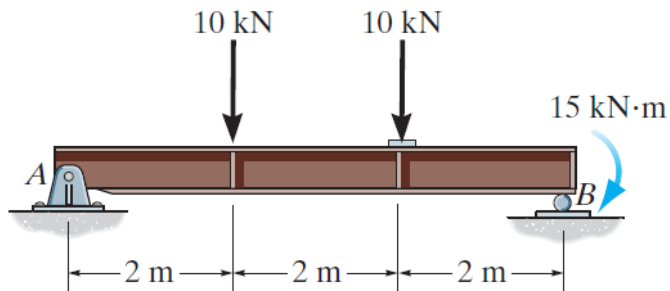


problem 6-40

***6-40.** Draw the shear and moment diagrams for the simply supported beam.



Prob. 6-40

beam

```
u = symunit;
x = sym('x');
E = sym('E');
I = sym('I');

old_assum = assumptions;
clearassum;

b = beam; %(kN,m)
b = b.add('reaction', 'force', 'Ra', 0);
b = b.add('reaction', 'force', 'Rb', 6*u.m);
b = b.add('applied', 'force', -10*u.kN, 2*u.m);
b = b.add('applied', 'force', -10*u.kN, 4*u.m);
b = b.add('applied', 'moment', -15*u.kN*u.m, 6*u.m);
b.L = 6*u.m;
```

elastic curve

```
[y(x,E,I) dy(x,E,I) m v w r] = b.elastic_curve(x, 'factor'); %#ok
y
```

```
y(x, E, I) =
```

$$\begin{cases} -\frac{5x(20m^2 - x^2)}{4EI} \text{ kN} & \text{if } x \leq 2m \\ -\frac{5(x^3 - 24x^2m + 108xm^2 - 32m^3)}{12EI} \text{ kN} & \text{if } x \in (2m, 4m] \\ -\frac{5(x - 6m)(5x^2 - 42xm + 48m^2)}{12EI} \text{ kN} & \text{if } 4m < x \end{cases}$$

dy

dy(x, E, I) =

$$\begin{cases} -\frac{5(20m^2 - 3x^2)}{4EI} \text{ kN} & \text{if } x \leq 2m \\ -\frac{5(x^2 - 16xm + 36m^2)}{4EI} \text{ kN} & \text{if } x \in (2m, 4m] \\ -\frac{5(5x^2 - 48xm + 100m^2)}{4EI} \text{ kN} & \text{if } 4m < x \end{cases}$$

m

m(x) =

$$\begin{cases} \frac{15x}{2} \text{ kN} & \text{if } x \leq 2m \\ -\frac{5(x - 8m)}{2} \text{ kN} & \text{if } x \in (2m, 4m] \\ -\frac{5(5x - 24m)}{2} \text{ kN} & \text{if } 4m < x \end{cases}$$

v

v(x) =

$$\begin{cases} \frac{15}{2} \text{ kN} & \text{if } x \leq 2m \\ -\frac{5}{2} \text{ kN} & \text{if } x \in (2m, 4m] \\ -\frac{25}{2} \text{ kN} & \text{if } 4m < x \end{cases}$$

w

w(x) = 0

reactions

Ra = vpa(r.Ra) %%ok

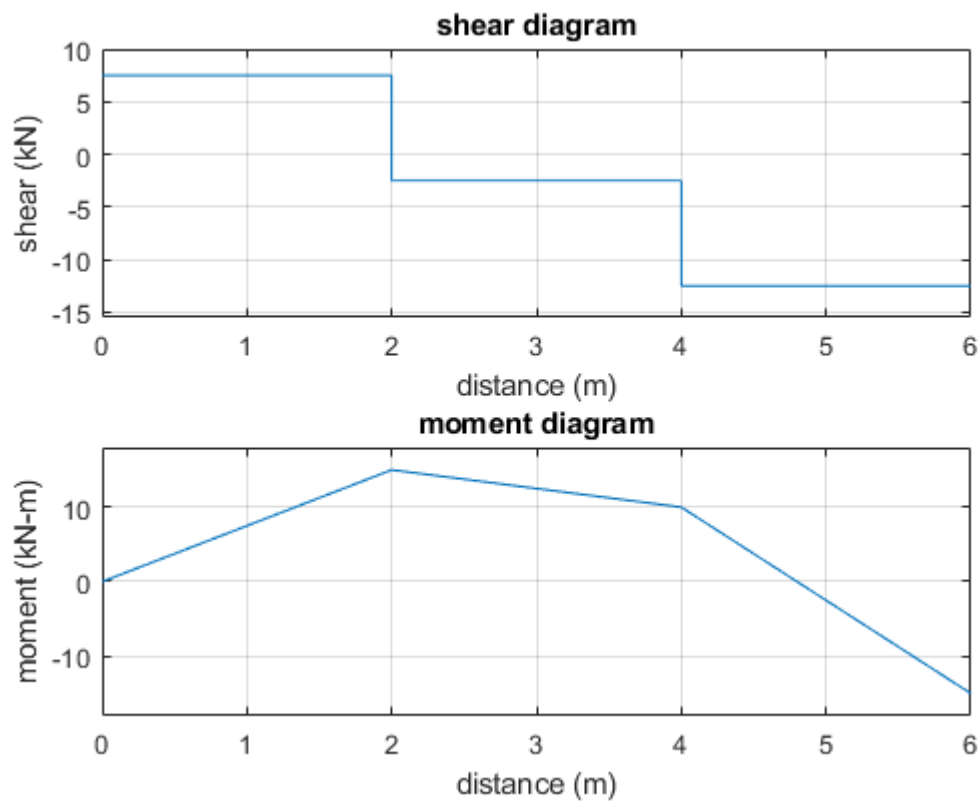
$R_a = 7.5 \text{ kN}$

```
Rb = vpa(r.Rb) %#ok
```

$R_b = 12.5 \text{ kN}$

shear and moment diagram

```
beam.shear_moment(m, v, [0 6], {'kN' 'm'});  
subplot(2,1,1);  
axis([0 6 -15.5 10]);  
subplot(2,1,2);  
axis([0 6 -18 18]);
```



clean up

```
setassum(old_assum);  
clear args old_assum Ra Rb;
```