SO LIN'S LAB SHEET FOR
PHOTOCOPYING ONLY: 27/4

UNIVERSITY OF NAIROBI

DEPARTMENT OF MECHANICAL ENGINEERING

STREGTH OF MATERIALS

BEAM DEFLECTION EXPERIMENT.

OBJECT;

The object of the test is to study the deflection of the beam for varying load s, varying spans and varying cross-section, and to demonstrate the Reciprocal Theorem.

APPARATUS;

(Fig.1)

Bed, hardened steel knife edge, supports, load shackles with knife edge, dial indicator on arm, weights, steel and wooden beams.

METHOD

1. Measure the width (b) and depth (d) of each beam (fig 2.Table 2)
2. Mark the center of each beam
3. using the thickest beam over the longest span, determine the central deflection for central points loads. Repeat for 5 different values of loads. (fig 3 , Table 3).
4. For a given central point load determine the central deflection for 5 different spans of one beam (move the supports one step each towards the center (fig. 4, Table 4).
5. For various beams, using a constant span and central point load, determine the central deflections. As in 3, but L is of your choice)
6. For one beam of given span determine the central deflection due to two equal loads overhanging the support by equal amounts. Repeat for 5 different values of loads(fig 6, Table 6)
7. Determine the deflection (δ ak) at a point at distance.
   - "a" From the left hand support due to load w at distance "b" from the left hand support .(fig 7 i ,Table 7 i)
   - Find the deflection (δak) by interchanging values of "a" and "b" (fig 7 ii, Table ii)
   - Determine also the deflections at both points when load w each are applied at the two points simultaneously: repeat for 5 different values of 'a' and 'b'(fig 7 iii, Table 7 iii)

CALCULATION:

For a central point load w on a simply supported beam of span b, the central deflection is given by:

$$\delta = \frac{wb^3}{48\,E\,I}$$

For two equal lads w overhanging the support by distance "c" the central deflection is given by;

$$\delta = \frac{wcb^2}{8\,EI}$$

I = Moment of inertia of cross section

$= \frac{b\,d^3}{12}$ for rectangular sections where b is the beam width and d is the beam depth.

GRAPHS

1. Plot w against δ for b constant for steps 3 and6
2. plot log L against log δ for w constant for step 4
3. Plot log d against log δ for constant w and b for step 5

Determine E young's modulus from graph 1,2, and 3.

CONCLUSION:

Write down the conclusions briefly, and comment on the difference values of E calculated above and the value of deflection measured in step 7 in relation to the superposition principles and Reciprocal Theorem.

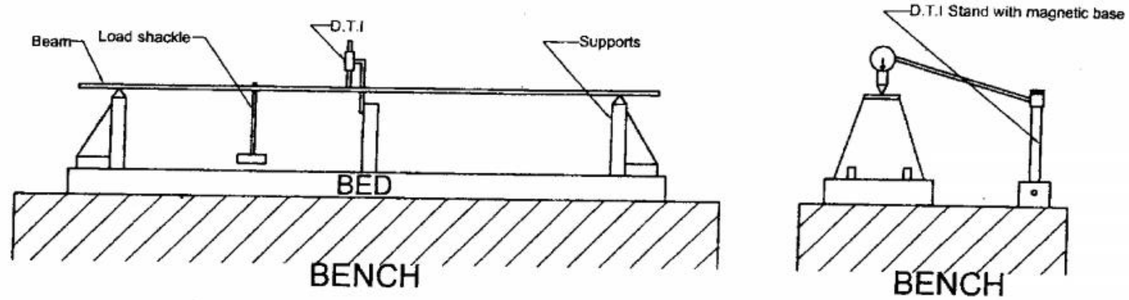

FIG 1, APPARATUS

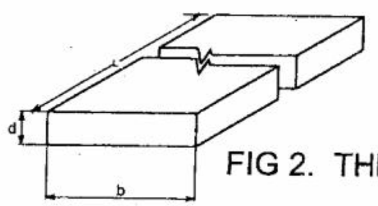

FIG 2. THE BEAM

BEAM	A	B	C
b(mm)			
d(mm)			

TABLE 2 BEAM DETAILS

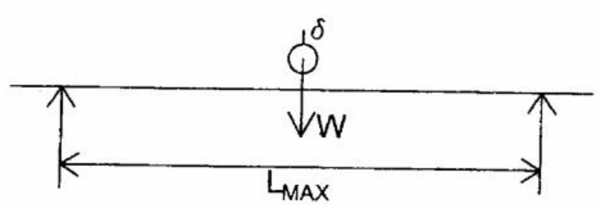

FIG 3, STEP 3

L (mm) =	BEAM =				
W(g)					
δ(mm)					

TABLE 3, STEP 3

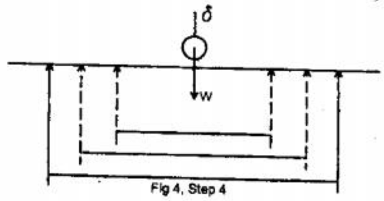

Fig 4, Step 4

W(g) = BEAM =					
L(mm)					
δ (mm)					

Table 4, Step 4

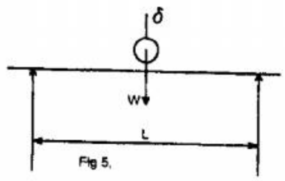

Fig 5.

W(g) = L(mm) =			
Beam	A	B	C
δ(mm)			

Table 5, Step 5

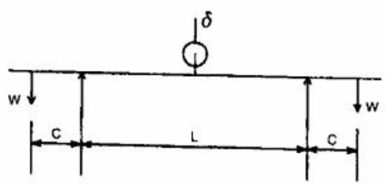

Fig 6, Step 6

L(mm)- C(mm) = BEAM =					
L(mm)					
δ (mm)					

TABLE 6, STEP 6

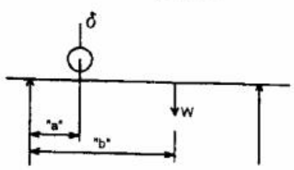

Fig 7(I)

BEAM B

TABLE	7(I)	7(II)
BEAM=		
W(g)=		
"a"=		
"b"=		
δ(mm)		

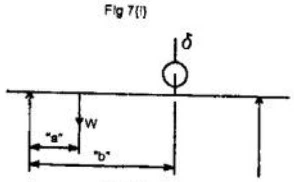

Fig 7(II)

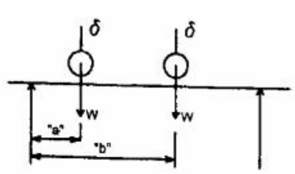

Fig 7(III)

Table 7(III) Beam = W(g) =					
"a"					
"b"					
δ"a"					
δ"b"					