

EXPERIMENT 10:

Practical Name: Simply Supported Beam

AIM: -To find experimentally the reactions at the supports of a simply supported beam and compare the results with analytical values.

APPARATUS: -Simply supported beam setup, hangers, and loads.

THEORY: -Beam is a structural member usually horizontal and straight provided to carry loads that are vertical or inclined to its axis. A simply supported beam is one whose ends are resting freely on the supports that provide only vertical reactions. Simply supported beam becomes unstable if it is subjected to oblique or inclined loads. When simply supported beam is subjected to only vertical loads, its FBD forms a system of parallel forces in equilibrium. Conditions of equilibrium $\Sigma F = 0$ and $\Sigma M = 0$ can be applied to determine the support reactions analytically.

PROCEDURE: -

1. Place the beam of length L on simple supports. Note that below both the simple supports there is a spring arrangement. On loading, the spring compresses due to the reaction force and this compressive force is indicated on the dial.
2. Arrange the load hangers arbitrarily on the beam and set the left and right dial pointers to zero. This will nullify the effect due to self-weight of the beam and the hangers.
3. Suspend the loads from the hangers. Note the load values W_1 , W_2 , and so on and their distances X_1 , X_2 and so on from the left support.
4. Note the left and right support dial readings.

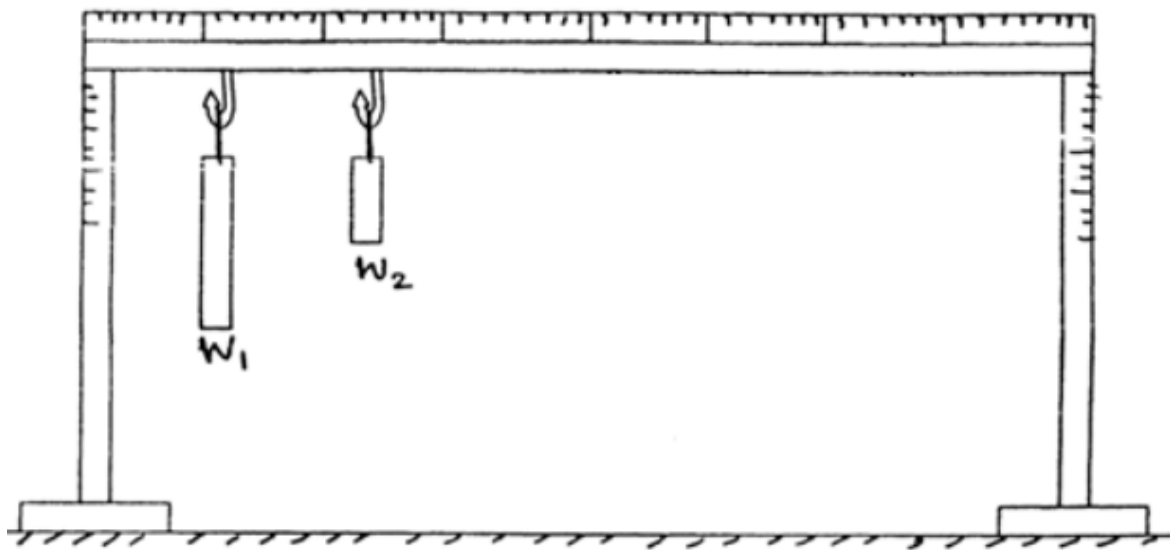
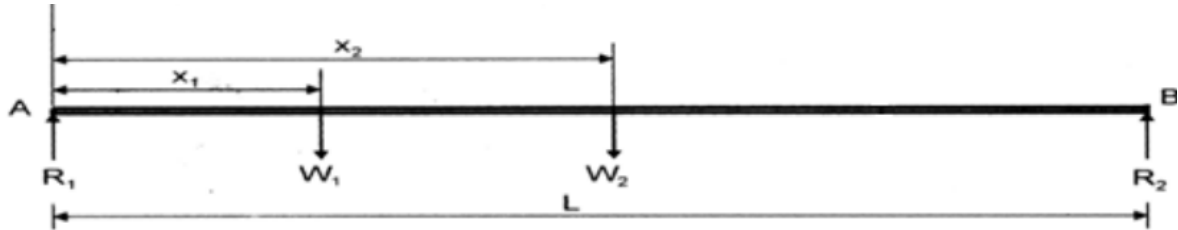


Fig. Simply supported beam with two loads

5. Repeat the above steps 1 to 4 by changing the weights in the hangers and also the hanger position for two more sets of observations.

6. Compare the experimental values with analytical values obtained by applying Conditions of Equilibrium.



Sr.No	W1(kg)	W2(kg)	X1(mm)	X2(mm)	Observed reaction		Analytical Reactions	
					N	N	N	N

CALCULATIONS

Applying Conditions of Equilibrium

$$\sum M_A = 0 \quad \curvearrowright +ve$$

$$-W_1 \times x_1 - W_2 \times x_2 + R_2 \times L = 0$$

$$\therefore R_2 = \frac{W_1 \times x_1 + W_2 \times x_2}{L}$$

$$\sum F_y = 0 \quad \uparrow +ve$$

$$R_1 - W_1 - W_2 + R_2 = 0$$

$$\therefore R_1 = W_1 + W_2 - R_2$$

RESULT: -

The support reactions obtained experimentally are nearly equal to the analytical values. The difference is within the limits of experimental error. Hence the experiment is verified.