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

Signature of the Staff In-charge with date

Title – Support reaction of beam

CO4: 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
$\Sigma F_{xi} = 0$
$\Sigma F_{yi} = 0$
$\Sigma M_o = 0$

AIM:

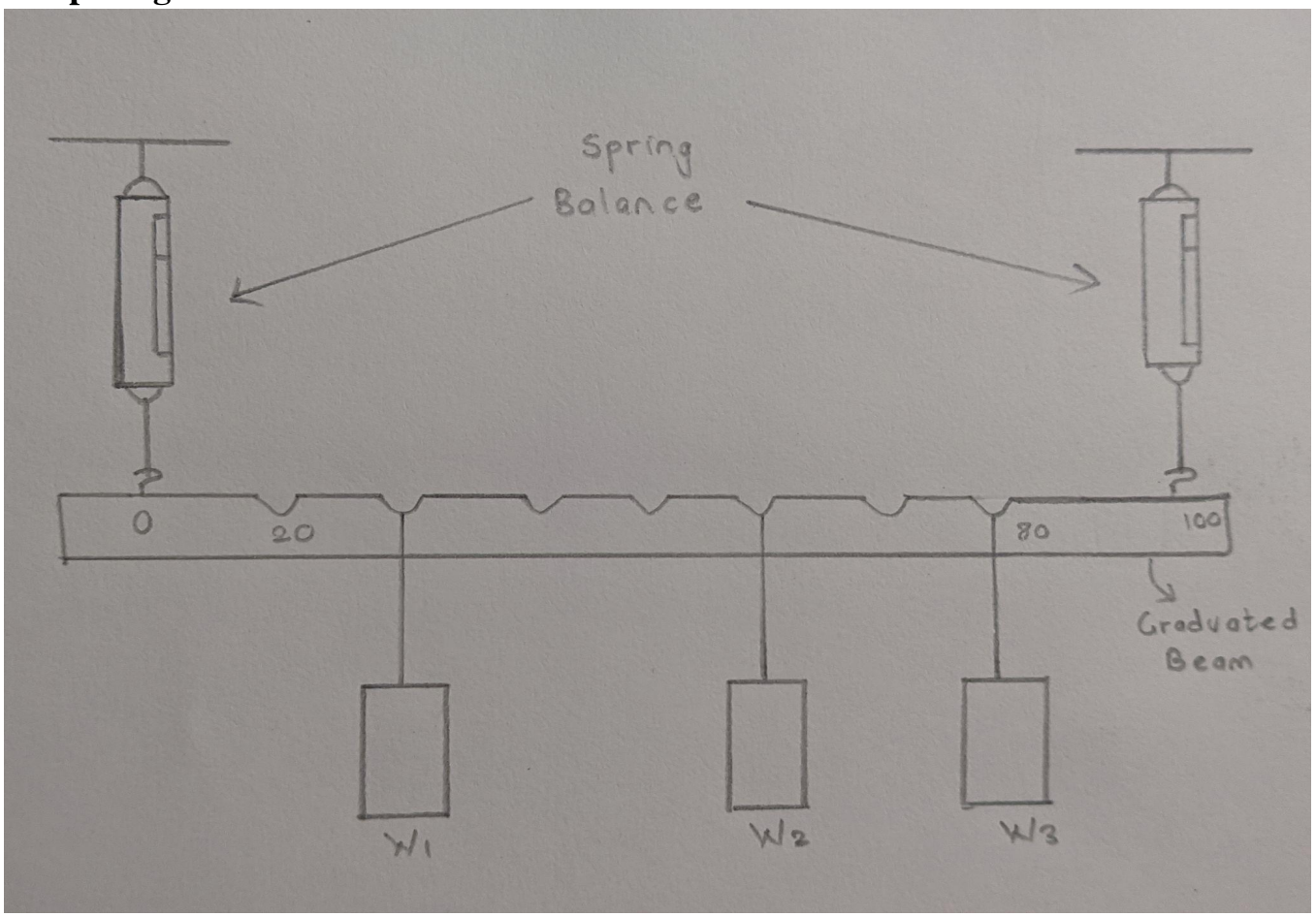
To find the support reaction of a simply supported beam analytically and verify the same experimentally.

APPARATUS:

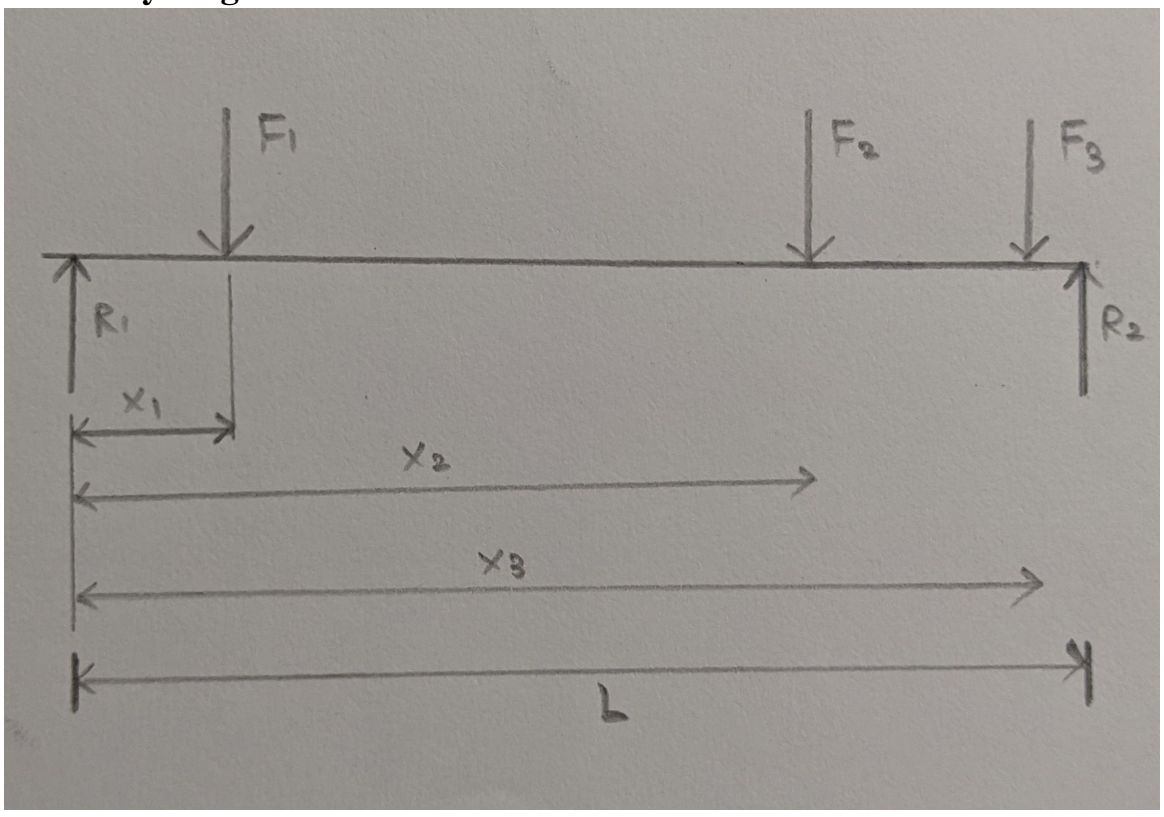
A graduated beam supported at both the ends by spring balances, hangers and weights.

K J Somaiya College of Engineering (A Constituent College of Somaiya Vidyavihar University)

Setup Diagram:



Free body diagram:



PROCEDURE:

1. Take the initial readings of the spring balances at both the ends.
2. Suspend three known weights at different known distances from the left support of the beam.
3. Note the readings of the spring balances again.
4. The difference between the final and initial readings of the spring balances gives the reactions at the two supports.
5. Calculate the support reactions analytically.
6. Compare the same with the experimental values and find the percentage error on each of the support reactions. It is assumed that all the forces are coplanar and beam remains in the horizontal position even after loading.

OBSERVATION TABLE:

Set no	Forces acting (N)			Distances from R_1 (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	R_1	R_2	R_1	R_2		
1	9.8 N	19.6N	9.8 N	15	40	80	21.34N	17.86 N	22.54 N	15.68N	5.3%	13.9%
2												
3												

CALCULATION:

Taking moment ACW as +ve

$\Sigma M_O = 0$

$F1x1+F2x2+F3x3-R2L=0$

R2=F1x1+F2x2+F3x3/L
=9.8*15+19.6*40+9.8*80/96

R2 =17.86N

Put in,
R1+R2=F1+F2+F3
R1=9.8+19.6+9.8-17.86

R1=21.34

%error = | ((Analysed-Actual)/Actual) | *100

%error in R1= | ((21.34-22.54)/22.54) | *100
=5.3%

%error in R1= | ((17.86-15.68)/15.68) | *100
=13.9%

RESULT:

% error in R_1 = 5.3%

% error in R_2 = 13.9%

Conclusion:

Therefore,we have verified the principle of forces in beams using parallel force apparatus .

Signature of faculty in-charge