COMPUTER APPLICATION IN CIVIL ENGINEERING

Import numpy as np

L= 12 #length in meters

W= #intensity of load in KN/m

#Question a

#Bending moment(M) and shear force(V) at the first end ,x=0

X=0

M= (w(-6\*x\*2+6\*L\*x-L\*\*2))/12

V=(w\*(L/2-x)

j=’The bending moment at x=0’

k=’the shear force at x=0

print()

print(‘(a.1)’+ m + str(M) + ’and ’,n + str(V))

#Bending moment(M) and shear(V) at the first end, x=L=10

x = L

M = (w\*(-6\*x\*\*2+6\*L\*x-L\*\*2))/12

V = w\*(L/2-x)

j = ‘The bending moment at x=L is ‘

k = ‘the shear force at x= L

print()

print(‘a.2)’+ m + str(M) + ‘and’, n+str(V))

#Question b

“””

When the bending moment is zero, we get an expression x\*\*2-Lx+L\*\*2/6=0

“””

#from the expression

j = 1

k = -L

l= L\*\*2/6

#Using the almighty formula the two roots are;

Discriminant =b\*\*2-4\*a\*c

Root\_1b= (-b + np.sqrt(discriminant))/2\*a

Root\_2b = (-b-np.sqrt(discriminant))/2\*a

Print()

Print(‘(b) the points of contraflexure are{0} and {1}’.format(root\_1b,root\_2b))

#Question c

“””

When the shear force is zero, x= L/2

“””

X = L/2

Print()

Print(‘(c) the point at which V=0 is {}’.format(x))

#Question d

P= 0

S= 0.01

q= L+s

x= np.arange(p,q,s)

M= (w\*(-6\*x\*\*2 + 6\*L\*x-L\*\*2))/12

Print()

Print(‘(d) Using the initialized variable, the bending moment at each step in the array is {0}’.format(M))

#Question e

V = w\*(L/2 – x)

Print(‘(e) the shear for each step along the span is {}’.format(V))

#Question f

“””

Let the absolute value of the bending moment array be AM

“””

AM = abs(M)

m\_AM = min(AM)

“””

When the bending moment is m\_AM, we get an expression x\*\*2-Lx + (L\*\*2/6) = (28m\_AM)/w = 0

“””

#from the above expression

j = 1

k = -L

l = (L\*\*2/6) + (2\*m\_AM)/w

#Using the almighty formular the two roots are;

Discriminant = b\*\*2 -4\*a\*c

Root\_1f = (-b +np.sqrt(discriminant))/2\*a

Root\_2f = (-b-np.sqrt(discriminant))/2\*a

Print()

Print(‘(f) the points along L at which the absolute values of the bending moment array is minimum are {0} and {1}’.format(root\_1f,root\_2f))

#Question g

“””

Let the relative errors be r\_e

“””

R\_e1 = ((root\_1b-root\_1f)/root\_1b\*100)

R\_e2 = ((root\_2f\_root\_2b)/root\_2f\*100)

Print()

Print(‘(g) the relative errors between estimated points of contraflexure are {0}% and {1}%’.format(r\_e1,r\_e2))

#Question h

“””

Let the maximum bending moment be max\_M and the minimum bending moment be min\_M

“””

#for the maximum

Max\_M = max(M)  
“””

When the bending moment is max\_M, we get an expression x\*\*2-Lx + (L\*\*2/6) + (2\*max\_M)/w = 0

“””

j = 1

k =-L

l = (L\*\*2/6) + (2\*max\_M)/w

#Using the almighty formula the two roots are;

Discriminant = b\*\*2 – 4\*a\*c

Root\_1 = (-b + np.sqrt(discriminant))/2\*a

Root\_2 = (-b – np.sqrt(discriminant))/2\*a

Print()

Print(‘(h.1) the points at which the maximum bending moment occur are {0} and {1}’.format(root\_1,root\_2))

#for the minimum

Min\_M = min(M)

“””

j = 1

k = -l

l = (L\*\*2//6) + (2min\_M)/w

#Using the almighty formula the two roots are;

Discriminant = b\*\*2 – 4\*a\*c

root\_1 = (-b – np.sqrt(discriminant))/2\*a

root\_2 = (-b + np.sqrt(discriminant))/2\*a

print()

print(‘(h.2) the points at which the minimum bending moment occur are {0} and{1}’.format(root\_1,root\_2))