fill in the tank with clean water free from foreign material, change the water every six months.
- 4) Frequently, at least once in three months, grease all visual moving parts.
- 5) To start and stop supply pump, always keep gate valve closed.
- 6) It is recommended to keep Sphere Rod setting at close position before starting the turbine.



AIM OF THE EXPERIMENT:-

To conduct a test at various heads of given centrifugal pump and find its efficiency.

APPARATUS:-

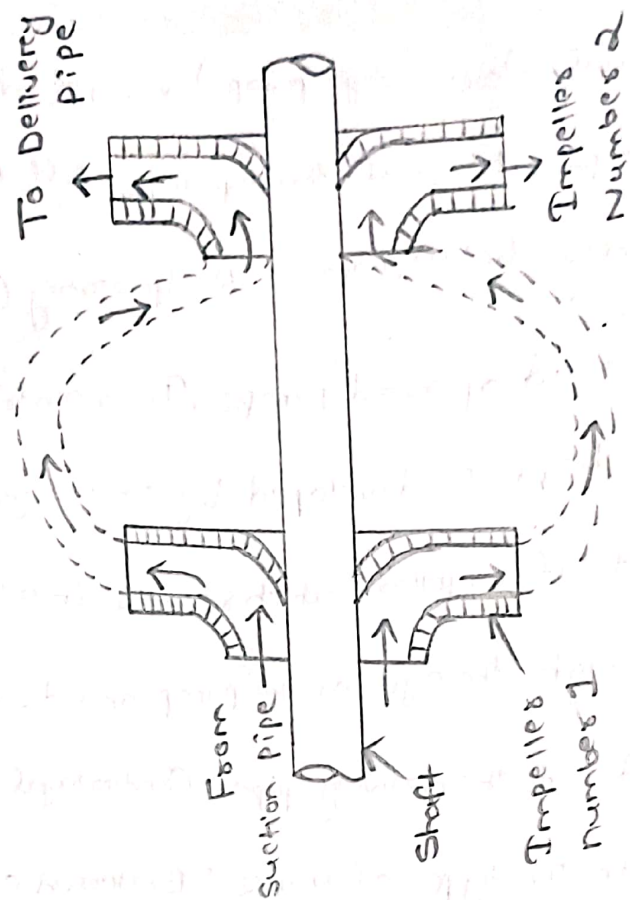
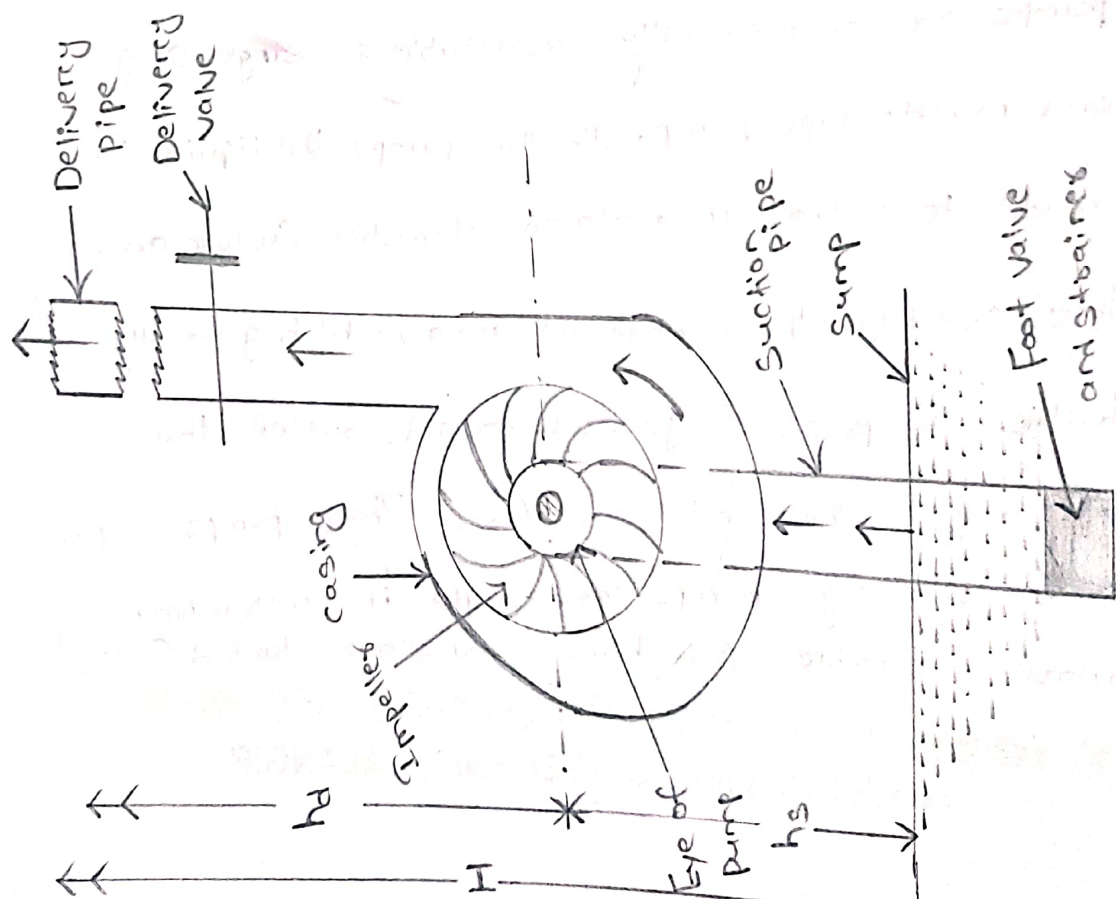
The test Rig mainly consists of (1) Centrifugal pump set (2) Panel board (3) Pressure and vacuum gauges to measure the head (4) Measuring Tank to measure the discharge (5) Energy meter to measure the input to the motor (6) Sump

THEORY:-

In general, a pump may be defined as mechanical device when connected in a pipe line, can convert the mechanical energy into hydraulic energy, thus resulting in the flow of liquid from lower potential to higher potential. Pumps are of major concern to most engineers and Technicians. The types of pumps vary in principle and design. The selection of the pump for any particular application is to be done by understanding their characteristics. The most commonly used pumps for domestic, agricultural and Industrial are Centrifugal.



Reciprocating, Axial flow (Stage pumps), air jet, diaphragm and turbine pumps. Most of these pumps fall mainly into a class namely Rotodynamic, Reciprocating (positive displacement) and fluid operated pumps. In a centrifugal pump, pressure head is developed by centrifugal action. The pump consists of impellers, which rotate in a casing. Fluid enters through the eye of the pump and discharges radially outwards to the delivery pipe. Centrifugal pumps also come based on the type of vanes: Backward curved blades, Radial type and forward curved type. Centrifugal pumps are commercially available as single stage and multi-stage pump. In this pump, the liquid is made to rotate in a closed chamber (volute casing), thus creating the centrifugal action, which gradually builds the pressure gradient towards outlet thus resulting in the continuous flow. These pumps compared to reciprocating pumps are simple in construction, more suitable for handling viscous, turbid (muddy)



Pipe connecting outlet of
1st Impeller to inlet of 2nd
Impeller



Liquid can be directly coupled to high speed electric motors (without any speed reduction), easy to maintain. But, their hydraulic heads at low flow rates is limited and hence not suitable for very high heads compared to reciprocating pump of same capacity. But, still in most cases, this is the only type of pump, which is being widely used for agricultural applications because of its practical suitability. The present test rig allows the students to understand and draw the operating characteristics at various heads, flow rates and speeds.

Specifications:-

i) Centrifugal pump set:- The pump set is of design, horizontal spindle, and vertical split case. The pump is of such a size, type and design that

i) Total head

ii) Discharge and

iii) Power requirements at normal speed is well

suited for the experimental purposes in technical institutes.

GOVERNMENT POLYTECHNIC, BALANGIR



2) A.C. Motor:- The electric motor suitable for operation on 50 cycles A.C supply is provided.

3) Gauges:- Suitable range of pressure and vacuum gauges to measure the total head on the pump with reasonable accuracy.

4) Measuring Tank:- It is provided to measure the discharge of the pump with overflow arrangement. The tank is complete with gauge glass and scale arrangement.

5) Piping System:- Suitable piping system with pipes, bends and valves are provided. A simple strainer valve is provided on the suction side to prevent any foreign matter entering into the pump. While starting the motor always keep the valve in close position.

6) Panel Board:- The panel board houses all the necessary electrical items, like switch, starter for the above pump set and an energy meter to read the power input and it is fitted with the unit on a strong



iron base with sufficient height.

PROCEDURE:-

- 1) Start the motor keeping the delivery valve close.
- 2) Note down the pressure gauge and vacuum gauge reading by adjusting the delivery valve to required head say 0 metres.

Now calculate the total head (H).

$$\text{Pressure Head} = \text{kg/cm}^2 \times 10 = \text{metres}$$

$$\text{Vacuum Head} = (\text{mm of Hg} \times 13.6) / 1000 \text{ metres}$$

Datum head = Distance between pressure and vacuum gauge in meter

$$\text{Total Head (H)} = \text{Pressure Head} + \text{Vacuum head} + \text{Datum head}$$

- 3) Note down the time required for the rise of 10 cm (i.e. 0.1) Water in the collecting tank by using stop watch.

Discharge: The time taken collect some 'R' cm of water in the collecting tank

$$Q_{\text{act}} = \frac{A \times R}{t}$$

Where:

A = area of the collecting tank in m^2

R = rise of water level taken in metres

t = Time taken for rise of water level to height 'R' is cm



Graphs:-

- 1) Discharge vs Head
- 2) Discharge vs Input power
- 3) Discharge vs efficiency

PRECAUTIONS:-

- 1) Don't start the pump if the voltage is less than 380V.
- 2) Don't forget to give electrical neutral and earthing connection to the main plug.
- 3) At least once in 3 months grease/oil the rotating parts.
- 4) Initially put the clean water free from foreign material and change the water once in 3 months.
- 5) At least every week, operate the unit for five minutes to prevent clogging of moving parts.

CONCLUSION:-

Submitted by

Name - Sumit Kumar Padhan

Roll no - F20110004049

Branch Mechanical Engg

Semester - 5th

GOVERNMENT POLYTECHNIC, BALANGIR



AIM OF THE EXPERIMENT:-

To conduct a test at various heads of given reciprocating pump finds its efficiency.

APPARATUS REQUIRED:-

- i) A reciprocating pump
- ii)
- iii) Piping system and collecting tank
- iv) Input power Measuring arrangement and
- v) SS sump tank
- vi) Stop watch
- vii) Scale

THEORY:-

In general, a pump may be defined as mechanical device when connected in a pipe line, can convert the mechanical energy into hydraulic energy, thus resulting in the flow of liquid from lower potential to higher potential. Pumps are of major concern to most engineers and technicians.

The types of pumps vary in principle and design. The selection of the pump for any particular application is to be done by understanding their characteristics. The most commonly used pumps for domestic, agricultural and industrial are centrifugal, reciprocating, axial flow (stage pumps) air jet, diaphragm and turbine pumps. Most of



These pumps fall mainly into a class namely rotodynamic reciprocating (positive displacement) and fluid operated pumps. Reciprocating pump is based purely on mechanical concepts, since the liquid is displaced by a piston (plunger) moving in a cylinder. They discharge a definite quantity of liquid irrespective of the head on the pump i.e., positive displacement. However, in a single acting pump, water is sucked into the cylinder in the suction stroke and delivered out of the cylinder in the delivery stroke that is the discharge only on alternate strokes, where as in double acting pump there is a suction and delivery in each stroke that is the discharge is continuous. Pour the lubricating oil SAE 40 in the crankcase of the reciprocating pump to the required level once in a year. This will require about 250cc of oil prime the pump before starting see that V belt are in proper tension. Start the motor keeping the delivery valve in fully open position. Open the gauge cocks, and see the pressure developed by the pump. Delivery control valve may be closed up to about 30 meters of the water head on the delivery side. Under any circumstances the valve should not be closed beyond 40 meters head on the



delivery side. If the pressure exceeds this value (40 kg/sq cm) the cylinder head gasket joints, piston, pressure gauge etc. would be damaged. To stop the pump set, first close the gauge cocks. Do not close the delivery valve on the other hand it may open fully. Then switch off the motor.

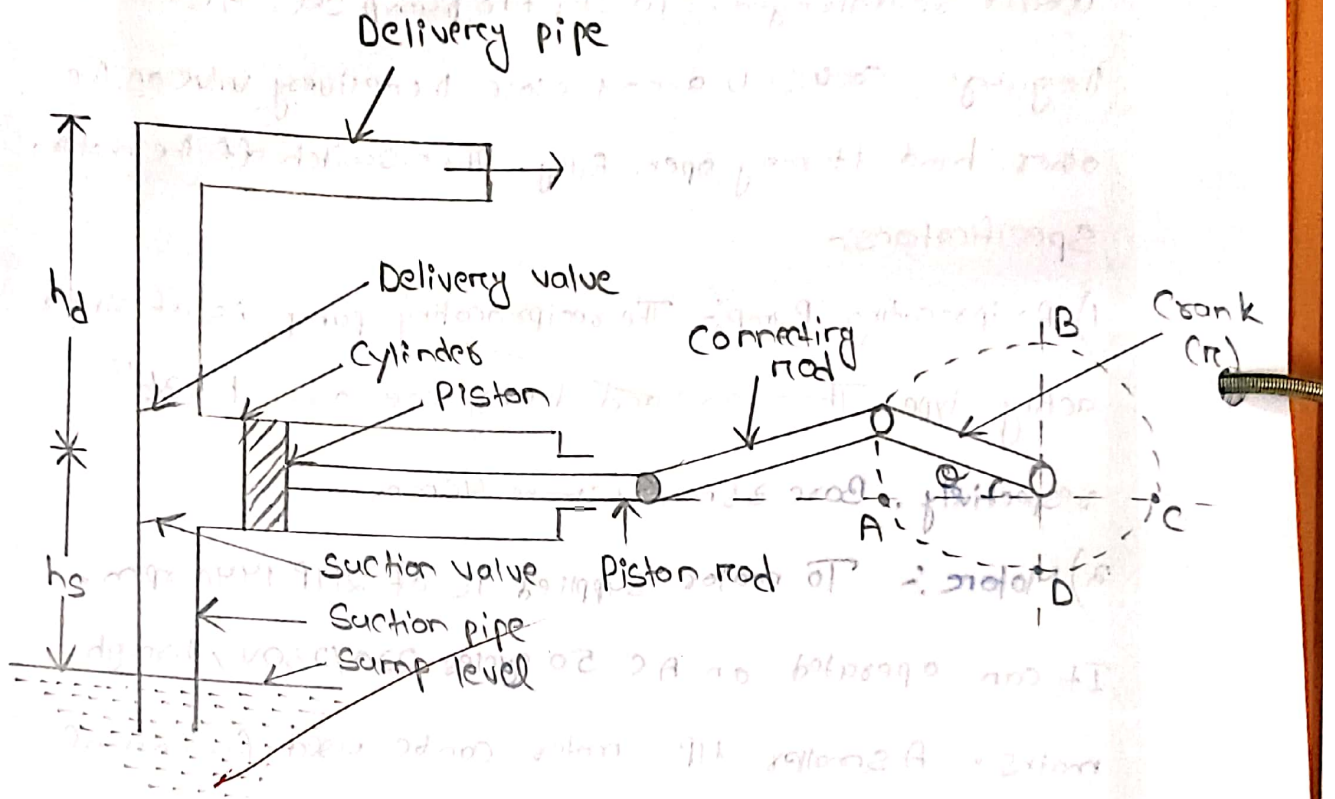
Specifications:-

1) Reciprocating Pump:- The reciprocating pump is of single acting type. The suction and delivery size are $1\frac{1}{2}$ " respectively. Bore 38 mm, Stroke 40 mm

2) Motor:- The motor supplied is of 2HP 1440 rpm. It can operate on AC 50 cycles 220/230V, through mains. A smaller HP motor can be used for normal working conditions, a higher power motor is selected to test the pump at higher speed, high pressure combinations without over loading it.

3) Piping system:- Suitable piping system with pipes, bends valves etc. Arrangement with cocks is also provided for connecting pressure and vacuum gauges to the delivery and suction pipe.

4) A simple strainer valve is provided on the suction side to prevent any foreign matter from entering into the pump.





The gate valve is provided on the delivery side to control the Head of the ~~head~~ pump. Note that the delivery valve should never be closed when the pump is working.

5) Input Power Measurement:- A kilowatt-hour meter is provided to measure the power input to the motor. The energy meter constant (The number of revolutions per minute of the energy meter Disc) is stamped on the meter. From this the input power can be easily calculated.

6) Sump - A sump is provided compactly within the (Floor space of the main unit to store adequate water for circulation through the unit for experimentation)

PROCEDURE:-

1) Check the gauge glass and meter scale assembly of the measuring tank and see that it is fixed water tight and vertically. Check whether all the joints are leak proof and water tight.

2) Check whether all the electric connection is correct. See that the gauges are mounted on the correct position and their cocks closed.

3) Delivery valve should be in fully open condition. Start the motor keeping the delivery valve fully open.



4) Note down the pressure gauge and vacuum gauge reading by adjusting the delivery valve to require head say in meters. Now calculate the total head (H)

$$\text{Pressure Head} = \text{kg/cm}^2 \times 10 = \text{meters}$$

$$\text{Vacuum Head} = \frac{\text{mm of Hg} \times 13.6}{1000} \text{ meters}$$

Datum head = Distance between pressure and vacuum gauge in meters

$$\text{Total head (H)} = \text{Pressure Head} + \text{vacuum head} + \text{Datum Head}$$

5) Note down the time required for the rise of 10 cm (i.e., 0.1 m) water in the collecting tank by using stop watch. ~~calculate discharge~~



AIM OF THE EXPERIMENT:-

Direct operation of single and double acting pneumatic cylinders.

Direct operation of single acting cylinder

APPARATUS REQUIRED:-

- Single acting cylinder
- 3/2 lever operated dev
- Connecting tubes

AIR SUPPLY:-

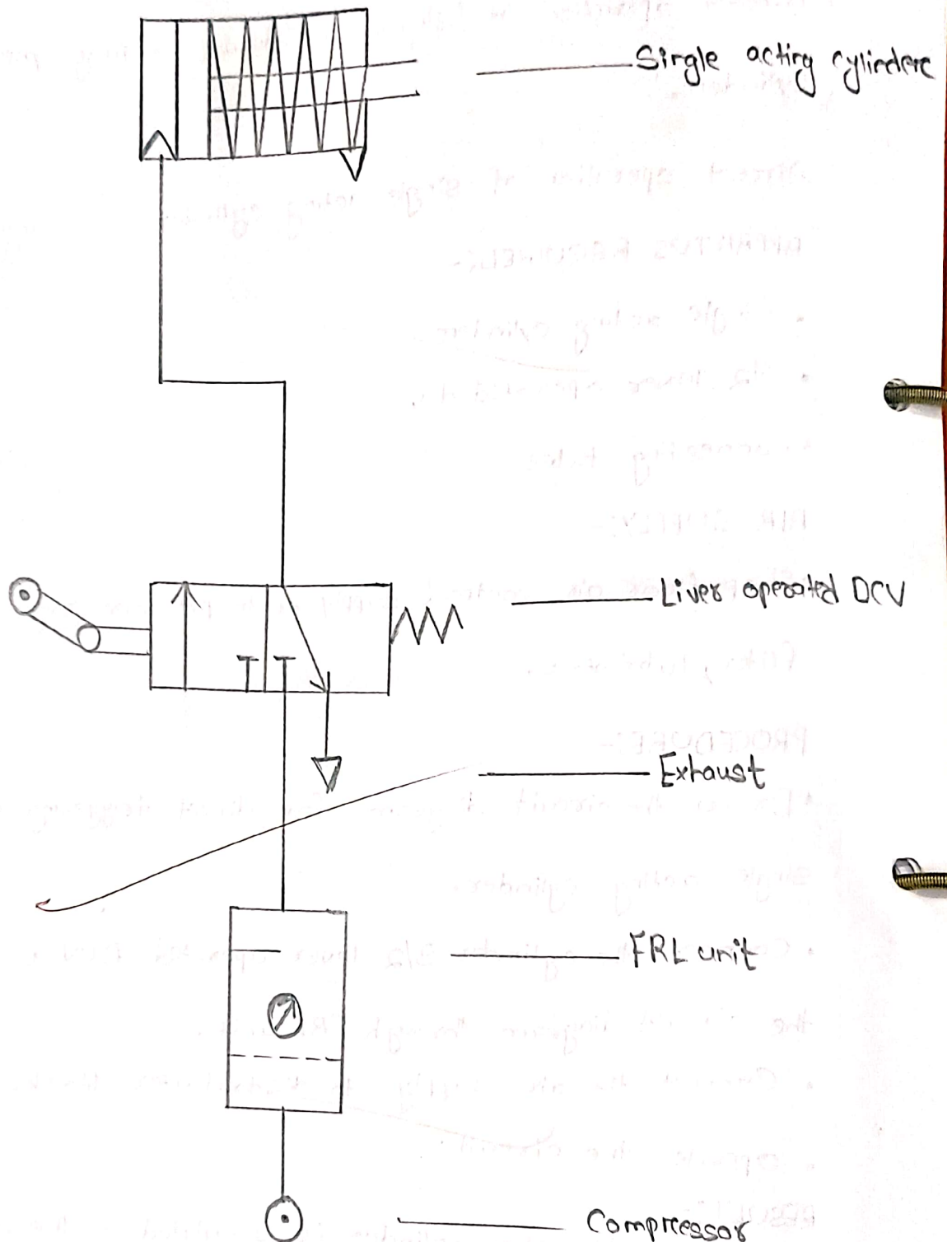
- Shop floor air control supply with pressure regulator, filter, lubricators.

PROCEDURE:-

- Draw the circuit diagram for direct triggering of single acting cylinder.
- Connect the cylinder 3/2 lever operated DEV as per the circuit diagram through FRL unit.
- Connect the air supply to distributor block.
- Operate the circuit.

RESULT:-

Thus a single acting cylinder is simulated in the direct method with help of direction control valves.





Direct operation of Double acting cylinder

APPARATUS REQUIRED:-

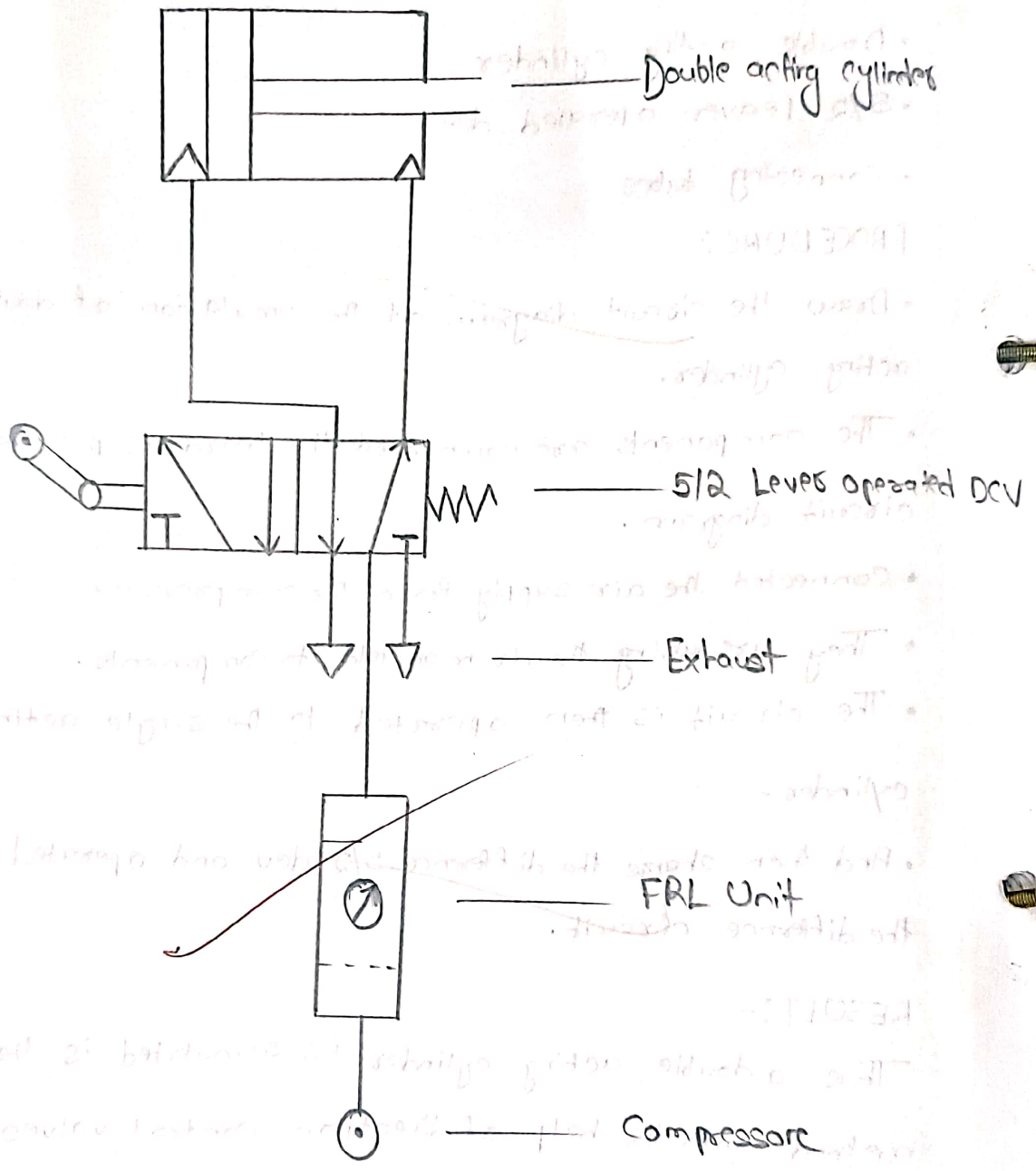
- Double acting cylinder
- 5/2 lever operated dev
- Connecting tubes

PROCEDURE:-

- Draw the ~~circuit diagram~~ of the simulation of double acting cylinder.
- The components are connected the board as per the circuit diagram.
- Connected the air supply from the compressor.
- They are using the air manifold to components.
- The circuit is then operated to the single acting cylinder.
- And then change the difference ~~5/2 dev~~ and operated the ~~the difference circuit~~.

RESULT:-

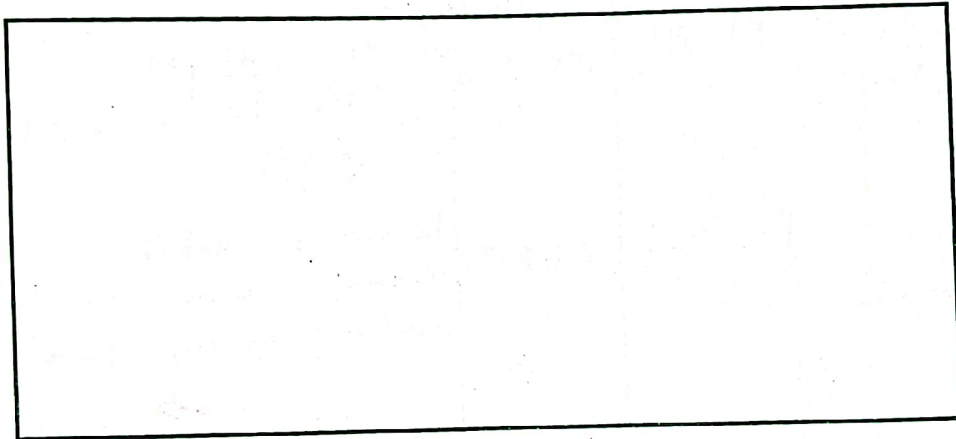
Thus a double acting cylinder is simulated is the direct method with the help of direction control valves.



GOVERNMENT POLYTECHNIC, BALANGIR



LARKIPALI, BALANGIR



State Council Regd. No. F21110004005

Name Aman Ratan Baganty

Roll. No. 4005 Semester 5th Session

Branch Mechanical Group

Subject Refrigeration & Air conditioning LAB

GOVERNMENT POLYTECHNIC, BALANGIR

DEPARTMENT OF ...MECHANICAL...ENGINEERING...



INDEX PAPER

Sl. No.	NAME OF THE EXPERIMENT	DATE	SHEET USED	REMARKS
1.	To study the construction features of domestic refrigeration	4.08.23	1-5	 11/8/23
2.	To study the construction features of water cooler	11.08.23	6-8	 18/8/23
3.	To study the construction features of window air conditioning.	25.8.23	9-14	 1/9/23
4.	To study the construction features of split air conditioning.	8.9.23	15-19	 15/9/23
5.)	To determine COP of simple vapour compression refrigerator tutor.	29.9.23	20-24	 6/10/23
6.	To determine the COP of window type air conditioning test rig.	13.10.23	25-27	 3/11/23
7.	To determine COP of window split type air conditioning test rig.	10.11.23	28-31	 17/11/23

Experiment - 01

Page No. 01



Aim of the experiment :-

To study the construction features of domestic refrigeration.

Apparatus Required :-

1) Domestic refrigeration.

Theory :-

A vapour compression refrigeration system is now days used to for all purpose of refrigeration. It used a refrigerant sealed in air tight and leak proof mechanism.

The refrigerant is circulated through the system & undergoes number of changes in its state while passing through various part of system. The refrigerant absorb heat from one place to releases it on another place.

Mechanism of domestic refrigeration :-

A domestic refrigerator consist of 5 essential part.



1.) Compressor :-

The low pressure and temperature vapour refrigerant from evaporator is drawn into compressor through the inlet or suction valve where it is compressed to high pressure and temperature. This high pressure and temperature vapour refrigerant is discharged into the condenser through the delivery valve.

2.) Condensor :-

The condensor or cooler consists of coil or pipes in which the high pressure and temperature vapour refrigerant is cooled and condensed. The refrigerant while passing through the condensor, gives up its latent heat to the surrounding condensing medium which is normally air or water.

3.) Receiver :-

The condensed liquid refrigerant from the condenser is stored in vessel in



as receiver from where it is supplied to the evaporator through the expansion valve.

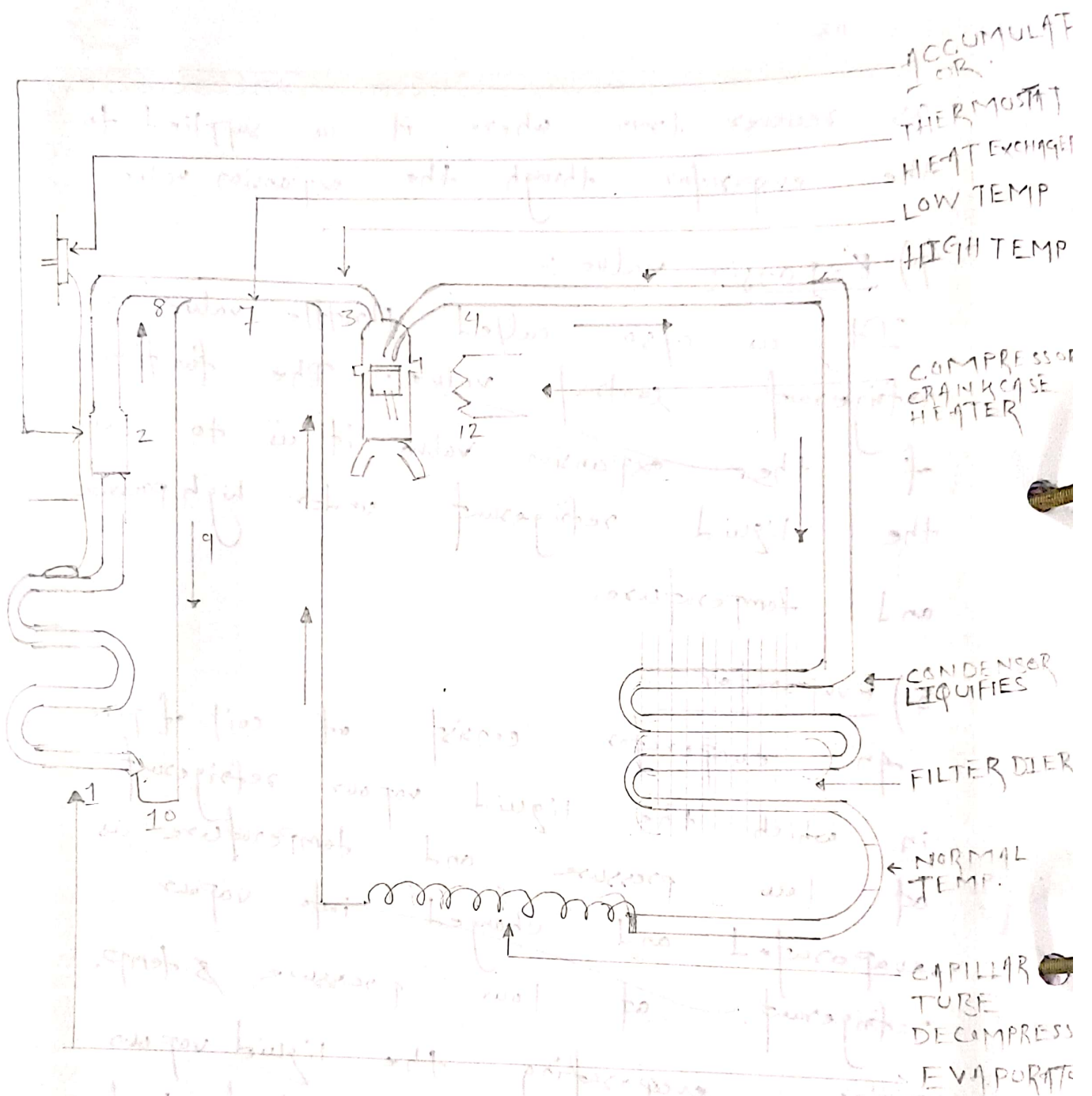
4.) Expansion valve :-

It is also called throttle valve or refrigerant control valve. The function of the expansion valve is to allow the liquid refrigerant under high pressure and temperature.

5.) Evaporator :-

An evaporator consist of coil of pipe in which the liquid vapour refrigerant at low pressure and temperature is evaporated and changed into vapour refrigerant at low pressure & temp.

During evaporating the liquid vapour refrigerant absorb its latent heat of vaporization from medium which is used to be cooled.



REFRIGERATION CYCLE OF COMPRESSION
TYPE REFRIGERATOR.



Working principle :-

The low pressure vapour in dry state is drawn from the evaporator during the suction stroke of the compressor. During compression, the pressure and temperature is increased. When the high pressure refrigerant vapour enters the condenser, heat flows from the condenser to the cooling medium, thus allowing the vaporized refrigerant to return to liquid state.

After condensation, the liquid refrigerant is stored in liquid receiver. Then it is passed through the expansion valve, where the pressure is reduced sufficiently to allow the vaporization of the liquid at low temperature. The low pressure refrigerant vapour after expansion enters the evaporator where heat



is absorbed by it and cycle is completed.

Conclusion :-

From the above experiment we successfully studied the construction features of domestic refrigerator.

Amal
11/8/23

Submitted by

Name - Aman Ratan Bagarthy

Regd no - F2110004005

Branch - Mechanical / 5th sem

Experiment - 02



Page No. 06

Aim of the experiment :-
To study the construction features of water cooler.

Apparatus required :-

S.L.	Equipment	Specification	Quantity
01	Model of water cooler		1

Theory :-

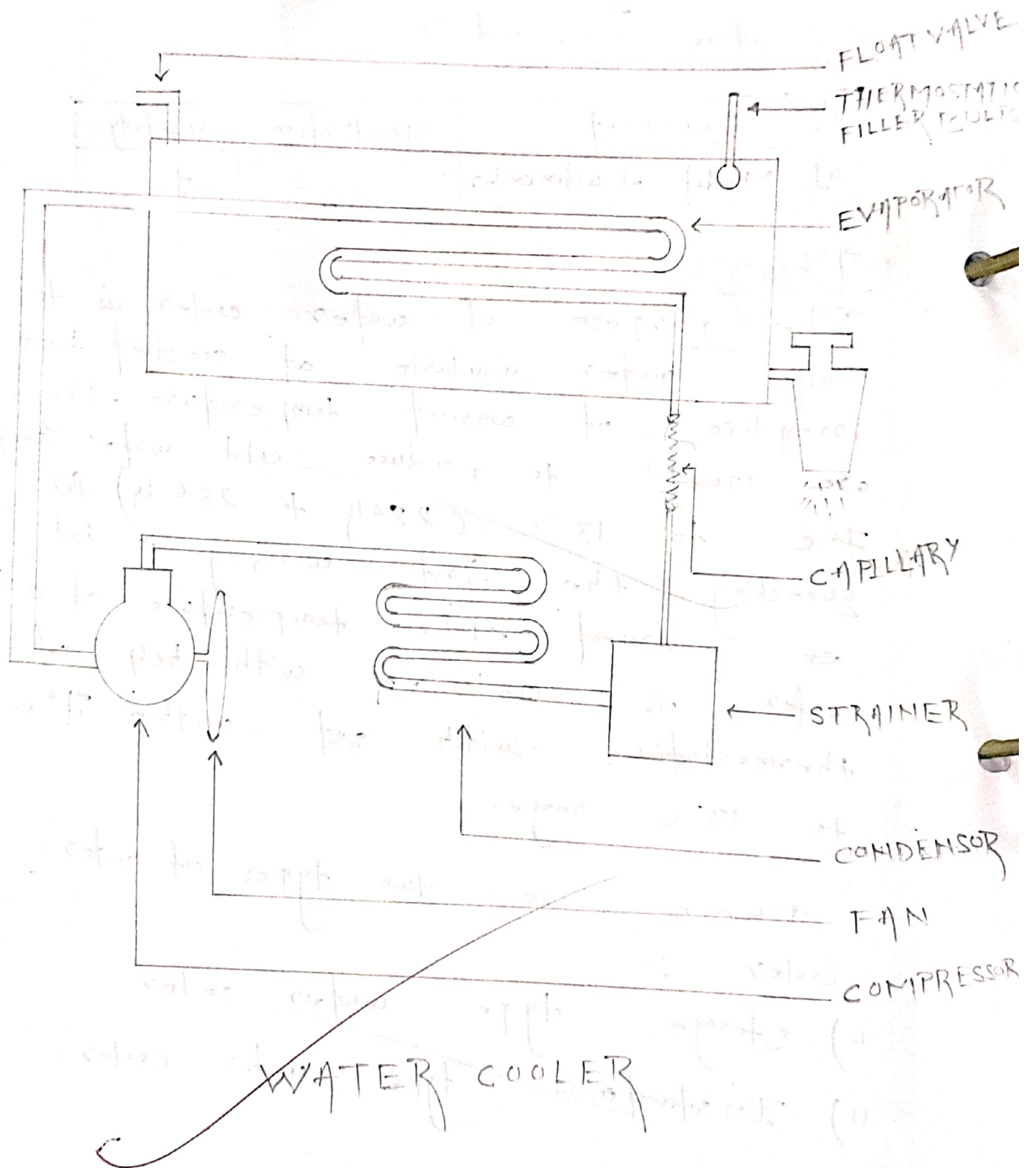
The purpose of water cooler is to make water available at constant temp. irrespective of ambient temperature. They are meant to produce cold water about 7°C to 13°C (280K to 286K) for quenching the first working in hot environment. The temperature of cold water is controlled with help of thermostatic switch set within 7°C to 13°C range.

There are two types of water cooler :-

- 1.) Storage type water cooler
- 2.) Instantaneous type water cooler.

GOVERNMENT POLYTECHNIC, BALANGIR







STORAGE TYPE WATER COOLER :-

- i.) The evaporator coil is soldered into wall of the storage tank of cooler.
- ii.) The tank may be galvanized steel or stainless steel. The water level in tank is maintained by float valve.
- iii.) In this type of water cooler the machine will run for long period to bring down the temperature of mass of water in storage tank.

- iv.) When the water is drawn from the cooler and equal amount of fresh water is allowed in tank, the temperature will rise up slowly and the machines start again.

INSTANTANEOUS TYPE WATER COOLER :-

- i.) cylindrical wound coil are bonded together by soldering.
- ii.) Bottle type water cooler.
- iii.) Pressure type water cooler.



→ In this type of water cooler the evaporator consist of two separate cylindrical around coil made up of cooler or stainless steel tube.

→ The evaporator refrigerant is one of the oil the other to be cooled is in the other oil.

→ The water cooled by the refrigerant in evaporator by conduction.

→ These water cooler are further classified as (a) Bottle type (b) pressure type (c) self contained remote type.

Conclusion :-

We have successfully ~~studied~~ studied about water cooler.

18/8/23

Submitted by :-

Name - Aman Bagarthy

Regd no - F21110004005

Branch - Mechanical

Experiment - 093



Page No. 09

Aim of the experiment :-

To study the construction features of window air conditioning.

Apparatus Required :-

S.L. of	Equipment	specification	Quantity
01	Window A.C	1 Tonn Cap.	1

Theory :-

The working of window air conditioner can be explained by separately considering the two cycles of air room air cycle and hot air cycle. The compartment of room and hot air are separated by an insulated partition inside the body of air conditioner. The setting of thermostat and that working has also been explained.

Room air cycle :-

The room air inside the room and in front part of air conditioner where the ceiling coil is located is considered to be room air. When the window A.C is started the blower starts

GOVERNMENT POLYTECHNIC, BALANGIR



immediately and after few second the compressor also start. The evaporator coil or the cooling coil get cooled as soon as the compressor is started.

The ~~blower~~ ^{blower} behind the cooling coil start sucking the room air, which is at high temperature and also carries the dirt and dust particles. On its path toward the blower, the room air first passes through the filter where the dirt and dust particles from it get removed.

The air then passes over the cooling coil where two process occur. Firstly, since the temperature of the cooling coil is much lesser than the room air, the refrigerant inside the cooling coil absorb the heat from the air. Thus, the moisture due to this heat temperature of the room air becomes very low, the air becomes chilled.



This air of low humidity and ~~low~~ is sucked by the blower and it blows it at high pressure. The chilled air then passes through small duct inside the air conditioner and it is then thrown ~~outside~~ the air conditioner through the opening in front panel or grill.

The cooled air inside the room absorbs the heat and also the moisture and so its temp. and moisture content ~~becomes~~ high. This air is again sucked by ~~blower~~ blower and cycle repeats. Some outside air also gets mixed with this ~~room~~ room air.

Hot Air cycle :-

The hot air cycle includes the atmospheric air that is used for cooling the condenser. The condenser of window air conditioner is exposed to external atmosphere. The propeller fan located behind

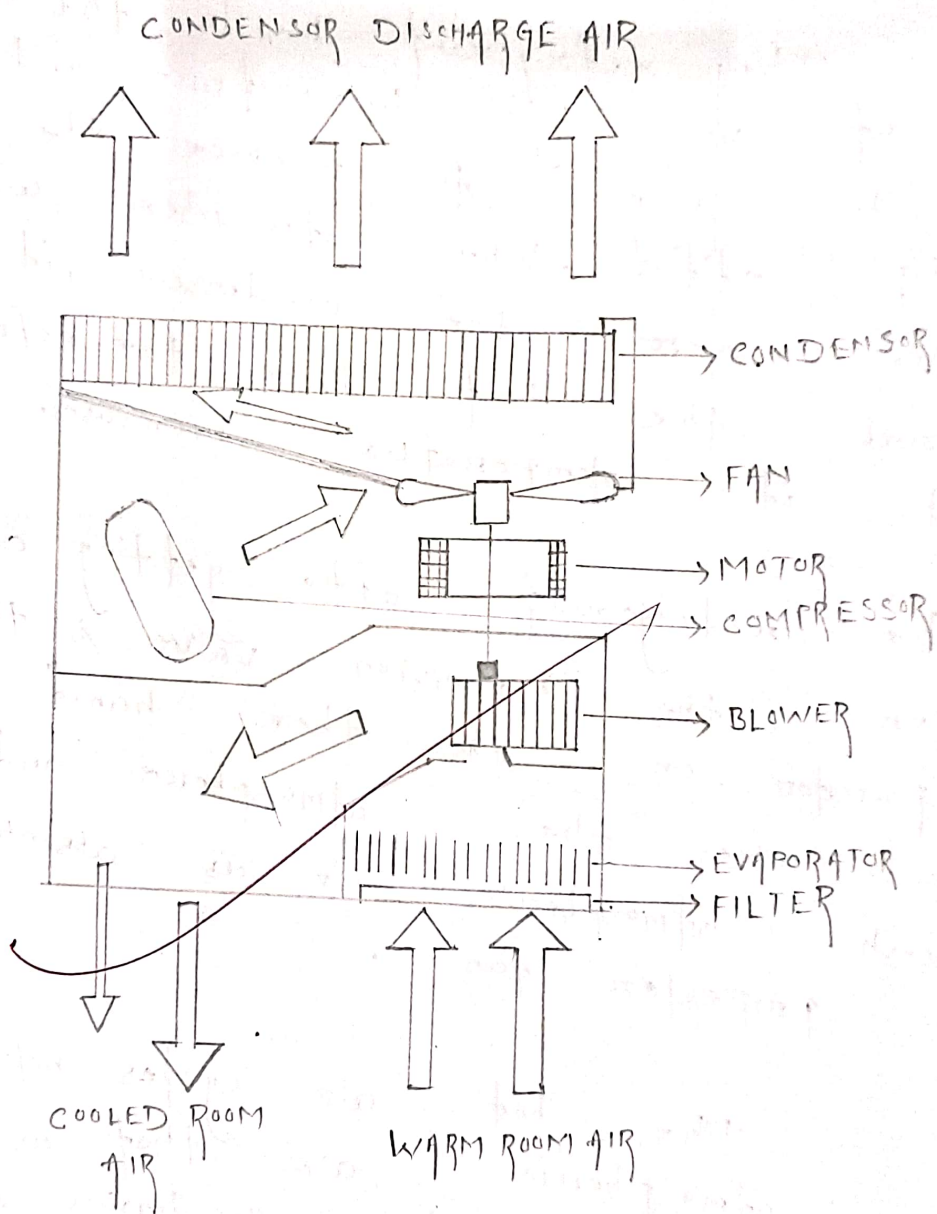


the condenser suck atmospheric at
high temperature .

The refrigerant inside the condenser is at very high temperature and it has to be cooled to produce the desired cooling effect . When atmospheric air passes over the condenser , it absorb the heat from the refrigerant and its temperature increases .

The refrigerant after getting cooled enter the expansion valve & then evaporator . on the other hand the hot air mixes the atmosphere and then fresh atmospheric air is absorbed by propeller fan .

The hot air cycles includes the atmospheric air that is used for cooling with low air conditioner is exposed to external atmosphere . The propeller fan located behind condenser sucks





the atmospheric air temperature & it
blow air over condenser.

Setting the speed of fan :-

The speed of air can be set
by fan motor button provided on
control panel. If your AC has
remote control you can see
the fan speed button on it.

Important part of window AC :-

The filter is very important part
of AC it cleans the air before
it enters the room. For proper
functioning of filter it is very
important to clean it every two
weeks. If this is not done the
filter will get ~~choked~~ choked
and it won't be able to
clean the air. soon the dirt
will also enter the evaporator
coil & choke it.



Conclusion :-

We have successfully studied the window
air conditioning.

Amal
1/9/23

Submitted by
Name - Amal R. Bagareddy
Branch - Mechanical
Regd no - F2111 0004005
Sem - 5th.

GOVERNMENT POLYTECHNIC, BALANGIR



Aim of the experiment :-

To study the construction features of split air conditioning.

Apparatus Required :-

01. Split A.C OF 1 TON OF 1 QUANTITY

Theory :-

A split air conditioner is a suitable alternative to wall, window or centralized air conditioner system, often called mini-split, ductless or duct-free air conditioning. This system can adequately cool a standard-sized house with requiring extensive installation cost & effort.

A split air conditioner is made up of two elements of primary part that very familiar. The evaporator and compressor. Both of these elements exist



is more common central air unit and wall air conditioner. The differences with mini-split system is that they are separated into two different distant components one being outdoor and one being indoor. The outdoor section is a compressor that initiates the cooling process, while the indoor component consist of an evaporator and fan.

The two section are connected with set of electrical wires and tubing also called lines used to transport air between the section. If these lines that allow the split to be considered ductless and the fact that the wires and tubing so small and discreet compared to large duct is where the mini split name comes from.



Function :-

The compressor is controlled by an internal thermostat. As the thermostat detects warm air it activates the outdoor compressor. The compressor

The compressor circulates a refrigerant gas, increasing the pressure and temperature of the refrigerant as it compresses it through a series of pipes. The refrigerant then moves to condenser for further processing.

In the condenser a cooling system removes heat from the high-pressure gas & gas change. The phase & become liquid. This chilled liquid is pushed through tubing indoors until it reaches the evaporator system.



Inside the home, the evaporator fan collect warm air and passes it through chamber containing the chilled liquid refrigerant. The fan system blow this air which has now been cooled back into the room, lowering the overall temp of space. If the thermostat still detect air that is warmer than desirable, process continues and refrigerant and any excess heat that remain in system are passed back out door to compressor to in order to begin cycle again.

Benefit of split Air system :-

1.) Less energy loss -

A split air conditioner is compact and isolated between two localized component section, so there, is very little opportunity for heat and other energy to escape the system. centralized air conditioning system waste enormous amount of energy due to heat exchanges in the air conditioner system.



2.) Less Heat loss -
Split air conditioner system are preferable to window and wall air conditioning unit as well. Although the latter are small and easily to install, they do not provide reliable large space or to multiple rooms.

3.) Targeted Heating and cooling -
Additionally it possible to have more than one indoor evaporator and fan, you could have in each room or area of your home and run them each independently with only one outdoor compressor. This combines the efficiency and customization of space heater or fan with convenience air.

Conclusion :-

We have successfully studied the split type air conditioning.

Aman
15/9/23

Submitted by
Name - Aman Rajawat
Branch - Mechanical
Regd no - F21110004605



Aim of the experiment :-

To determine the COP of simple vapour compression refrigeration system.

Apparatus Required :-

S.L No	Equipment	Specification	Quantity
01	Refrigerator	Vapour compression	1
02			
03			

Theory :-

The vapour compression refrigeration system is now days used for all purpose of refrigeration. It uses a refrigerant sealed in air tight and leak proof mechanism through the system and refrigerant is circulated.



through system and under goes a number of changes in its state. While passing through various parts of system, the refrigerant absorbs heat from one place to another.

Construction :-

A simple vapour compression refrigeration system mainly consist of compressor, condenser, receiver, expansion valve and evaporator. The compressor consist of an arrangement in which an electric motor is provided. The condenser is made in coil shaped pipe refrigerant is stored tank in which liquid vapour refrigerant of pressure is evaporated.

Working procedure :-

- i.) Give proper power supply to the vapour compressor refrigeration tube.
- ii.) Switch on the condenser, compressor.



- 3.) Note down pressure reading and temp. reading for calculation.
- 4.) Take down the meter reading in 30 min intervals.
- 5.) While switching off the test rig first switch off the compressor then condenser and finally switch off the main switch.

S.L.	Pressure in PSI		Temperature (°C)				Mass flow rate kg/min
	P ₁	P ₂	T ₁	T ₂	T ₃	T ₄	

Calculation :-

T_1, P_1 = compressor inlet temp & pressure.
 T_2, P_2 = compressor outlet temp & pressure.
 T_3, P_3 = condenser " " " "
 T_4 = Evaporator temperature

$$\text{Relative COP} = \frac{(\text{COP})_{\text{actual}}}{(\text{COP})_{\text{Theoretical}}}$$

$$(\text{COP})_{\text{actual}} = \frac{Q}{W}$$

$$Q = \text{Heat extracted in evaporator} \\ = m_w \times c_{pw} \times (T_{y \text{ initial}} - T_{y \text{ final}})$$

c_{pw} = specific heat of water.

W = work input.

We got the meter reading after 30 min is _____.

From pressure :-

$$P_1 = \underline{\hspace{2cm}}$$

$$P_2 = \underline{\hspace{2cm}}$$

$$1 \text{ bar} = 14.5 \text{ psi}$$

$$1 \text{ psi} = \frac{1}{14.5} \text{ bar}$$

psi = pound per square inch.

$$(\text{COP})_{th} = \underline{\hspace{2cm}}$$

$$(\text{COP})_{rel} = \frac{(\text{COP})_{\text{actual}}}{(\text{COP})_{th}}$$

GOVERNMENT POLYTECHNIC, BALANGIR



Conclusion :-

We successfully conducted experiment
and actual COP is _____ the
theoretical COP is _____
relative COP is found to
be _____.

Submitted by :-

Name - Aman Bhandari
Regd no - F2111004005
Branch - Mechanical

Experiment - 06

Page No. 25

Aim of the experiment :-

To determine the COP of window types air conditioning test rig.

Apparatus Required :-

S/L	Equipment	Quantity
01	window air conditioning	1

Theory :-

Refrigeration is defined as process of reducing and maintaining temp of a space less than that of surrounding. But air conditioning is the process of reducing and maintaining temperature along with velocity, humidity and purity of air of space. window air conditioning is one type air conditioner.

GOVERNMENT POLYTECHNIC, BALANGIR

Coefficient of performance is defined as ratio of heat extracted in the evaporator to work done on refrigerant.

Working principle :-

- 1.) switch on main board. check voltage should, it should not be less than 220 volt.
- 2.) switch on the condenser fan motor.
- 3.) start the blowers of ceiling fan.
- 4.) start compressor.
- 5.) check the amperes. Initially it shall be around 10 amp and then it will decrease to 5 amp.
- 6.) Note down reading pressure gauges. Absence of any reading will indicate blockages of pipelines.



8.) Note down various reading and calculate.

9.) While switching off machine the compressor then condenser fan motor.

S.L	Pressure in Psi		Temp. (°C)			
	P ₁	P ₂	T ₁	T ₂	T ₃	T ₄

Calculation :-

T₁, P₁ = Compressor inlet temp and pressure

T₂, P₂ = Compressor outlet temp and pressure

T₃, P₃ = Condenser outlet temp & pressure

T₄ = Evaporator temp

$$COP = \frac{Q}{W}$$



$$COP = \frac{h_1 - h_4}{h_2 - h_1}$$

Conclusion :-

We successfully conducted experiment
and COP is found to be _____.

Submitted by :-

Harman Aman Bishwari

Regd no - F2111000405

Branch - Mechanical / 5th

Experiment - of

Page No. 28



Aim of the experiment :-

To determine COP of split type air conditioning test rig

Apparatus Required :-

1.) split air conditioning test rig.

Theory :-

Refrigeration is defined as process of reducing and maintaining temperature of space less than that of surrounding. But air conditioning is the process of reducing and maintaining temperature along with velocity, humidity & purity of air of space. Split type air conditioner is one type of air conditioner.

COP is defined as the ratio of heat extracted in the evaporation to work done.



on the refrigerator.

$$\text{COP} = \frac{Q}{W}$$

Working principle :-

- 1.) switch on main board. check voltage, it should not be less than 220 volt.
- 2.) switch on the condenser fan motor.
- 3.) start the blower of cooling coil.
- 4.) start the compressor
- 5.) check the amperes meter for compressor. Initially it shall be around 10 amp. then it will decrease to 4 to 5 amp.

c.) Note down reading for service pressure gauges. Absence of any reading will indicate sticking of pipe line.

GOVERNMENT POLYTECHNIC, BALANGIR



7) Take down reading of various temperature in digital temp.

8) Note down various reading and calculate COP.

S.L	Pressure		Temperature			
	P ₁	P ₂	T ₁	T ₂	T ₃	T ₄

Calculation :-

T₁, P₁ = compressor inlet temp & pressure
 T₂, P₂ = compressor outlet temp & pressure
 T₃, P₃ = condenser outlet temp & pressure
 T₄ = Evaporator temperature

$$COP = \frac{Q}{W}$$



$$COP = \frac{h_1 - h_4}{h_2 - h_1}$$

Conclusion :-

We successfully conducted the experiment and the COP is found to be _____.

submitted by

Name - Aman Bera

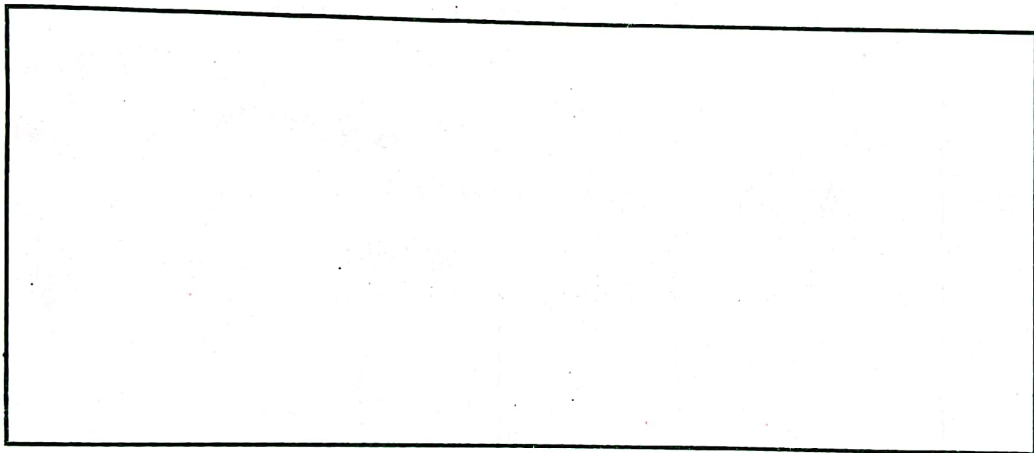
Branch - Mechanical

Regd no - F2116004005

GOVERNMENT POLYTECHNIC, BALANGIR



LARKIPALI, BALANGIR



State Council Regd. No. F21110004050

Name Sushanta maharana

Roll. No. 4050 Semester 5th Session

Branch Mechanical Group

Subject CAD & CAM Lab

GOVERNMENT POLYTECHNIC, BALANGIR

DEPARTMENT OF



INDEX PAPER

Sl. No.	NAME OF THE EXPERIMENT	DATE	SHEET USED	REMARKS
1	TO draw a circle by using 2D drafting.	14.8.23	1 to 3	II 12/8/23
2.	TO draw rectangle by using 2D drafting.	18.8.23	4 to 5	II 18/8/23
3.	TO create a polygon by using 2D drafting.	28/08/23	6 to 8	II 28/8/23
4.	Draw a screw jack by using 2D drafting.	11/09/23	7 to 8	II 11/09/23
5.	Draw a screw jack by using 3D drafting.	06/10/2023	9 to 10	II 3/10
6.	To create/draw a gib & cutter joint by using 3D drafting.	03/11/2023	10 to 11	II 10/11/23



Aim of the experiment :-

To draw a circle by using 2D drafting.

Apparatus Required :-

Auto desk 2021

Theory :-

A circle in two dimensional plane has a fixed radius / diameter and its center has specified by co-ordinates by knowing its Center, co-ordinate and radius / diameter we can construct and create in two dimensional plane by using Auto-CAD.

Command used :-

(1) C

(2) 3P, 2P, TTR, TTT



1. Center radius :-

Procedure :

- C ↵
- Specify center point of circle (point 1) and click.
- Specify radius of circle (point 2) and click.

2. Center Diameter :-

Procedure :

- C ↵
- Specify center point of the circle (point 1)
- D ↵ (For diameter)
- Specify "Diameter of circle" ↵

3. 2-point circle :-

Procedure :

- C ↵
- 2P ↵
- Specify 1st point of circle (click)
- Specify 2nd point of circle (click)

4. 3-point circle :-

Procedure :

- C ↵
- 3P ↵
- Specify 1st point of circle (click)
- Specify 2nd point of circle (click)
- Specify 3rd point of circle (click)

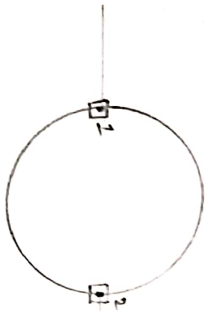
1. Center radius



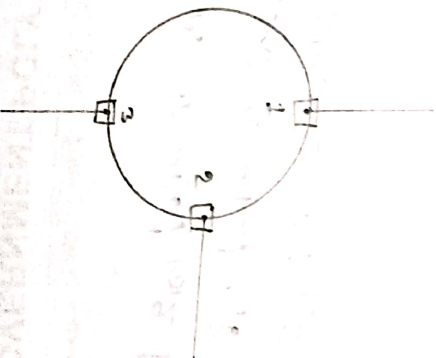
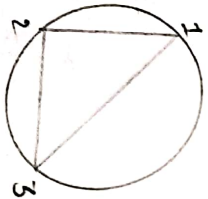
2. Center diameter



3. 2-Point Circle



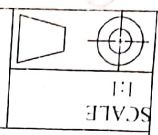
4. 3-Point Circle



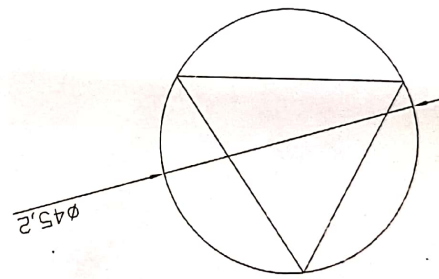
GOVERNMENT POLYTECHNIC, BALANGIR		MECHANICAL ENGINEERING	
DESIGNED		DRAWN	
CHECKED		STANDARD	ISO
APPROVED			
NAME		DATE	

DRAWING NO.1

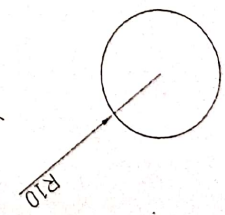
SHEET 1 OF 1



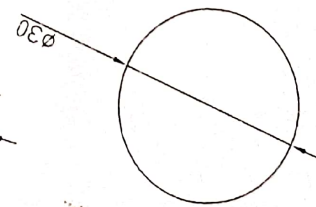
3 POINT CIRCLE



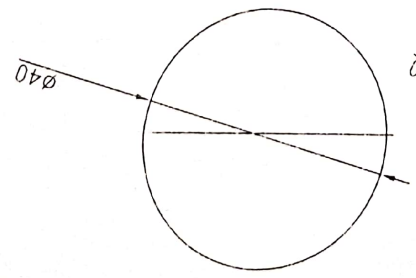
CENTER RADIUS



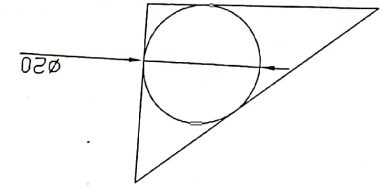
CENTER DIAMETER



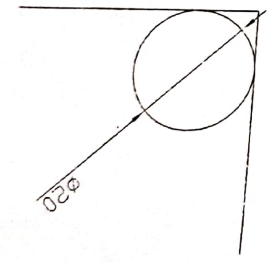
2 POINT CIRCLE



TAN, TAN, TAN CIRCLE



TAN, TAN, RADIUS





5. Tan, Tan, Radius :-

Procedure :-

- C $\swarrow$
- T $\swarrow$ (For tan, tan, Radius)
- Specify 1st tangent point of circle.
- Specify 2nd tangent point of circle.
- Specify Radius of circle $\swarrow$

6. Tan, Tan, Tan :-

Procedure :-

- Go to "draw" menu.
- select "tan, tan, tan"
- select 1st tangent of circle
- select 2nd tangent of circle
- specify 3rd tangent of circle

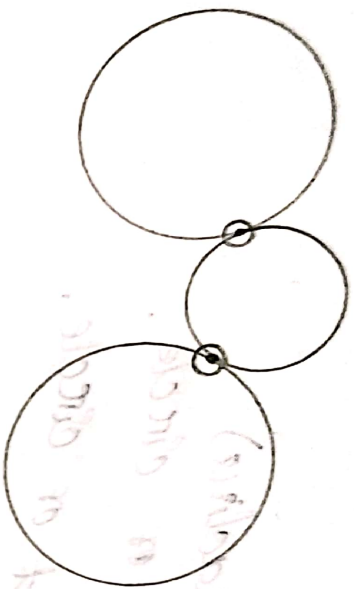
* Conclusion :-

from the above experiment we have successfully drawn the circle by using 3D drawing

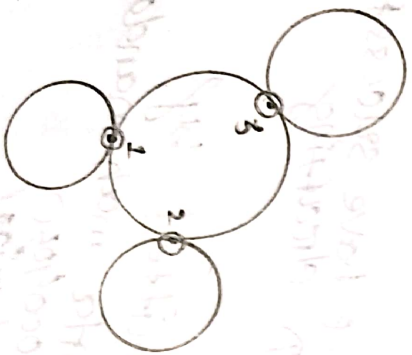
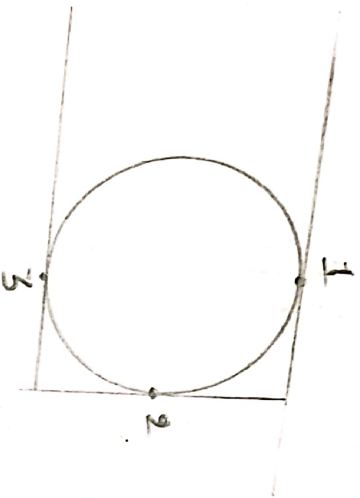
Submitted by
NAME - Sushanta mahamunda
Reg No - F21110004050
Branch - Mechanical

18/01/22

5. Tan, Tan, Teaching



6. Tan, Tan, Tan



AIM OF THE EXPERIMENT :-

To draw rectangle by using 2D drafting.

APPARATUS REQUIRED :-

Auto desk 2001

THEORY :-

A rectangle in two dimensional plane has corner point which are specified by co-ordinates in two dimensional plane by using Auto cad.

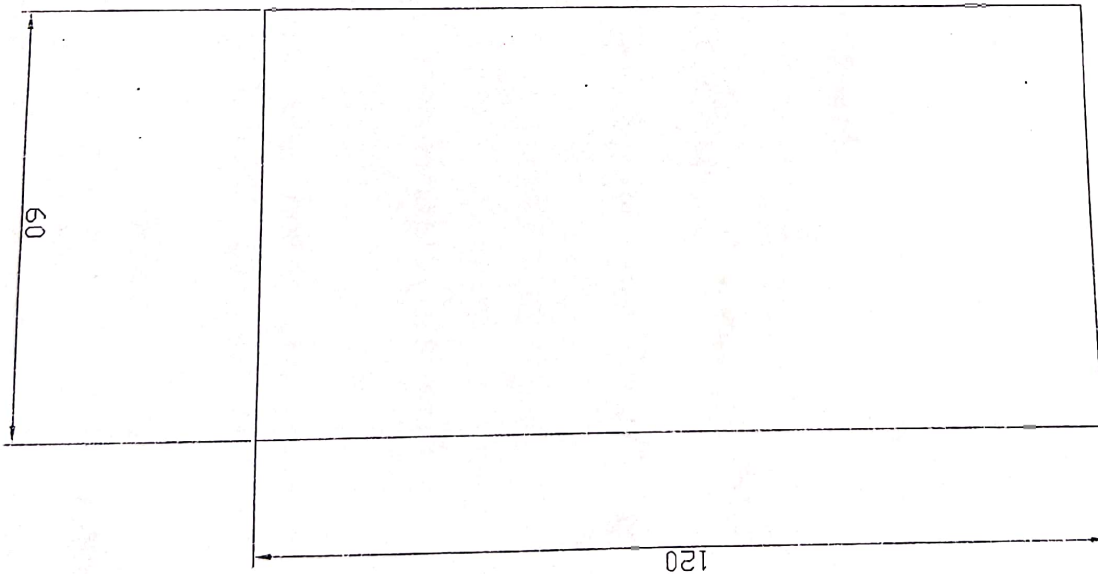
COMMAND USED :-

1. Rec ↵
2. Area, Dimensional, Rotational.

Procedure :-

1) By using diagonal method :-

- Rec ↵
- Click and specify first corner point
- Click and specify other corner point.



RECTANGLE 120*60

GOVERNMENT POLYTECHNIC, BALANGIR
MECHANICAL ENGINEERING

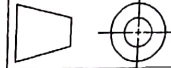
NAME		DATE
DESIGNED		
DRAWN		
CHECKED		
STANDARD	ISO	
APPROVED		

DRAWING NO.2

SHEET 2

SCALE 1:1

RECTANGLE



(ii) By using Dimensional method :-

- Rec $\swarrow$
- click and specify first corner point.
- D $\swarrow$
- Specify length of rectangle. (120 mm)
- specify width of rectangle. (40 mm)

(iii) By using Area method :-

- Rec $\swarrow$
- specify first corner point.
- A $\swarrow$
- specify the area of rectangle (8000 mm²)
- specify the width of rectangle or length of rectangle.
- W $\swarrow$
- specify the width of rectangle (50 mm)

* Conclusion :-

From the above experiment we have successfully draw the rectangle by using 2D drafting.

18/8/23

Submitted by
Reg. No - 2011000450
Branch - mechanical



Aim of the experiment :-

To create a polygon by using 2D drafting.

Apparatus required :-

1) Auto desk 2021

Theory :-

A polygon of various no. of side can be created / draw if the centre of polygon and no. of side are specified. We can also inscribe or circumscribe a circle in polygon in a two dimensional plane by using Auto CAD.

Commands for polygon :-

- i) Polygon
- ii) Enter no. of side
- iii) Specify centre of polygon
- iv) Specify inscribed or circumscribed
- v) Specify the radius of circle.

Conclusion :-

From the above experiment we have successfully drawn polygon using 2D drafting.

Submitted by

01/09/23

Name - Sushanta Mahananda

Regd no - 121110004030

Branch - Mechanical / 1st year



AIM of the Experiment:-
Create / draw a screw jack by using 2D drafting.

APPARATUS REQUIRED:-

Auto-CAD 2021

THEORY:-

A screw jack manually operated is contrivance to lift heavy object over a small height with distinct mechanical advantage it also serves as a supporting aid the raised position. A screw jack is actuated by square thread. screw worked by applying moderate effort at the end of a tommy bar inserted into the hole at the head of the screw.

COMMAND Used for making A screw Jack:-

1. Line command
2. circle
3. Hatching
4. Osnap
5. ortho
6. offset
7. method of increment/extend
8. filled
9. Dimension
10. cut/trim.

procedure:-

- (1) Open auto-cad → start a new drawing
- (2) Draw the base: use the line, rectangle or polyline to create the base of the screw jack.
- (3) Draw a helical structure resembling a screw.
- (4) Detailing: Add necessary details or annotation to label the parts or indicate dimension.
- (5) save the drawing



CONCLUSION :-
We successfully ahead a screw jack using 2D
drawing.

18/9/22

Submitted by

Name :- Sushanta maharanda
Branch :- mechanical / 5th sem
Regd No :- FA1100040520



AIM OF THE EXPERIMENT:-
Create / draw a screw jack by 3D drafting.

APPARATUS REQUIRED:-

Auto-CAD 2021

THEORY:-

A screw jack manually operated is contrivance to lift to heavy object over a small height with a distinct mechanical advantage it also serves as a supporting aid in the raised position. A screw jack is actuated by a square threaded screw work by applying a moderate effort at the end of a tommy bar inserted into the hole of the screw.

COMMAND USED FOR MAKING A SCREW JACK:-

1. Line
2. Circle
3. Offset
4. Snap
5. Dimensioning
6. Ortho
7. Fillet
8. Cut
9. Extrude
10. Revolve

PROCEDURE:-

1. Model different parts of a screw jack using Extrude, Revolve
2. Create body of the screw jack.
3. Select XZ plane.
4. Draw the 2D sketch as shown.
5. Use revolved position command to create 3D feature angle 360° .

Conclusion:-
We successfully draw a screw jack using 3D modeling.

13/10/23

Submitted by

Name :- Sushanta Mahapatra
Branch :- Mechanical / 1st Sem
Regd No :- 121110004032



Aim of the experiment :-

To Create / draw a gib & cutter joint by using 3D drafting.

Apparatus required :-

1) Auto desk 2001

Theory :-

When the rod of square or rectangular cross-section subjected to axial forces have to be connected temporarily a strap joint is used. In this type of cutter joint, the end of one of the rods is forced into the force into which the end of other rod fits. The forced end of rod is called strap since the strap is open on one side if only other is used to connect the two rods as explained earlier and when the rods are subjected to axial forces the end of the strap open end to prevent the opening out of the ends strap gib used in conjunction with the cutter.

Procedure :-

1) Draw the 2D profile of the gib cutter using lines, arc, and circle in the XY plane.

ii) Use the extrude command to give the 2D profile depth in the Z-direction to create the 2D shape.

iii) Adding detail :- Apply chamfers on fillet to smooth edges on add any necessary detail to the cutter.



(iv) Review the 3D model to ensure accuracy and functionality adjust dimension or shape if necessary.

(v) Finalization save the file and consider adding annotation for detail for manufacturing.



Submitted by


10/11/23

Name :- Sushanta Mahapatra
Branch :- Mechanical / 5th
Regd no :- F2111000403D