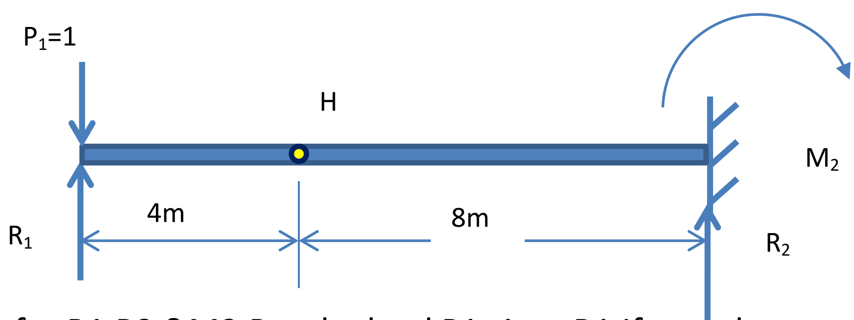
Alfurat Al-Awsat Technical University
Technical College / Al-Najaf
Department : Building & Construction Technology Engineering
Subject: Theory of Structures
Class: Third year
Lecturer : Professor Dr. Hakim Alkurayshi

Lecture (11)examples on Influence lines in beams

Example 1 .

Draw the influence lines for R1,R2 and M2 . The self-weight of the beam is 3 tones/m. A uniform load 2t/m and a load of 20 t passes over this beam .Find the maximum value of the fixed end moment M2.



To draw the I.L. for R1,R2 &M2.Put the load P1=1 on R1.If we take moment about hinge ,this will give us R1=1 ,R2=0 and to find the value of M2 for this case take moment about point 2.

$$\sum M_2 = 0 \ldots\ldots\ldots\ldots\ldots R_1 x12 - 1x12 + M_2 = 0$$

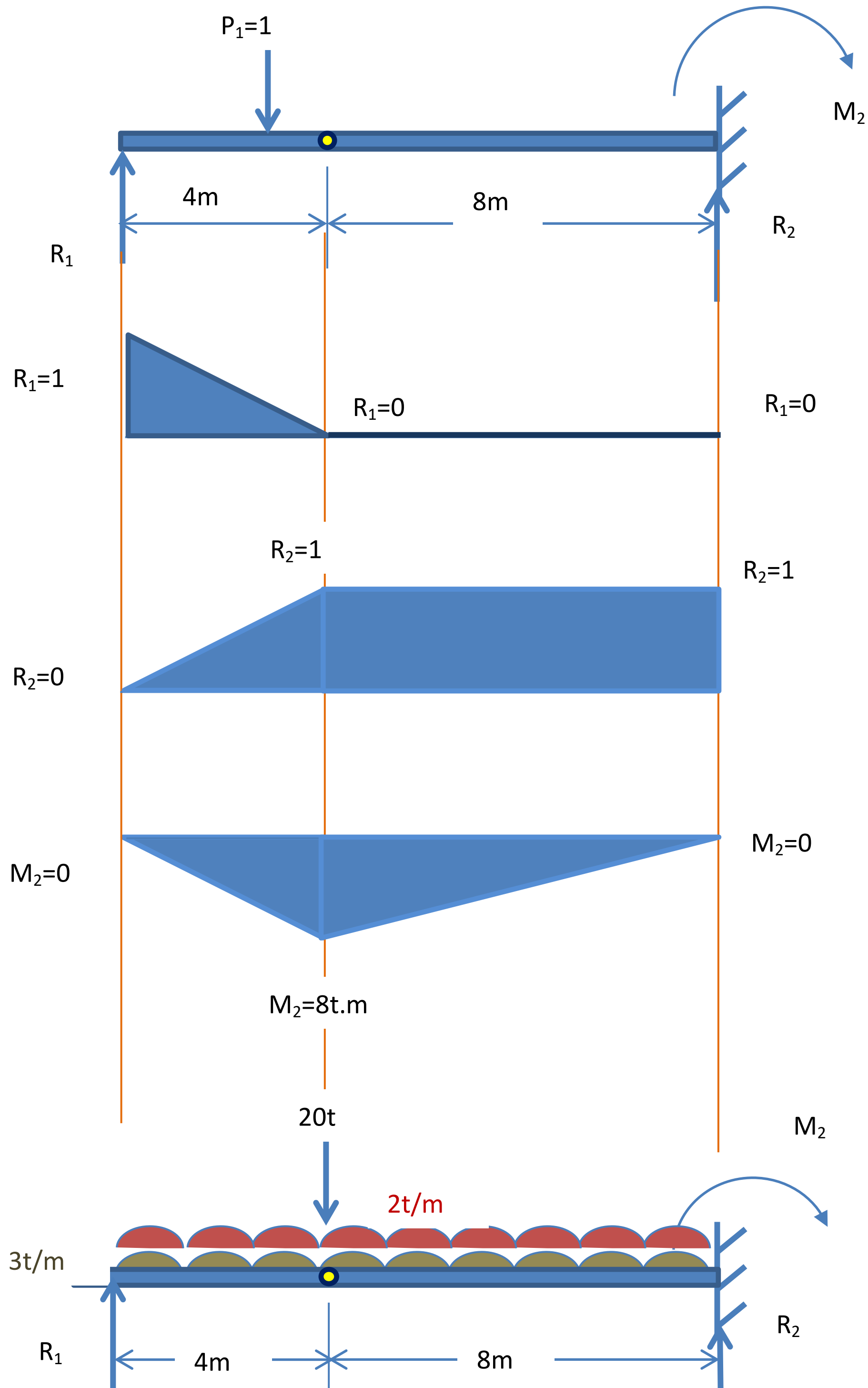
$$1x12 - 1x12 + M_2 = 0 \ldots\ldots\ldots\ldots\ldots\ldots\ldots M_2 = 0$$

Fix that points on the drawing. Now put the load P1 =1 on the hinge, R1=0, R2=1 .Take moment about 2 to find out M2.

$$\sum M_2 = 0 \ldots\ldots\ldots\ldots\ldots 1x8 - M_2 = 0 \ldots\ldots\ldots\ldots M_2 = 8\ t.m$$

Fix that point on the drawing.

Finally , put the load P1=1 on point 2, R1=0 .Take moment about 2 to find out M2. M2=0 ,draw that .



Now to find maximum M2 ,multiply the distributed load by the area of the moment M2 influence line.

M2=3x[0.5x8x12] +2x[0.5x8x12]+20x8=400t.m(hogging)

Example 2 . ***Draw the influence line for R2. The self-weight of this beam is 2 tones/m. A uniform load 1.2t/m and a single load of 30 t moves on the beam .Find the maximum value of R2.***

$\Sigma M_{H1}=0$ 18 R1+8R2=0 ………….9R1=-4R2…………(1)

$\Sigma M_{H2}=0$ 26R1+16R2-1x8=0…….6.5 R1+4R2=2 ……(2)

Here the unit load P=1 must be applied at the position of the applied concentrated load which is here equal to 30 t.

6.5 R1-9R1=2 ……………..*R1=-0.8t* , *R2=-1.8t*

(R2)$_{max.}$=2x{0.5x1.8x26+0} + 1.2x{0.5x1.8x26} + 30x1.8 **=128.88 t(up)**