



KEMENTERIAN PENDIDIKAN TINGGI
JABATAN PENDIDIKAN POLITEKNIK DAN KOLEJ KOMUNITI



JABATAN KEJURUTERAAN MEKANIKAL

DJJ30323 & STRENGTH OF MATERIALS

LECTURER NAME		
TYPE OF ASSESSMENT		
TOPIC		
DURATION		
DATE OF ASSESSMENT		
STUDENT'S INFORMATION	NAME	REGISTRATION NO.
TOTAL MARKS	CLO3	/100

DJJ30323 & STRENGTH OF MATERIALS

PRACTICAL TASK 3 & SHEAR FORCE

CLO 3

Organize appropriately experiment in groups according to Standard Operation Procedures. (P4, PLO5)

PLO5

DK6: ENGINEERING PRACTICE
DP1: DEPTH OF KNOWLEDGE
DP3: DEPTH OF ANALYSIS REQUIRED
DP4: FAMILIARITY OF ISSUES

A. TITLE

Comparison between theoretical and experimental shear force.

B. OBJECTIVES

To show that the shear force at a cut section of a beam is equal to the algebraic sum of the forces acting to the left or right of the section.

C. TOPIC SUMMARY/ THEORY

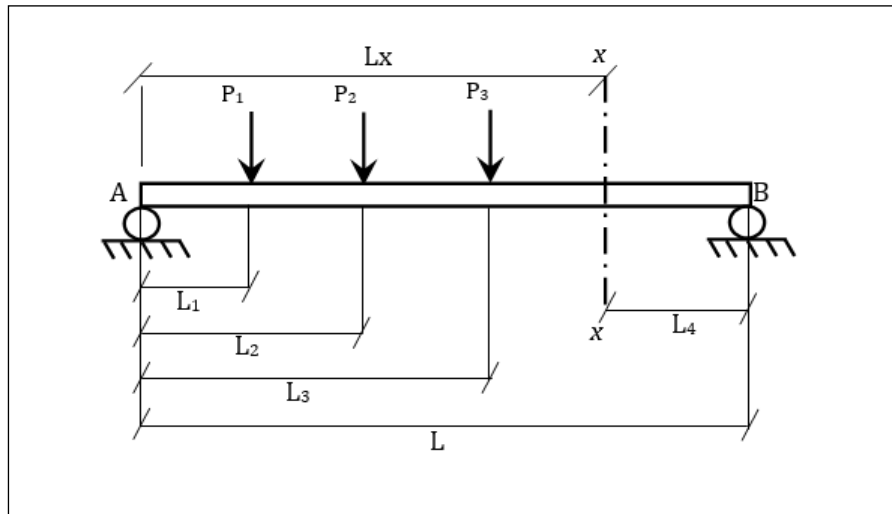


Figure 1: Simple support beam by rollers.

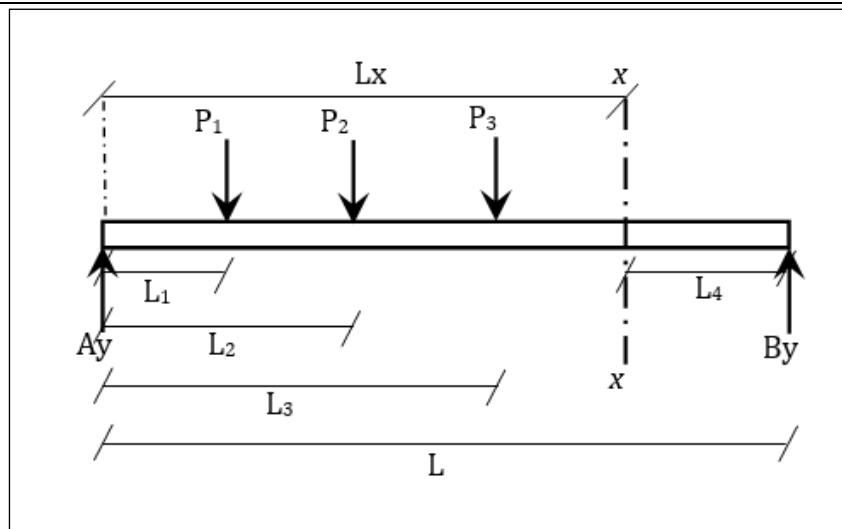


Figure 2: Free Body Diagram of the simple support beam by rollers.

Equilibrium force;

$$\begin{aligned}\Sigma M_A &= 0 \\ &= (-P_1 L_1) + (-P_2 L_2) + (-P_3 L_3) + B_y L \\ B_y &= (P_1 L_1 + P_2 L_2 + P_3 L_3) / L\end{aligned}$$

Or

$$\begin{aligned}\Sigma M_B &= 0 \\ &= [-P_3 (L - L_3)] + [-P_2 (L - L_2)] + [-P_1 (L - L_1)] + A_y L \\ A_y &= [(P_3 (L - L_3)) + (P_2 (L - L_2)) + (P_1 (L - L_1))] / L\end{aligned}$$

Hence, shear force at section x-x is;-

$$S.F_{x-x} = A_y + (-P_1) + (-P_2) + (-P_3)$$

Or

$$S.F_{x-x} = B_y$$

D. MATERIAL / TOOLS

Lists of apparatus:

- i. A pair of simple roller support.
- ii. Special beam with a cut section.
- iii. A set of loads.
- iv. Load hangers.
- v. Load cell.
- vi. Digital indicator.
- vii. Measuring tape.

E. GENERAL INSTRUCTION / SAFETY PROCEDURE

- i. Wear suitable attire when in the lab.
- ii. Wear safety goggles while handling the liquids.
- iii. Always clean droplets or excessive liquid at the working area during and after experiments.
- iv. Always obey the Lecturer/Lab Assistant instructions.

F. WORK INSTRUCTION / PROCEDURE

Lists of procedure:

- i. Connect the load cell to the digital indicator.
- ii. Switch on the indicator. Press the tare button to get '0N' on display. For stability of the reading, the indicator must be switch on 5 minutes before taking readings.
- iii. Place the beam on the supports, A and B.
- iv. Measure the length of the beam span, L from A to B using measuring tape.
- v. Measure the length of the beam span, L_4 from cut section to B using measuring tape.
- vi. Hang the load hangers at the beam with suitable distance referring to the FBD.
- vii. Place several loads on each load hangers.
- viii. Record the indicator's reading in Table 6.1. The value displayed represents the value of force.
- ix. Repeat step (vi) to (viii) for another **FOUR** sets of case.

G. RESULT

Given the distance of load cell from the center of the beam cross section is 175mm.

Given the formula of shear force experiment, $S.F_{exp} = [F \times (175 \times 10^{-3})] / L_4$

Given the formula of percentage error, $S.F = [(S.F_{exp} - S.F_{x-x}) / S.F_{x-x}] \times 100\%$

Answer the following questions:

- i. Beam span's length from support A to support B : $L = \underline{\hspace{2cm}}$ mm
- ii. Distance from the cut section to support B : $L_4 = \underline{\hspace{2cm}}$ mm
- iii. Fill in the Table 7.1
- iv. Plot the bar chart to compare the theoretical and experimental shear force for each case.

Table 7. 1

Load Case	Load and Its Distance from the Left Support, A						Digital Indicator's Reading, F (N)	Shear Force Experiment, S.F _{exp} (N)	Shear Force Theory, S.F _{x-x} (N)	Percentage Error, S.F (%)
	P ₁ (N)	L ₁ (m)	P ₂ (N)	L ₂ (m)	P ₃ (N)	L ₃ (m)				
Case 1										
Case 2										
Case 3										
Case 4										
Case 5										

- v. Plot the bar chart to compare the theoretical and experimental bending moment for each case.



H. DISCUSSION

Discuss the following questions:

- i. Discuss the reaction happens when a load is applied to the beam and discuss why the condition was occurred.

- ii. Discuss the probable factors that affect the accuracy of this experiment.

I. CONCLUSIONS

Make a conclusion about the experiment.

J. REFERENCES

List down all the books and journals referred.

PREPARED BY:
(Course Lecturer)

.....
(
Date:

CHECKED BY:
(Course Coordinator/
Head of Programme)

.....
(
Date:

APPROVED BY:
(Head of Programme/
Head of Department)

.....
(
Date: