



K J Somaiya College of Engineering, Mumbai-77

(Autonomous College Affiliated to University of Mumbai)

Batch: D2 Roll No.: 16010221025
Experiment / assignment / tutorial No. 2
Grade: AA / AB / BB / BC / CC / CD / DD

Signature of the Staff In-charge with date

Title: Support Reaction of Beam

CO1: Identify the effect of forces and moment in a given engineering system

CO3: Analyze applications of equilibrium using free body diagram

Objective

To verify the principle of forces in beams using parallel force apparatus

Theory

Beams are structural members which are generally horizontal. They are subjected to lateral forces which act orthogonal to the length of the member. There are various types of mechanisms used for supporting the beams. At these supports the reactive forces are developed which are determined by using the concept of equilibrium.

Determine the support reactions for the beam as

$$\sum f_{xi} = 0$$

$$\sum f_{yi} = 0$$

$$\sum M_o = 0$$

AIM:

To find the support reaction of a simply supported beam analytically and verify the same experimentally.

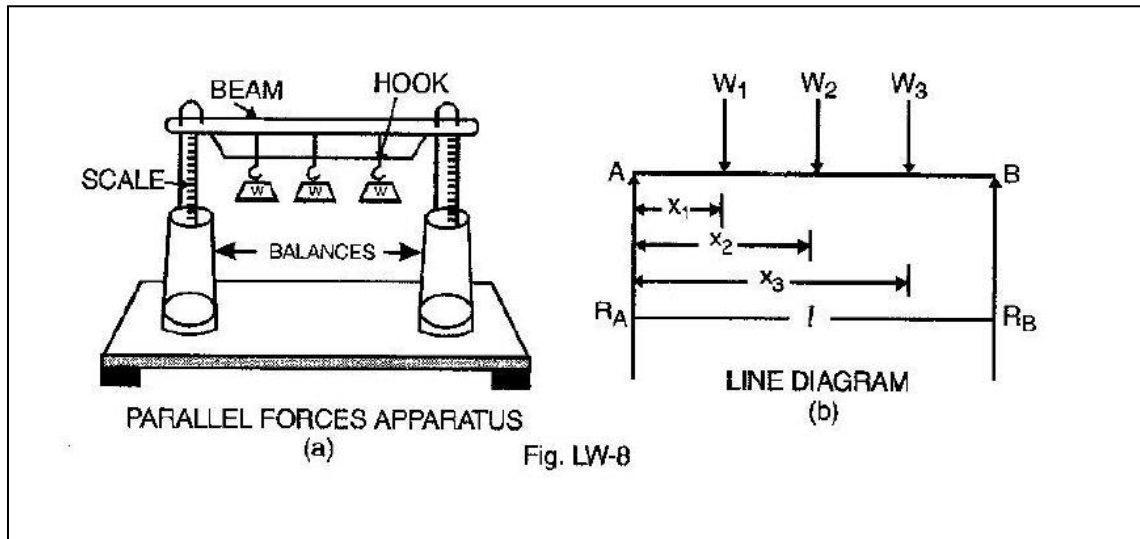
APPARATUS:

A graduated beam supported at both the ends by spring balances, hangers and weights.

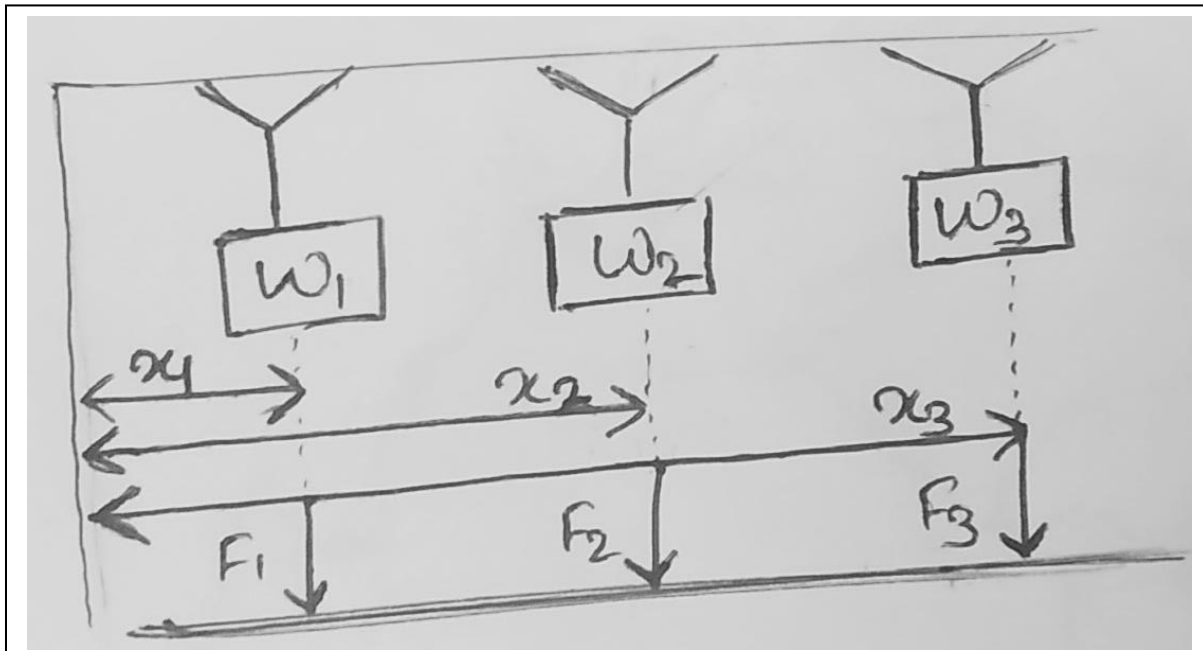
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Setup Diagram:



Free body diagram:





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OBSERVATION TABLE:

Set no	Forces acting (N)			Distances from R ₁ (cm)			Distance from R ₂ (cm)			Reactions by analysis (N)		Reactions observed (N)		% error in R ₁	% error in R ₂
	F ₁	F ₂	F ₃	X ₁	X ₂	X ₃	Y ₁	Y ₂	Y ₃	R ₁	R ₂	R ₁	R ₂	7.8	20
1	10	10	10	10	20	30	90	80	70	24	6	22.25	7.5	20	20
2	10	10	10	30	40	50	70	60	50	18	12	15	15	20	20
3	10	10	10	40	50	60	60	50	40	15	15	12.5	17.5	20	14.2

CALCULATIONS:

Department of Mechanical Engineering

Jan-May-2020

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$$\begin{aligned}
 \textcircled{1} R_1 &= \frac{90 \times 10 + 80 \times 10 + 70 \times 10}{100} = \frac{900 + 800 + 700}{100} \\
 &= \boxed{24 \text{ N}} \\
 R_2 &= \frac{10 \times 10 + 20 \times 10 + 30 \times 10}{100} \\
 &= \boxed{6 \text{ N}} \\
 \text{Error \% of } R_1 &= \frac{24 - 22.25}{22.25} \times 100 = \frac{1.75}{22.25} \times 100 \\
 &= \frac{175}{22.25} = \boxed{7.8} \\
 \text{Error \% of } R_2 &= \frac{6.75}{7.5} \times 100 = \frac{1.5}{7.5} \times 100 = \boxed{20}
 \end{aligned}$$

RESULT:

% error in $R_1 = 7.8\%$

% error in $R_2 = 20\%$

Average % error in $R_1 = 15.93$

Average % error in $R_2 = 18.06$

Signature of faculty in-charge



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