Numerical Methods & **Computer Programming**

Lecture 11

Practical Application of programming on Civil Engineering

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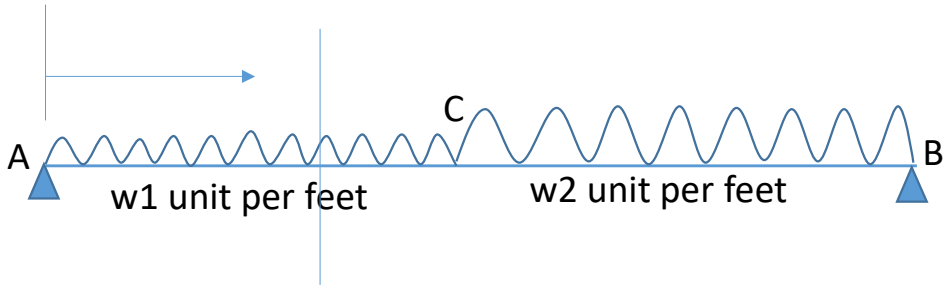
Write a C program to calculate shear force and bending moment at any point for the following beam.

Beam Portion	Loading Condition	Length
AC	w1 unit per feet	10 feet
CB	w2 unit per feet	10 feet



Program

Step 1: Find the reaction of the beam

Let us consider,

Reaction at A = r1

Reaction at B = r2

So, after calculating,

$$r2 = (2.5*w1)+ (7.5*w2)$$

$$r1 = (7.5*w1) + (2.5*w2)$$

Condition	Shear force	Bending Moment
x>=0 && x<=10	r1-(w1*x)	(r1*x)-(w1*x*x*0.5)
x>10&&x<20	r1-(w1*10)-(w2*(x-10))	(r1*x)-(10*w1*(x-5))-(w2*(x-10)*(x-10)*0.5)
x==20	0	0

Complete Solution

```
#include<stdio.h>
void main()
{
float w1,w2,r1,r2,s,m,x;
printf("Enter the value of x=\n");
scanf("%f",&x);
printf("Enter the value of w1=\n");
scanf("%f",&w1);
printf("Enter the value of w2=\n");
scanf("%f",&w2);
r2=(7.5*w1)+(2.5*w2);
r1=(2.5*w1)+(7.5*w2);
```

```
printf("\n Reaction at point A, r1 = %f",r1);
printf("\n Reaction at point B, r2 = %f",r2);
else if(x=>0&&x<=10)
{
s=r1-(w1*x);
m=(r1*x)-(w1*x*x*0.5);
printf("\n Shear force at %f distance from left is = %f",x,s);
printf("\n Bending Moment at %f distance from left is = %f",x,m);
}
```

```
else if(x>10&&x<=20)
{
s=r1-(w1*10)-(w2*(x-10));
m=(r1*x)-(10*w1*(x-5))-(w2*(x-10)*(x-10)*0.5);
printf("\n Shear force at %f distance from left is = %f",x,s);
printf("\n Bending Moment at %f distance from left is = %f",x,m);
}
else
{
printf("Please enter valid value of x=");}}
```

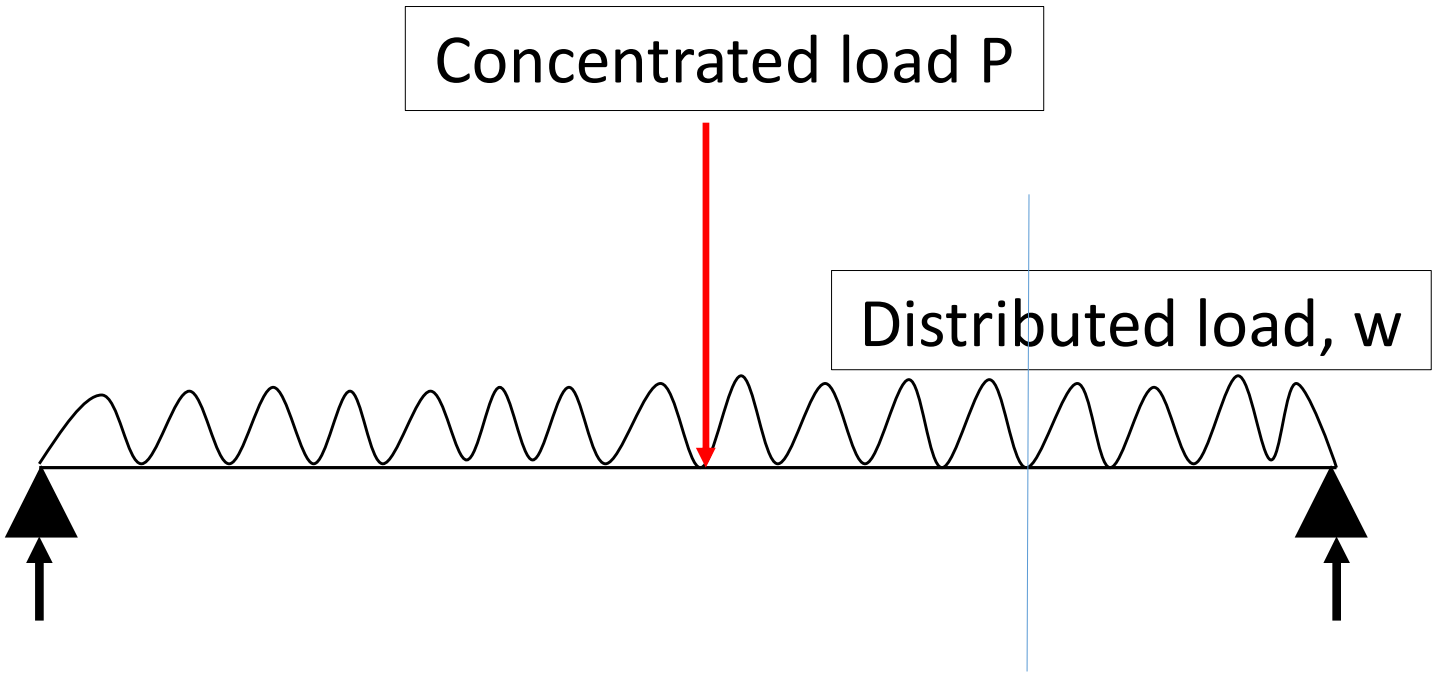
Recommended problems

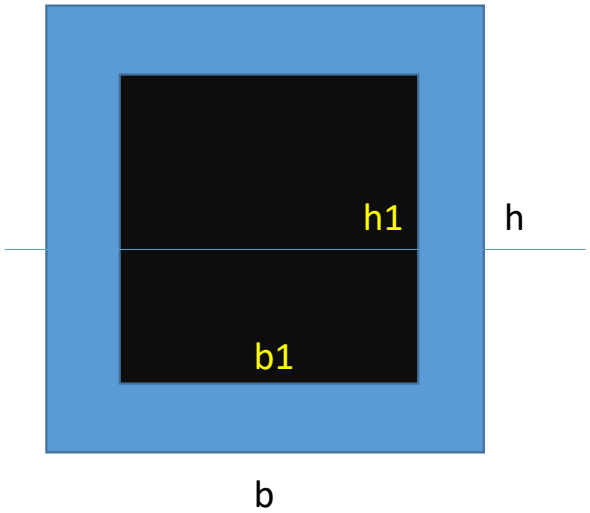
Practice each of these problems.

http://www.mediafire.com/file/31esyx7mqthm70t/Beam_Analysis.pdf/file

The more you practice, the more you can learn.

Program: Write a C program to calculate shear force, bending moment, shearing stress and flexural stress, maximum shearing stress and maximum flexural stress of the following beam at every l/10 distance.





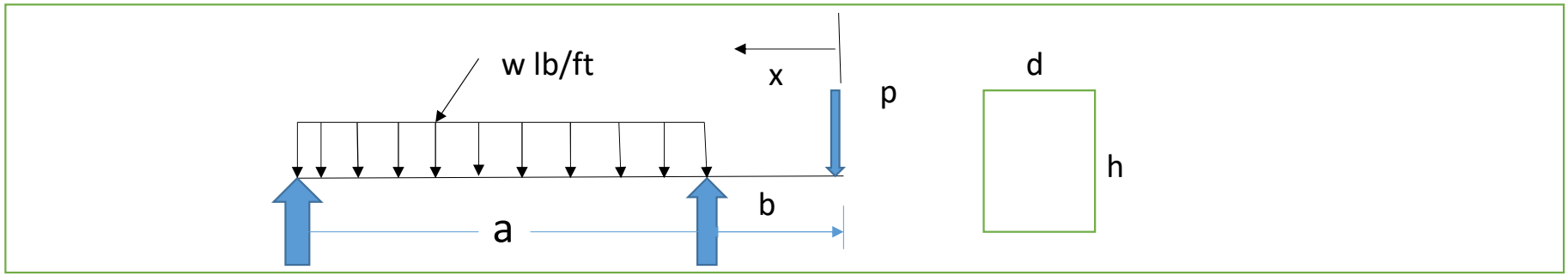
Complete Solution

```
#include<stdio.h>
void main()
float p,w,l,b,h,b1,h1;
float inertia,limit,v,m,ss,bs,ssmax,bsmax,vmax,mmax;
float r1,c,x,bb;
printf("Enter the value of concentrated load p = \n");
scanf("%f",&p);
printf("Enter the value of distributed load w = \n");
scanf("%f",&w);
printf("Enter the value of length l = \n");
scanf("%f",&l);
```

```
printf("Enter the value of b and h respectively=\n");
scanf("%f %f",&b,&h);
printf("Enter the value of b1 and h1 respectively=\n");
scanf("%f %f",&b1,&h1);
r1=(p*0.5)+(w*l*0.5);
printf("Reaction, r1 = %f",r1);
inertia=((b*h*h*h)/12.0)-((b1*h1*h1*h1)/12.0);
bb=b-b1;
q=((b*h*0.5)*(h*0.25))-((b1*h1*0.5)*(h1*0.25));
c=h/2.0;
limit=l/2.0;
```

```
for(x=0;x<limit;x=x+l/10)
{
v=r1-(w*x);
m=(r1*x)-(w*x*x*0.5);
ss=(v*q)/(inertia*bb);
bs=(m*c)/inertia;
printf("Distance x = %f shear = %f  Moment = %f  Shearing stress = %f  Bending
Stress = %f",x,v,m,ss,bs);
}
vmax=r1;
mmax=(r1*l*0.5)-(w*l*l*0.25);
ssmax=(vmax*q)/(inertia*bb);
bsmax=(mmax*c)/inertia;
printf("Maximum shearing stress = %f",ssmax);
printf("Maximum bending stress = %f",bsmax);
}
```

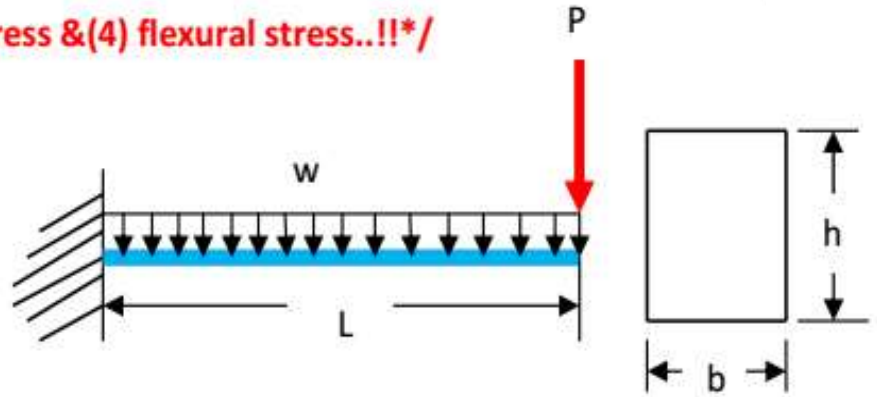
/* Find out:(1)shear force(2)moment(3)shearing stress &(4) flexural stress..!!*/




```
#include <stdio.h>
#include <conio.h>
#include<math.h>
Void main ()
{
Float p,w,a,b,s,m,ss,fs,r1,r2,d,h,q,c,I;
Printf (“Enter p,w,a,b,d,h,x);
Scanf(“%f%f%f%f%f%f%f”, &p,&w,&a,&b,&d,&h,&x);
r1= (w*a/2)- p*b/a;
r2 = (w*a/2)+ (p*(a+b))/a;
i = d*h*h*h/12;
q=d*h*h/8;
```

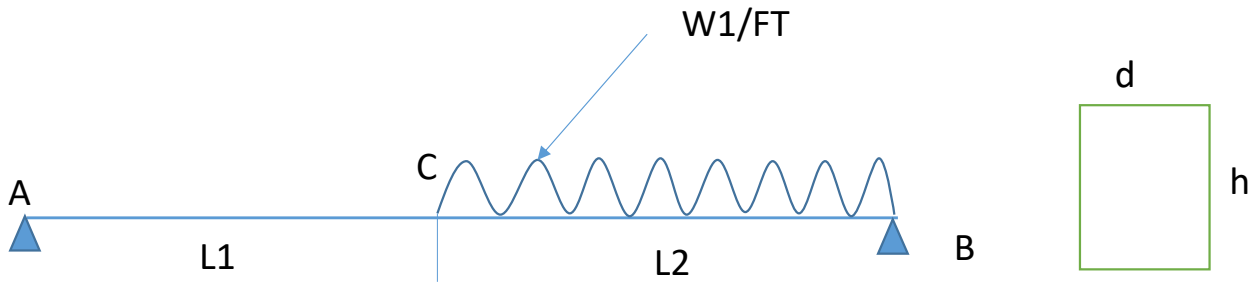
```
if ( x>=0 && x<=b)
{
s=p;
m=p*x;
ss=s*a/i*d;
fs=m*c/i;
Printf (“ shear=%f\n, moment=%f\n, shearing stress=%f\n, flexural stress =%f\n”,
s,m,ss,fs);
}
else if (x>=b && x<=(a+b))
{
s=p+w*(x-b)-r2;
m=p*x+w*(x-b)*(x-b)/2-r2*(x-b);
ss=(s*a)/(i*d);
fs=m*c/i;
printf (“ shear=%f\n, moment=%f\n, shearing stress=%f\n, flexural stress =%f\n”,
s,m,ss,fs);}}
```

```
/* Find out:(1)shear force(2)moment(3)shearing stress &(4) flexural stress..!!*/
#include<stdio.h>
void main()
{
float p,w,s,m,l,b,h,i,q,c,st,fs,v,sf;
printf("ENTER l,w,p,b,h:");
scanf("%f%f%f%f%f",&l,&w,&p,&b,&h);
c=h/2.00;
i=(b*pow(h,3))/12.00;
q=(b*pow(h,2))/8.00;
sf=p+w*l;
m=p*l+(w*pow(l,2))/2.00;
st=(sf*q)/(i*b);
fs=(m*c)/i;
printf("\nshear force=%f",sf);
printf("\nmoment=%f",m);
printf("\nshearing stress=%f",st);
printf("\nflexural stress=%f",fs);
return(0);
}
```

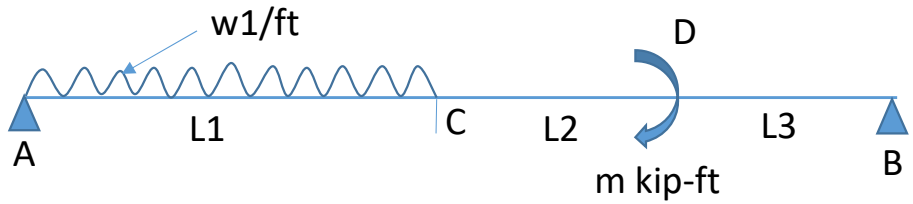


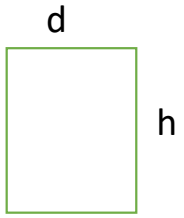
Assignment 1

Write a program to calculate **shear force and bending moment, Shearing stress and bending stress at any point** of the following beam.



Assignment 2





Summary of Beam Analysis Problem:

- Write a general program to calculate **shear force, bending moment, shearing stress and flexural stress at anywhere** of the following beam. [2017]
- Write a program to calculate **shear force and bending moment at any point** of the following beam. [2016]
- Write a program to calculate the **shear, moment, shearing stress and flexural stress** of a beam as shown in figure below **at every l/10 distance** from support. [2015]

THANK YOU