17CVCC93 - HYDRAULICS AND STRENGTH OF MATERIALS LAB (UG)

STANDARD OPERATING PROCEDURE

Name of the lab facility	**Fluid mechanics and machinery lab**
Purpose	**To determine the co-efficient discharge through orifice meter and venturimeter**
Scope	**At the end of this experiment, the student will be able to Calculate the value of coefficient of discharge for the given orifice and venturimeter and Know the applications.**
Responsibility	**Faculty incharge & HOD/MECH**

ORIFICE METER AND VENTURIMETER

PROCEDURE

1. **Ensure sufficient water is there in the main tank**
2. **Check the experimental setup for leaks. Measure the dimensions of collecting**
3. **The pipe is selected for doing experiments**
4. **The motor is switched on, as a result water will flow**
5. **According to the flow, the mercury level fluctuates in the U-tube manometer**
6. **The reading of H 1 and H 2 are noted**
7. **The time taken for 10 cm rise of water in the collecting tank is noted**
8. **The experiment is repeated for various flow in the same pipe**
9. **The co-efficient of discharge is calculated**

17CVCC93 - HYDRAULICS AND STRENGTH OF MATERIALS LAB (UG)

STANDARD OPERATING PROCEDURE

Name of the lab facility	**Fluid mechanics and machinery lab**
Purpose	**To determine of friction factor of Given set of pipes**
Scope	**At the end of this experiment, the student will be able to: Calculate the value of coefficient of friction for the given pipe and use it while designing.**
Responsibility	**Faculty incharge & HOD/MECH**

PIPE FRICTION

PROCEDURE

1. **Ensure sufficient water is there in the main tank**
2. **Check the experimental setup for leaks. Measure the dimensions of collecting tank**
3. **The diameter of the pipe is measured and the internal dimensions of the collecting tank and the length of the pipe line is measured**
4. **Keeping the outlet valve closed and the inlet valve opened**
5. **The outlet valve is slightly opened and the manometer head on the limbs H 1 and H 2 are noted**
6. **The above procedure is repeated by gradually increasing the flow rate and then the corresponding readings are noted.**

17CVCC93 - HYDRAULICS AND STRENGTH OF MATERIALS LAB (UG)

STANDARD OPERATING PROCEDURE

Name of the lab facility	**Fluid mechanics and machinery lab**
Purpose	**To study the performance characteristics of a centrifugal pump and to determine the characteristic with maximum efficiency.**
Scope	**At the end of this experiment, the student will be able to: Know the operation of centrifugal pump and Draw the characteristic curves of centrifugal pump at constant speed.**
Responsibility	**Faculty incharge & HOD/MECH**

CENTRIFUGAL PUMP

PROCEDURE

1. **Ensure sufficient water is there in the main tank**
2. **Check the experimental setup for leaks.**
3. **Measure the dimensions of collecting tank**
4. **Prime the pump close the delivery valve and switch on the unit**
5. **Open the delivery valve and maintain the required delivery head**
6. **Note down the reading and note the corresponding suction head reading**
7. **Close the drain valve and note down the time taken for 10 cm rise of water level in collecting tank**
8. **Measure the area of collecting tank**
9. **For different delivery tubes, repeat the experiment**
10. **For every set reading note down the time taken for 5 revolutions of energy meter disc.**

17CVCC93 - HYDRAULICS AND STRENGTH OF MATERIALS LAB (UG)

STANDARD OPERATING PROCEDURE

Name of the lab facility	**Fluid mechanics and machinery lab**
Purpose	**To study the performance characteristics of a reciprocating pump and to determine the characteristic with maximum efficiency.**
Scope	**At the end of this experiment, the student will be able to: Know the operation of reciprocating pump and Draw the characteristic curves of reciprocating pump.**
Responsibility	**Faculty incharge & HOD/MECH**

RECIPROCATING PUMP

PROCEDURE

1. **Ensure sufficient water is there in the main tank**
2. **Check the experimental setup for leaks.**
3. **Measure the dimensions of collecting tank**
4. **Prime the pump close the delivery valve and switch on the unit**
5. **Open the delivery valve and maintain the required delivery head**
6. **Note down the reading and note the corresponding suction head reading**
7. **Close the drain valve and note down the time taken for 10 cm rise of water level in collecting tank**
8. **Measure the area of collecting tank**
9. **For different delivery tubes, repeat the experiment**
10. **For every set reading note down the time taken for 5 revolutions of energy meter disc.**

17CVCC93 - HYDRAULICS AND STRENGTH OF MATERIALS LAB (UG)

STANDARD OPERATING PROCEDURE

Name of the lab facility	**Fluid mechanics and machinery lab**
Purpose	**To study the performance characteristics of a gear oil pump and to determine the characteristic with maximum efficiency.**
Scope	**At the end of this experiment, the student will be able to: Know the operation of gear oil pump and Draw the characteristic curves of gear oil pump.**
Responsibility	**Faculty incharge & HOD/MECH**

GEAR OIL PUMP

PROCEDURE

1. **Ensure sufficient oil is there in the main tank.**
2. **Check the experimental setup for leaks.**
3. **Measure the dimensions of collecting tank .**
4. **Close the delivery valve and switch on the unit.**
5. **Open the delivery valve and maintain the required delivery head.**
6. **Note down the reading and note the corresponding suction head reading.**
7. **Close the drain valve and note down the time taken for 10 cm rise of water level in collecting tank.**
8. **Measure the area of collecting tank.**
9. **For different delivery tubes, repeat the experiment.**
10. **For every set reading note down the time taken for 5 revolutions of energy meter disc.**

17CVCC93 - HYDRAULICS AND STRENGTH OF MATERIALS LAB (UG)

STANDARD OPERATING PROCEDURE

Name of the lab facility	**Fluid mechanics and machinery lab**
Purpose	**To study the performance characteristics of a jet pump and to determine the characteristic with maximum efficiency.**
Scope	**At the end of this experiment, the student will be able to: Know the operation of jet pump and Draw the characteristic curves of jet pump.**
Responsibility	**Faculty incharge & HOD/MECH**

JET PUMP

PROCEDURE

1. **Ensure sufficient water is there in the main tank**
2. **Check the experimental setup for leaks.**
3. **Measure the dimensions of collecting tank**
4. **Prime the pump close the delivery valve and switch on the unit**
5. **Open the delivery valve and maintain the required delivery head**
6. **Note down the reading and note the corresponding suction head reading**
7. **Close the drain valve and note down the time taken for 10 cm rise of water level in collecting tank**
8. **Measure the area of collecting tank**
9. **For different delivery tubes, repeat the experiment**
10. **For every set reading note down the time taken for 5 revolutions of energy meter disc.**

17CVCC93 - HYDRAULICS AND STRENGTH OF MATERIALS LAB (UG)

STANDARD OPERATING PROCEDURE

Name of the lab facility	**Fluid mechanics and machinery lab**
Purpose	**To conduct load test on pelton wheel turbine and to study the characteristics of pelton wheel turbine.**
Scope	**At the end of this experiment, the student will be able to: Know the working of a Pelton wheel and Draw the characteristic curves of Pelton wheel turbine**
Responsibility	**Faculty incharge & HOD/MECH**

PELTON WHEEL TURBINE

PROCEDURE

1. **Ensure sufficient water is there in the main tank**
2. **Check the experimental setup for leaks.**
3. **The Pelton wheel turbine is started.**
4. **All the weight in the hanger is removed.**
5. **The pressure gauge reading is noted down and it is to be maintained constant for different loads.**
6. **The Venturimeter readings are noted down.**
7. **The spring balance reading and speed of the turbine are also noted down.**
8. **A 5Kg load is put on the hanger, similarly all the corresponding readings are noted down.**
9. **The experiment is repeated for different loads and the readings are tabulated.**

17CVCC93 - HYDRAULICS AND STRENGTH OF MATERIALS LAB (UG)

STANDARD OPERATING PROCEDURE

Name of the lab facility	**Fluid mechanics and machinery lab**
Purpose	**To conduct load test on Francis turbine and to study the characteristics of Francis turbine.**
Scope	**At the end of this experiment, the student will be able to: Know the working and Draw the characteristic curves of Francis turbine**
Responsibility	**Faculty incharge & HOD/MECH**

FRANCIS TURBINE

PROCEDURE

1. **Ensure sufficient water is there in the main tank and Check the experimental setup for leaks.**
2. **The Francis turbine is started All the weights in the hanger are removed**
3. **The pressure gauge reading is noted down and this is to be Maintained constant for different loads**
4. **Pressure gauge reading is ascended down. The Venturimeter reading and speed of turbine are noted down**
5. **The spring balance reading and speed of the turbine are also noted down.**
6. **A 5Kg load is put on the hanger, similarly all the corresponding readings are noted down.**
7. **The experiment is repeated for different loads and the readings are Tabulated**

17CVCC93 - HYDRAULICS AND STRENGTH OF MATERIALS LAB (UG)

STANDARD OPERATING PROCEDURE

Name of the lab facility	**Fluid mechanics and machinery lab**
Purpose	**To conduct load test on Kaplan turbine and to study the characteristics of Kaplan turbine.**
Scope	**At the end of this experiment, the student will be able to: Know the working and Draw the characteristic curves of Kaplan turbine**
Responsibility	**Faculty incharge & HOD/MECH**

KAPLAN TURBINE

PROCEDURE

1. **Ensure sufficient water is there in the main tank and Check the experimental setup for leaks.**
2. **The Kaplan turbine is started All the weights in the hanger are removed**
3. **Open the gate valve slowly**
4. **Note down the pressure gauge reading G.**
5. **Note down the vacuum gauge reading V.**
6. **Vent the gauges of venturimeter**
7. **Note down the readings of pressure gauge (G 1) and vacuum gauge (V 1)**
8. **Measure the speed of the turbine by tachometer.**
9. **Load the turbine by placing dead weight and take all readings.**
10. **Experiment can be repeated for different guide and runner vane openings.**

17CVCC93 - HYDRAULICS AND STRENGTH OF MATERIALS LAB (UG)

STANDARD OPERATING PROCEDURE

Name of the lab facility	**Fluid mechanics and machinery lab**
Purpose	**To find the co-efficient of impact (C i) of the jet on fixed vanes of different types.**
Scope	**At the end of this experiment, the student will be able to: Derive the expression for impact of jet on flat and hemispherical plates. Calculate the co-efficient of impact.**
Responsibility	**Faculty incharge & HOD/MECH**

IMPACT OF JET OF WATER ON VANES

PROCEDURE

1. **Fix the vane to be tested inside the testing chamber by opening the top cover**
2. **Note the initial reading on the scale**
3. **Open the inlet water. The water jet from the nozzle strikes on the vane, gets deflected and drains back to the collecting tank.**
4. **Note the spring balance reading**
5. **Close the collecting tank drain valve, and note the time for 10cm rise in water level in the collecting tank.**
6. **Open the drain valve of collecting tank.**
7. **Repeat the experiment for different flow rates by adjusting the position of the inlet valve and for different values.**

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17CVCC93 - HYDRAULICS AND STRENGTH OF MATERILAS LAB (UG)

STANDARD OPERATING PROCEDURE

Name of the Lab /facility	**Strength Of The Materials Lab**
Purpose	**To determine the Rockwell hardness number of the given specimen.**
Scope	**The concept of Rockwell hardness test can be studied easily and to find hardness of given specimens and also easy to operate and ideal for group studies & demonstration.**
Responsibility	**Faculty Incharge, HOD/MECH**

ROCKWELL HARDNESS TEST

PROCEDURE:

1. Clean the surface of the specimen with an emery sheet.
2. Place the specimen on the testing platform.
3. Raise the platform until the longer needle comes to rest
4. Release the load.
5. Apply the load and maintain until the longer needle comes to rest
6. After releasing the load, note down the dial reading.
7. The dial reading gives the Rockwell hardness number of the specimen.
8. Repeat the same procedure three times with specimen.
9. Find the average. This gives the Rockwell hardness number of the given specimen.

17CVCC93 - HYDRAULICS AND STRENGTH OF MATERILAS LAB (UG)

STANDARD OPERATING PROCEDURE

Name of the Lab /facility	Strength Of The Materials Lab
Purpose	To find the brinell hardness number for the given metal specimen.
Scope	The concept of Brinell hardness test can be studied easily and to find hardness of given specimens and also easy to operate and ideal for group studies & demonstration.
Responsibility	Faculty Incharge, HOD/MECH

BRINELL HARDNESS TEST

PROCEDURE:

1. Specimen is placed on the anvil. The hand wheel is rotated so that the specimen along with the anvil moves up and contact with the ball.
2. The desired load is applied mechanically (by gear driven screw) and the ball presses Into the specimen.
3. The diameter of the indentation made in the specimen by the pressed ball is measured by the use of a micrometer microscope, having transparent engraved scale in the field of view.
4. The indentation diameter is measured at two places at right angles to each other, and the average of two readings is taken.
5. The Brinell Hardness Number (BHN) which is the pressure per unit surface area of the indentation is noted down.

17CVCC93 - HYDRAULICS AND STRENGTH OF MATERILAS LAB (UG)

STANDARD OPERATING PROCEDURE

Name of the Lab /facility	**Strength Of The Materials Lab**
Purpose	**To conduct the torsion test on the given specimen for the following** **1. Modulus of rigidity** **2. Shear stress**
Scope	**The concept of Torsional test can be studied easily and to find torsion properties of given specimens and also easy to operate & demonstration.**
Responsibility	**Faculty Incharge, HOD/MECH**

TORSION TEST

PROCEDURE:

1. Measure the diameter and length of the given rod.
2. The rod is fixing in to the grip of machine.
3. Set the pointer on the torque measuring scale.
4. The handle of machine is rotate in one direction.
5. The torque and angle of test are noted for five degree.
6. Now the handle is rotated in reverse direction and rod is taken out

FORMULA USED:

1. Modulus of rigidity, $C = \frac{TL}{J\alpha}$ N/mm^2

Where,

α =angle of degree

2. Shear stress (t) =TR/L N/mm^2

17CVCC93 - HYDRAULICS AND STRENGTH OF MATERILAS LAB (UG)

STANDARD OPERATING PROCEDURE

Name of the Lab /facility	**Strength Of The Materials Lab**
Purpose	**To determine the stiffness of spring, modulus of rigidity of the spring wire and maximum strain energy stored.**
Scope	**The concept of spring test can be studied easily and to find stiffness properties of given springs and also easy to operate and ideal for group studies & demonstration.**
Responsibility	**Faculty Incharge, HOD/MECH**

SPRING TEST

PROCEDURE:

1. By using Vernier caliper measure the diameter of the wire of the spring and also the diameter of spring coil.
2. Count the number of turns.
3. Insert the spring in the spring testing machine and load the spring by a suitable weight and note the corresponding axial deflection in compression.
4. Increase the load and take the corresponding axial deflection readings.
5. Plot a curve between load and deflection. The shape of the curve gives the stiffness of the spring.

17CVCC93 - HYDRAULICS AND STRENGTH OF MATERILAS LAB (UG)

STANDARD OPERATING PROCEDURE

Name of the Lab /facility	**Strength Of The Materials Lab**
Purpose	**To determine the stiffness of spring, modulus of rigidity of the spring wire and maximum strain energy stored.**
Scope	**The concept of Impact test can be studied easily and to find impact energy of given specimens and also easy to operate and demonstration.**
Responsibility	**Faculty Incharge, HOD/MECH**

IMPACT TEST - IZOD

PROCEDURE:

1. **Raise the swinging pendulum weight and lock it.**
2. **Release the trigger and allow the pendulum to swing.**
3. **This actuates the pointer to move in the dial.**
4. **Note down the frictional energy absorbed by the bearings.**
5. **Raise the pendulum weight again and lock it in position.**
6. **Place the specimen in between the simple anvil support keeping the ”U” notch in the direction opposite to the striking edge of hammer arrangement.**
7. **Release the trigger and allow the pendulum to strike the specimen at its midpoint.**
8. **Note down the energy spent in breaking (or) bending the specimen.**
9. **Tabulate the observation.**

17CVCC93 - HYDRAULICS AND STRENGTH OF MATERILAS LAB (UG)

STANDARD OPERATING PROCEDURE

Name of the Lab /facility	**Strength Of The Materials Lab**
Purpose	**To study the UTM and perform the tensile test.**
Scope	**The concept of UTM test can be studied easily and to find Tensile,shear,Double shear properties of given specimens and also easy to operate and ideal for group studies & demonstration.**
Responsibility	**Faculty Incharge, HOD/MECH**

UNIVERSAL TESTING MACHINE (UTM)

PROCEDURE:

1. The load pointer is set at zero by adjusting the initial setting knob.
2. The dial gauge is fixed and the specimen for measuring elongation of Small amounts.
3. Measuring the diameter of the test piece by vernier caliper at least at three places and determine the mean value also mark the gauge length.
4. Now the specimen is gripped between upper and middle cross head Jaws of the m/c.
5. Set the automatic graph recording system
6. Start the m/c and take the reading.
7. The specimen is loaded gradually and the elongation is noted until the Specimen breaks.

17CVCC93 - HYDRAULICS AND STRENGTH OF MATERILAS LAB (UG)

STANDARD OPERATING PROCEDURE

Name of the Lab /facility	**Strength Of The Materials Lab**
Purpose	**To determine the Young"s modulus of the given specimen by conducting bending test.**
Scope	**The concept of Beam deflection test can be studied easily and to find young's modulus properties of given specimens and also easy to operate & demonstration.**
Responsibility	**Faculty Incharge, HOD/MECH**

BEAM DEFLECTION TEST

PROCEDURE:

1. **Measure the length (L) of the given specimen.**
2. **Mark the centre of the specimen using pencil / chalk**
3. **Mark two points A & B at a distance of 350mm on either side of the centre mark. The distance between A & B is known as span of the specimen (l)**
4. **Fix the attachment for the bending test in the machine properly.**
5. **Place the specimen over the two supports of the bending table attachment such that the points A &B coincide with centre of the supports. While placing, ensure that the Tangential surface nearer to heart will be the top surface and receives the load.**
6. **Measure the breadth (b) and depth (d) of the specimen using scale.**
7. **Place the dial gauge under this specimen at the centre and adjust the dial gauge Reading to zero position.**
8. **Place the load cell at top of the specimen at the centre and adjust the load indicator in the digital box to zero position.**
9. **Select a strain rate of 2.5mm / minute using the gear box in the machine.**
10. **Apply the load continuously at a constant rate of 2.5mm/minute and note down the deflection for every increase of 0.25 tonne load up to a maximum of 6 sets of readings.**
11. **Calculate the Young"s modulus of the given specimen for each load using the following formula:**

$$\text{Young's modulus, } E = \frac{Pl^3}{48I\delta}$$

Where,

P = Load in N

L = Span of the specimen in mm

I = Moment of Inertia in mm^4 ($bd^3/12$)

b = Breadth of the beam in mm.

d = Depth of the beam in mm

δ = Actual deflection in mm.

12. **Find the average value of young"s modulus that will be the Young"s modulus of the given specimen.**

17CVCC93 - HYDRAULICS AND STRENGTH OF MATERILAS LAB (UG)

STANDARD OPERATING PROCEDURE

Name of the Lab /facility	**Strength Of The Materials Lab**
Purpose	**To conduct the torsion test on the given specimen for the following** **1. Modulus of rigidity** **2. Shear stress**
Scope	**The concept of Torsional test can be studied easily and to find torsion properties of given specimens and also easy to operate & demonstration.**
Responsibility	**Faculty Incharge, HOD/MECH**

TORSION TEST

PROCEDURE:

1. Measure the diameter and length of the given rod.

2. The rod is fixing in to the grip of machine.

3. Set the pointer on the torque measuring scale.

4. The handle of machine is rotate in one direction.

5. The torque and angle of test are noted for five degree.

6. Now the handle is rotated in reverse direction and rod is taken out

FORMULA USED:

1. Modulus of rigidity, $C = \frac{TL}{J\alpha}$ N/mm^2

Where,

α =angle of degree

2. Shear stress (t) =TR/L N/mm^2