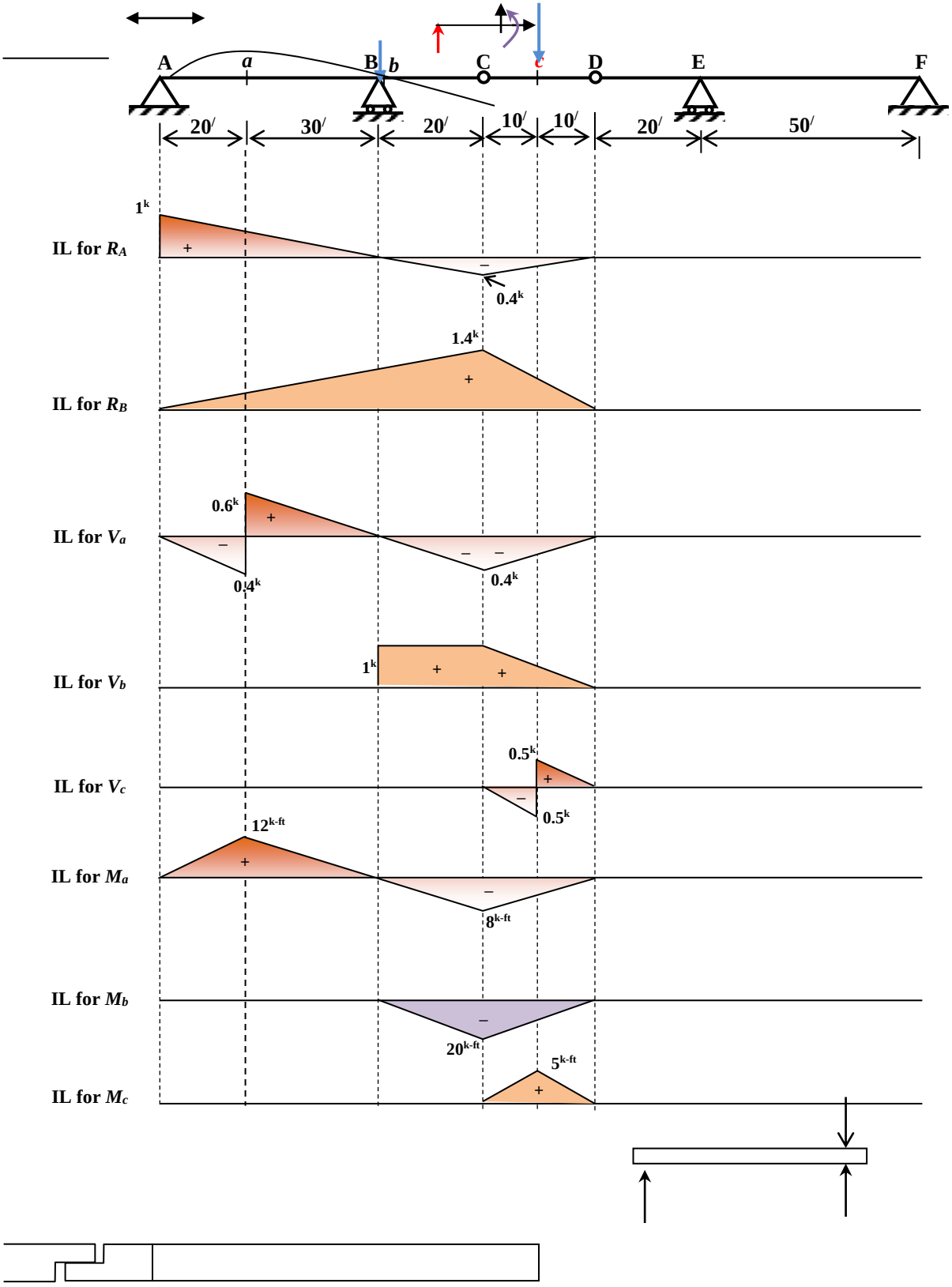
DRAW IL DIAGRAM OF THE FOLLOWING STRUCTURE

IL Part 4

Q.2. Draw IL diagrams for R_A, R_B, V_a, V_b, V_c, M_a, M_b and M_c of the following balance cantilever bridge as a unit load moves from A to F.



Q.3. Draw IL diagrams for R_A, R_B, V_a, V_b, V_c, M_a, M_b and M_c of the balance cantilever bridge as shown below in a line diagram as a unit load moves from A to F.

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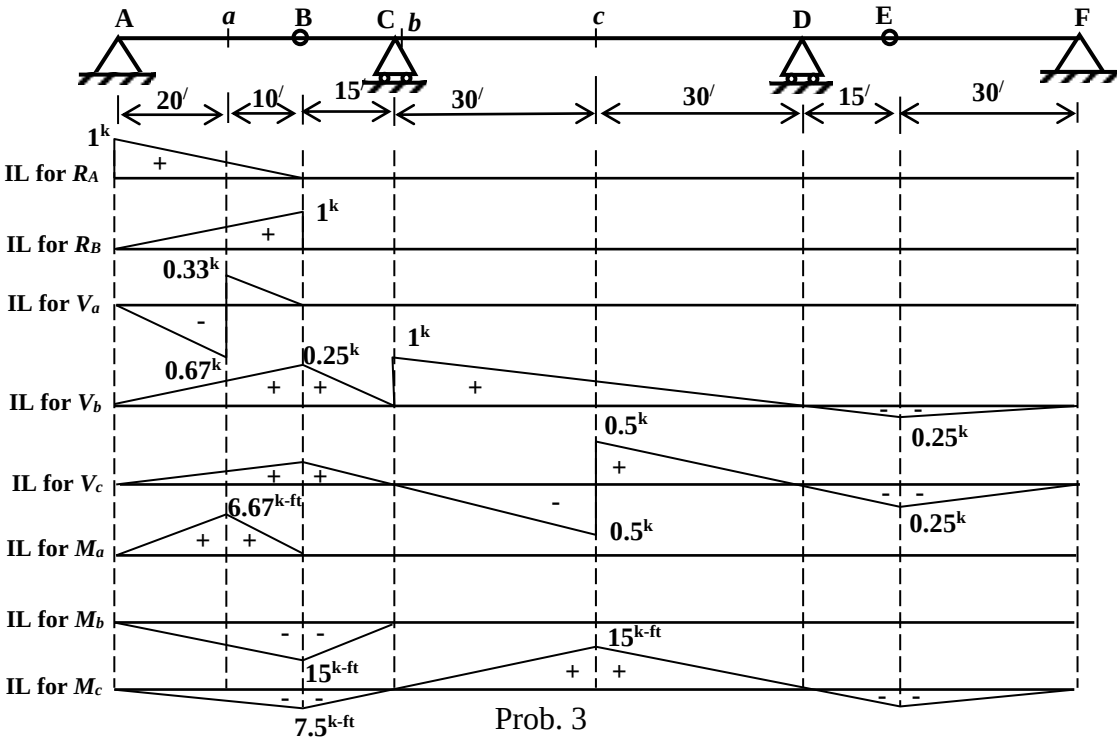
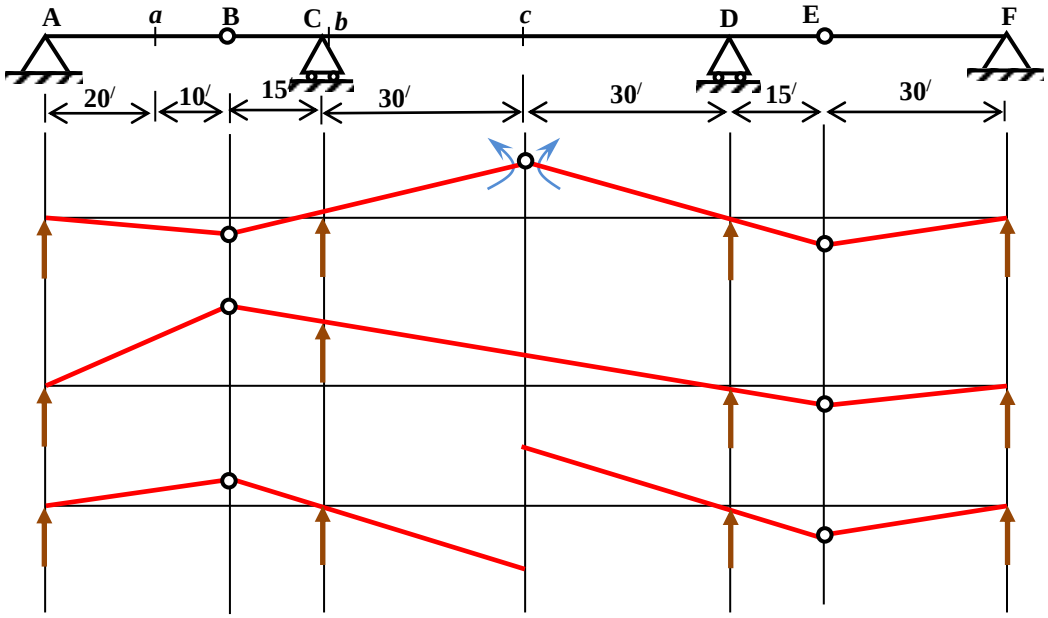


Prob. 3



Q.4. Draw IL diagrams for R_A, R_B, V_b, V_c, M_b, M_c and reactive moment at support M_A of the following compound beam as a unit load moves from A to C.

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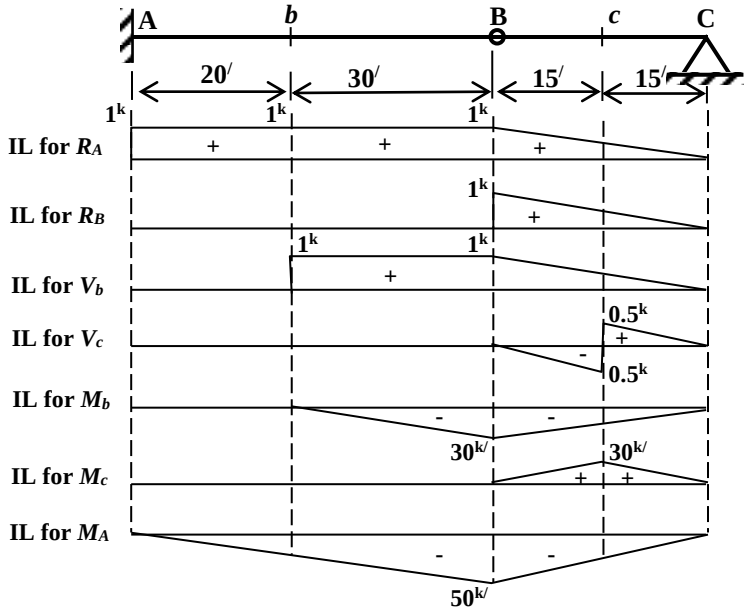
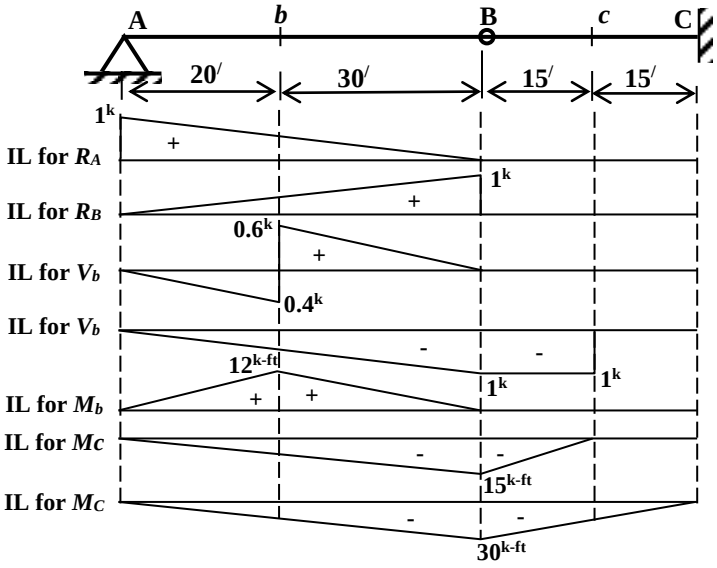
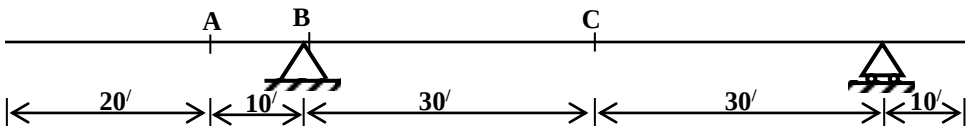


Q.5. Draw IL diagrams for R_A, R_B, V_b, V_c, M_b, M_c and M_C (reactive moment) of the balance cantilever bridge as shown below in a line diagram as a unit load moves from A to F.



Prob. 5

1. Draw the influence lines for shear and the influence lines for moment at A, B, and C in the beam. B is just to the right of the left support. A unit load moves from left to right end of beams. (Shedd & Vawter, p-138, Prob.- 88)

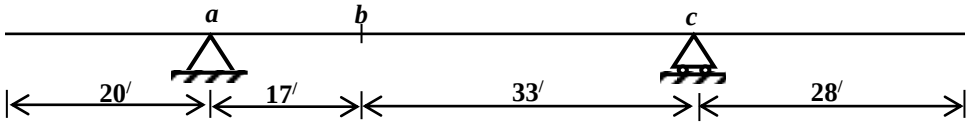


Prob. 1

2.(i) Draw the influence lines for shear at sections *a*, *b*, and *c*; *a* and *c* are to be taken an infinitesimal distance to the left of the supports.

(ii) Draw the influence lines for moment at *a*, *b*, and *c*.

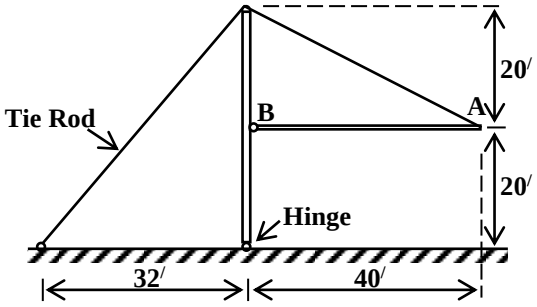
(iii) Draw the influence lines for shear at *a* and *c* when they are an infinitesimal distance to the right of the supports. (Shedd & Vawter, p-139, Prob.- 89)



Prob. 2

3.(i) Draw the influence line for vertical component of the tie rod reaction as a unit load moves from A to B.(Shedd & Vawter, p-139, Prob.- 90)

(ii) Draw the influence line for moment in the must at B as a unit load moves from A to B.

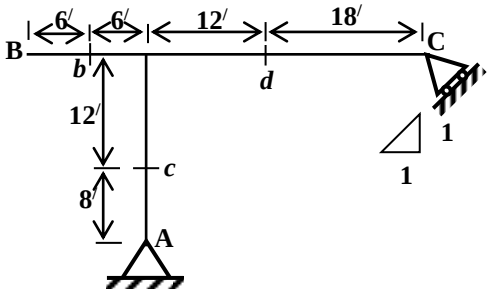


Prob. 3

4. Draw the following influence lines for the structure shown. In all cases the unit load moves between B and C.(Shedd & Vawter, p-139, Prob.- 89)

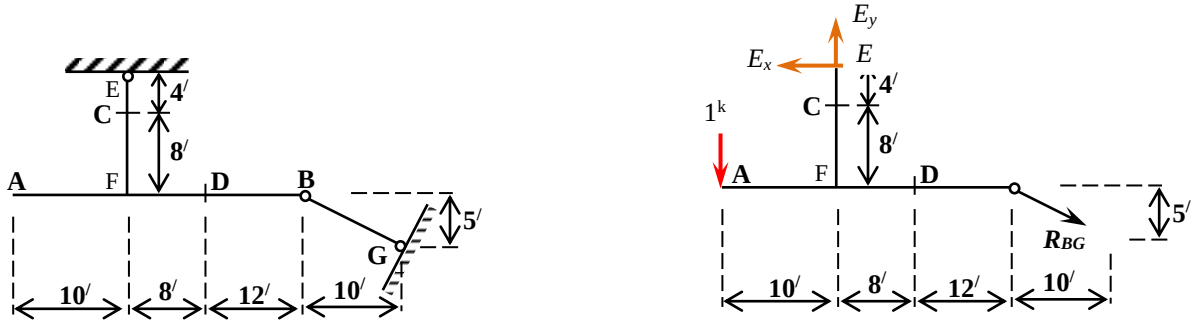
(i) Vertical component of the reaction at A.

(ii) Shear and moment at *b*.
(iii) Shear and moment at *c*.
(iv) Shear and moment at *d*.



Prob. 4

5. Draw the influence lines for shear and moment at C and D in the beam shown as a unit load moves from A to B. (Shedd & Vawter, p-140, Prob.- 92)



Prob. 5

When 1^k at A

$$\sum M_E = 0;\quad -1\times 10 + R_{BG}\frac{5}{\sqrt{10^2+5^2}}\times 20 - R_{BG}\frac{10}{\sqrt{10^2+5^2}}\times 12 = 0$$

$R_B = 5.59k$, $R_{BGx} = -5.0k$, $R_{By} = -2.5k$; $V_C = -5.0k$, $V_D = +2.5k$, $M_C = 20k\ ft$, $M_D = 30k\ ft$,

When 1^k at F

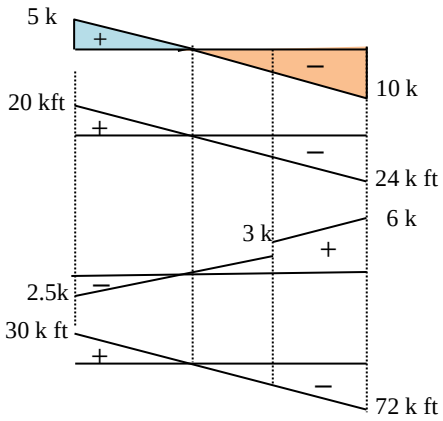
$R_B = 0.0$, $R_{Bx} = 0.0k$, $R_{By} = 0.0k$; $V_C = 0k$, $V_D = 0.0k$, $M_C = 0k\ ft$, $M_D = 0k\ ft$,

When 1^k at left of D

$R_B = 4.472k$, $R_{Bx} = -4k$, $R_{By} = -2k$; $V_D = 2k$, $M_D = -24k\ ft$,

When 1^k at right of D

$R_B = 4.472k$, $R_{Bx} = -4k$, $R_{By} = -2k$; $V_D = 3k$, $M_D = -24k\ ft$,



When 1^k at A

$R_B = 5.59k$, $R_{Bx} = 5.0k$, $R_{By} = 2.5k$; $V_C = 5.0k$, $V_D = -2.5k$, $M_C = 20k\ ft$, $M_D = 30k\ ft$,

When 1^k at F

$R_B = 0.0$, $R_{Bx} = 0.0k$, $R_{By} = 0.0k$; $V_C = 0.0k$, $V_D = 0.0k$, $M_C = 0k\ ft$, $M_D = 0k\ ft$,

When 1^k at left of B

$R_B = 4.472k$, $R_{Bx} = -4k$, $R_{By} = -2k$; $V_D = 2k$, $M_D = -24k\ ft$,

When 1^k at left of B

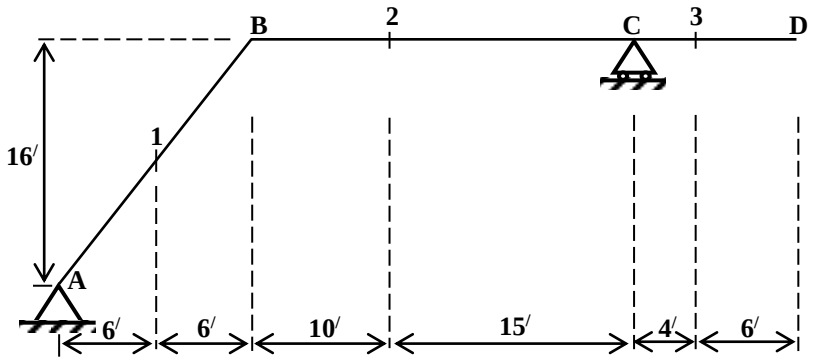
$R_B = 4.472k$, $R_{Bx} = -4k$, $R_{By} = -2k$; $V_D = 3k$, $M_D = -24k\ ft$,

When 1^k at B

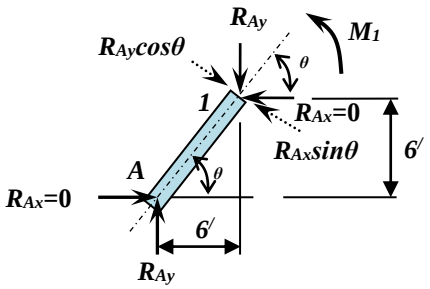
$R_B = 11.18k$, $R_{Bx} = -10k$, $R_{By} = -5.0k$; $V_C = -10k$, $V_D = 6k$, $M_C = -40k\ ft$, $M_D = -72k\ ft$,

6. Draw the following influence lines for the structure shown. In all cases the load moves from B to D. (Shedd & Vawter, p-140, Prob.- 93)

(i) Reaction at C, (ii) Shear and moment at 1, (iii) Shear and moment at 2. (iv) Shear and moment at 3.



Prob. 6



$V_1 = R_{Ay}cos\theta - R_{Ax}sin\theta$ $\quad M_1 = R_{Ay}*6' - R_{Ax}*6' = 6R_{Ay}$

~~When 1^k at A~~

~~$R_{Ax} = 0.0^k$, $R_{Ay} = 1.0^k$, $V_1 = V_2 = V_3 = 0$, $M_1 = M_2 = M_3 = 0$~~

When 1^k at B

$R_{Ax} = 0.0^k$, $R_{Ay} = 0.68^k$, $R_C = 0.32^k$, $V_1 = R_{ay}cos\theta = 0.68*(0.6) = 0.41^k$, $V_2 = -0.32^k$, $V_3 = 0$, $M_1 = 0.68x6 = 4.08$ k-ft, $M_2 = 0.32x15 = 4.8$ k-ft, $M_3 = 0$

When 1^k at just left of section 2

$R_{Ax} = 0.0^k$, $R_{Ay} = 0.405^k$, $R_C = 0.595^k$, $V_1 = R_{ay}cos\theta = 0.41*(0.6) = 0.24^k$, $V_2 = -0.59^k$, $V_3 = 0$, $M_1 = 0.405x6 = 2.43$ k-ft, $M_2 = 0.405x22 = 0.595x15 = 8.92$ k-ft, $M_3 = 0$

When 1^k at just right of section 2

$R_{Ay} = 0.405^k$, $R_C = 0.595^k$, $V_2 = +0.59^k$, $V_2 = 0$, $V_3 = 0$, $M_1 = 0.41x6 = 2.46$ k-ft, $M_2 = 0.405x22 = 0.595x15 = 8.92$ k-ft, $M_3 = 0$

When 1^k at C

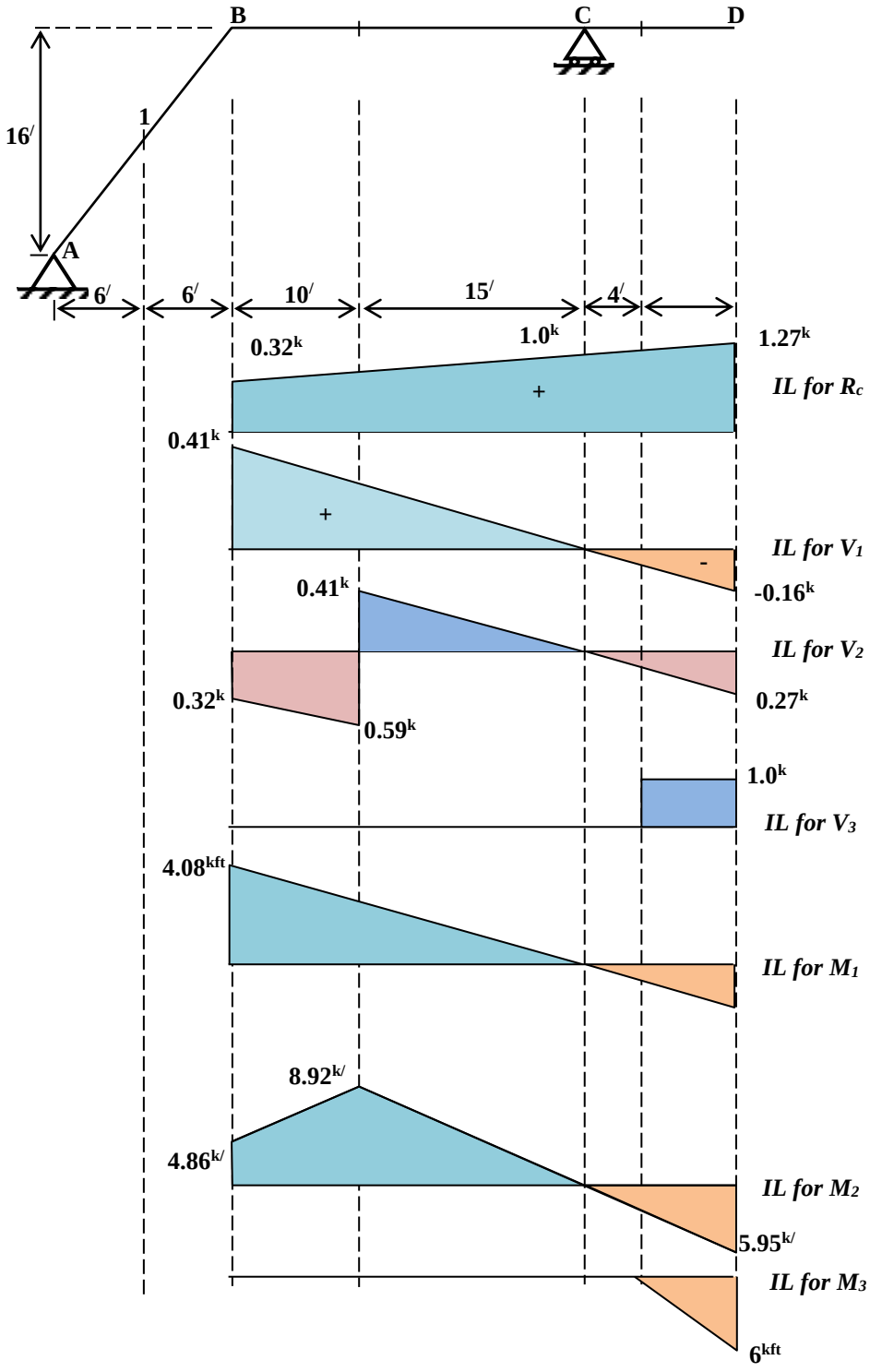
$R_C = 1.0^k$, All other values are zero.

When 1^k at just left of section 3, $V_3 = 0$, When 1^k at just right of section 3, $V_3 = 1$

When 1^k at just right of section 2

$R_{Ay} = -0.27^k$, $R_C = 1.27^k$, $V_1 = R_{ay}cos\theta = -0.27*(0.6) = -0.162^k$, $V_2 = +0.27^k$, $V_2 = 0$, $V_3 = 1$, $M_1 = -0.272x6 = -1.622$ k-ft, $M_2 = -0.27x22 = -5.94$ k-ft, $M_3 = 6$ k-ft

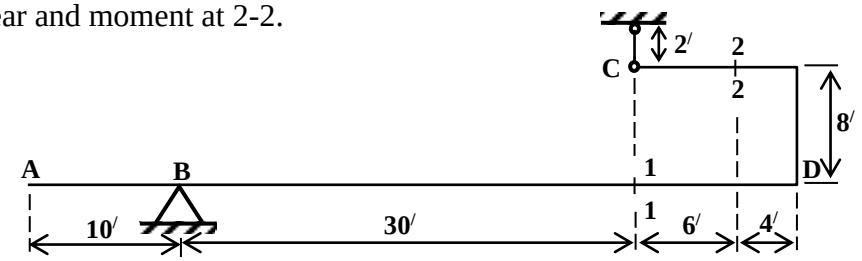
2 **3**


B
C
D
16′
1
A
6′
6′
10′
15′
4′
0.32k
1.0k
1.27k
IL for Rc
+
0.41k
+
IL for V1
-
0.41k
-0.16k
IL for V2
0.32k
0.27k
0.59k
1.0k
IL for V3
4.08kft
IL for M1
8.92k/
4.86k/
IL for M2
5.95k/
IL for M3
6kft

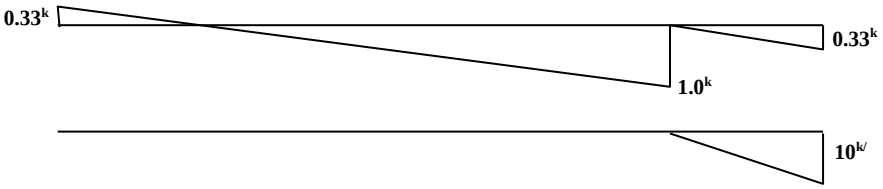
7. As a unit load moves from A to D, draw the influence lines for:
(Shedd & Vawter, p-141, Prob.- 96)

(i) Shear and moment at 1-1.

(ii) Shear and moment at 2-2.

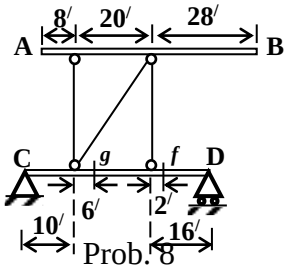


Prob. 7



8.(i) Draw the influence lines for shear and moment at *f*, in the beam CD of the frame shown, as a unit load moves from A to B.

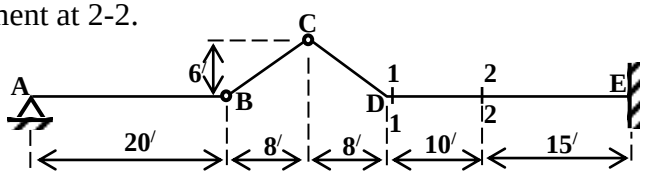
(ii) Draw the influence lines for shear and moment at *g* in the same beam for the same movement of the unit load. (Shedd & Vawter, p-141, Prob.- 97)



Prob. 8

9. As a unit load moves from A to B and from D to E on the following structure, draw the influence lines for:

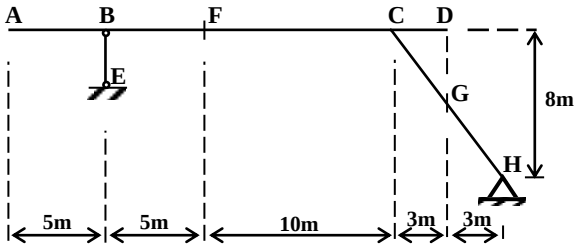
(i) Reaction at support A.
(ii) Reaction in the member BC.
(iii) Shear and moment at 1-1(Just to the right of D).
(iv) Shear and moment at 2-2.



Prob. 9

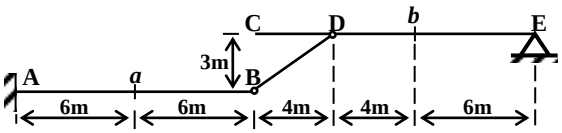
<u>When 1k at A</u>
R_A = 1k; F_{BC} = 0.0; $V_{1\text{-}1}$ = 0.0; $V_{2\text{-}2}$ = 0.0; $M_{1\text{-}1}$ = 0.0; $M_{2\text{-}2}$ = 0.0
<u>When 1k at B</u>
R_A = -1.33k; F_{BC} = 1.66k; $V_{1\text{-}1}$ = -1.0; $V_{2\text{-}2}$ = -1.0; $M_{1\text{-}1}$ = -16.0k-ft; $M_{2\text{-}2}$ = -26.0 k-ft
<u>When 1k at D</u>
R_A = 0.0k; F_{BC} = 0.0k; $V_{1\text{-}1}$ = -1.0; $V_{2\text{-}2}$ = -1.0; $M_{1\text{-}1}$ = 0.0 k-ft; $M_{2\text{-}2}$ = -10.0 k-ft
<u>When 1k at right of 1-1</u>
R_A = 0.0k; F_{BC} = 0.0k; $V_{1\text{-}1}$ = 0.0; $V_{2\text{-}2}$ = -1.0; $M_{1\text{-}1}$ = 0.0 k-ft; $M_{2\text{-}2}$ = -10.0 k-ft
<u>When 1k at left of 2-2</u>
R_A = 0.0k; F_{BC} = 0.0k; $V_{1\text{-}1}$ = 0.0; $V_{2\text{-}2}$ = -1.0; $M_{1\text{-}1}$ = 0.0 k-ft; $M_{2\text{-}2}$ = 0.0 k-ft
<u>When 1k at left of 2-2</u>
R_A = 0.0k; F_{BC} = 0.0k; $V_{1\text{-}1}$ = 0.0; $V_{2\text{-}2}$ = 0.0; $M_{1\text{-}1}$ = 0.0 k-ft; $M_{2\text{-}2}$ = 0.0 k-ft

10. As a unit load moves from A to D on the following structure, draw the influence lines for:
(i) Reaction in the member BE.
(ii) Shear and moment at F.
(iii) Shear and moment at G.



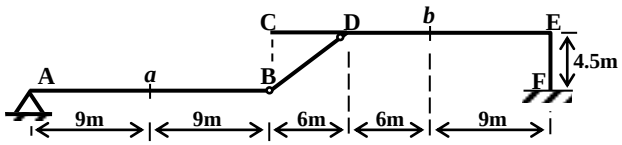
Prob. 10

11. Draw the influence lines for R_{BD}, M_A, V_a, V_b, M_a and M_b as a unit load moves from A to B and from C to E.



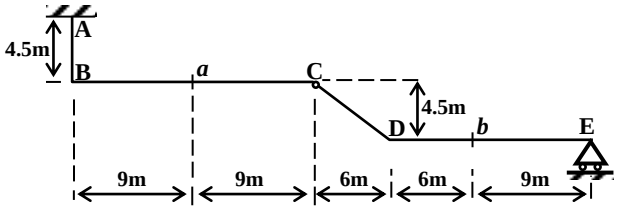
Prob. 11

12. Draw the influence lines for R_{BD}, M_F, V_a, V_b, M_a and M_b as a unit load moves from A to B and from C to E.



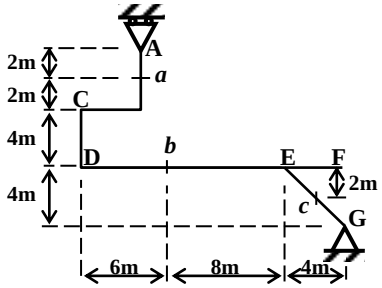
Prob. 12

13. Draw the influence lines for M_A, V_a, V_b, M_a and M_b as a unit load moves from B to C and from D to E.



Prob. 13

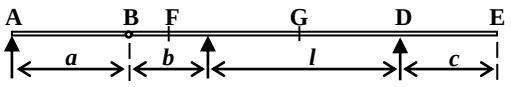
14. Draw the influence lines for V_a, V_b, V_c, M_a, M_b and M_c as a unit load moves from D to F.



Prob. 14

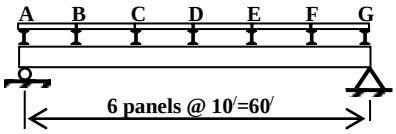
15. As a unit load moves from A to E on the following structure, draw the influence lines for: (Vazirani & Ratwani, Vol-I, p-502)

(i) Reactions R_A, R_B, R_C, and R_D.
(ii) Shear and moment at F.
(iii) Shear and moment at G.



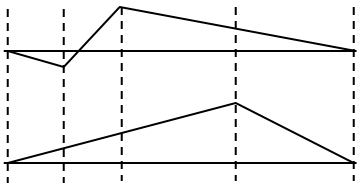
Prob. 15

16. For the girder shown, construct the influence lines for (i) shear in panel BC and (ii) moment at E. (Norris & Wilbur, 4th Ed, p-172)



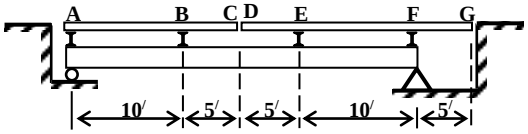
Prob. 16

V_B = - 1/6 k, V_C = +2/3 k

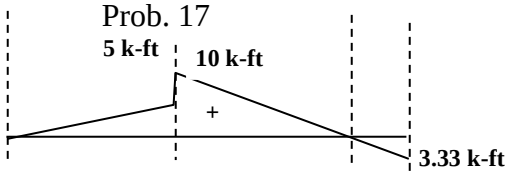


M_E = +13.33 k-ft

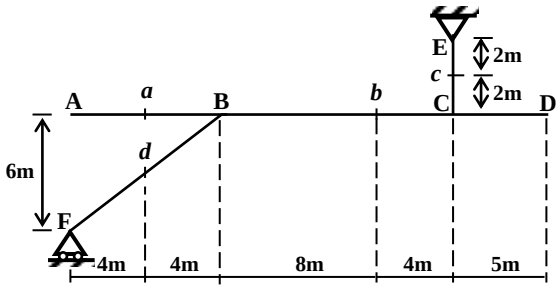
17. Note the unusual stringer arrangement for this girder. Construct the influence lines for the bending moment in the girder at E. (Norris & Wilbur, 4th Ed, p-173)



Prob. 17

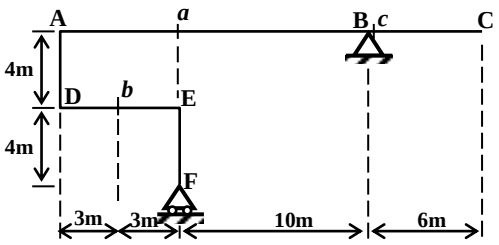


As a unit load moves from A to D on the following structure, draw the influence lines for shear and moment at sections *a*, *b*, *c*, and *d*.



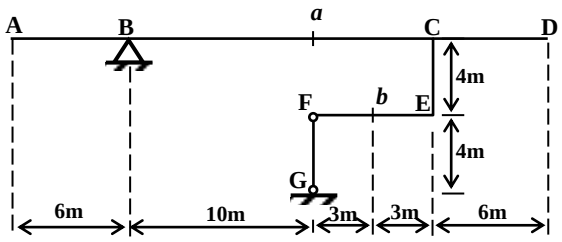
Prob. 18

18. As a unit load moves from A to D on the following structure, draw the influence lines for shear and moment at sections *a*, *b*, and *c*(just to the right of B).



Prob. 19

19. As a unit load moves from A to D on the following structure, draw the influence lines for shear and moment at sections *a*, and *b*. Also, draw the influence lines for reaction in member FG.



Prob. 20

21. As a unit load moves from A to D and E to F on the following structure, draw the influence lines for shear and moment at sections *a*, and *b*. Also, draw the influence lines for reaction in member FG.