KEMENTERIAN PENDIDIKAN TINGGI
JABATAN PENDIDIKAN POLITEKNIK DAN KOLEJ KOMUNITI

POLITEKNIK MALAYSIA
KUCHING SARAWAK

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***

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PRACTICAL TASK 2 & BENDING MOMENT

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 bending moment values.

B. OBJECTIVES

To show that the bending moment at a cut section of a beam is equal to the algebraic sum of the moments acting to the left or right of the section.

C. TOPIC SUMMARY/ THEORY

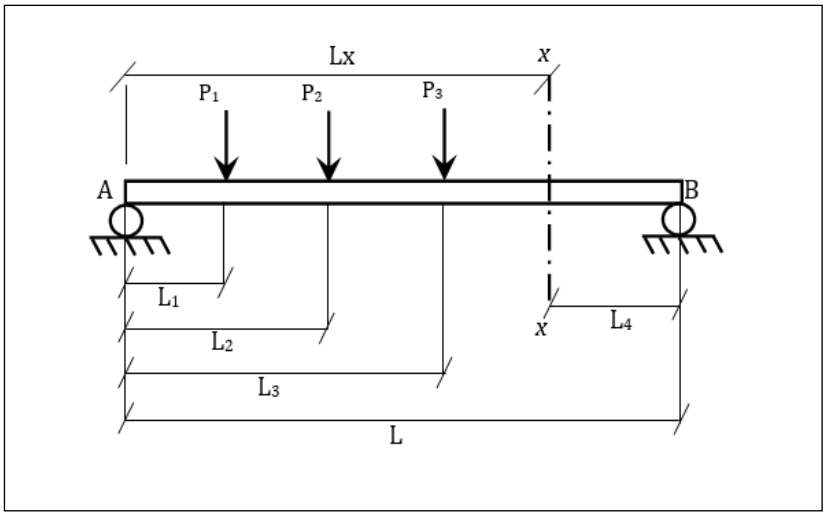

Figure 1: Simple support beam by rollers.

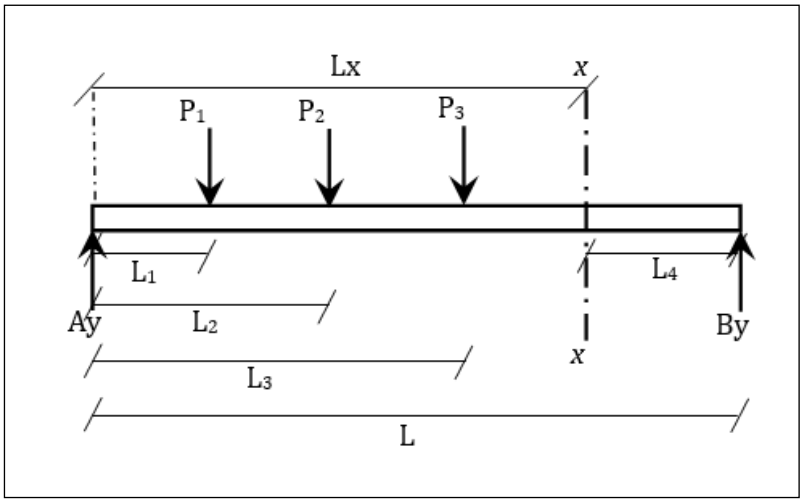

Figure 2: Free Body Diagram of the simple support beam by rollers.

Equilibrium force;

$$\Sigma M_A = 0$$

$$= (-P_1L_1) + (-P_2L_2) + (-P_3L_3) + ByL$$

$$By = (P_1L_1 + P_2L_2 + P_3L_3) / L$$

Or

$$\Sigma M_B = 0$$

$$= [-P_3(L - L_3)] + [-P_2(L - L_2)] + [-P_1(L - L_1)] + AyL$$

$$Ay = [(P_3(L - L_3)) + (P_2(L - L_2)) + (P_1(L - L_1))] / L$$

Hence; the bending moment at section x-x is;

$$B.M_{x\text{-}x} = AyLx + [(-P_1)(Lx - L_1)] + [(-P_2)(Lx - L_2)] + [(-P_3)(Lx - L_3)]$$

Or

$$B.M_{x\text{-}x} = ByL_4$$

D. MATERIAL / TOOLS

Lists of apparatus:

i. A pair of simple roller supports.
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

Procedures of the experiment:

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 bending moment experiment, $B.M_{exp} = F \times (175 \times 10^{-3})$
Given the formula of percentage error, $B.M = [(B.M_{exp} - B.M_{x\text{-}x}) / B.M_{x\text{-}x}] \times 100\%$

Answer the following questions:

i. Beam span's length from support A to support B : L = _____mm
ii. Distance from the cut section to support B : L_4 = _____mm
iii. Fill in the Table 7.1.

Table 7.1

Load Case	Load and Its Distance from the Left Support, A						Digital Indicator's Reading, F (N)	Bending Moment Experiment, $B.M_{exp}$ (Nm)	Bending Moment Theory, $B.M_{x\text{-}x}$ (Nm)	Percentage Error, B.M (%)
	P_1(N)	L_1(m)	P_2(N)	L_2(m)	P_3(N)	L_3(m)				
1										
2										
3										
4										
5										

iv. 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:***