MATLAB CODE

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clc; clear; close all;
disp('Simply Supported Beam with Multiple Supports');
%% Data Input Section
L = input('Length of beam in meters = ');
disp('Enter Supports (Hinge/Roller/Fixed)');
nS = input('Number of supports = ');
S = zeros(nS, 2);
support_types = cell(nS, 1);
for i = 1:nS
 S(i,2) = input(['Location of Support ' num2str(i) ' in meters = ']);
 support_types{i} = input(['Type of Support ' num2str(i) ' (Hinge/Roller/Fixed)
= '],'s');
end
disp('Enter support reactions:');
ForceReactions = zeros(nS, 1);
MomentReactions = zeros(nS, 1);
for i = 1:nS
 ForceReactions(i) = input(['Force Reaction for Support ' num2str(i) ' ('
support_types{i} ') in kN: ']);
 MomentReactions(i) = input(['Moment Reaction for Support ' num2str(i) ' in
kNm: ']);
end
disp('Enter Point Loads');
nP = input('Number of point loads = ');
P = zeros(nP, 2);
for i = 1:nP
 P(i,1) = input(['Load ' num2str(i) ' magnitude in kN = ']);
 P(i,2) = input(['Location of Load ' num2str(i) ' from left end in meters =
']);
end
disp('Enter Uniformly Distributed Loads');
nU = input('Number of UDLs = ');
U = zeros(nU, 3);
for i = 1:nU
 U(i,1) = input(['UDL ' num2str(i) ' intensity in kN/m = ']);
 U(i,2) = input(['Start position of UDL ' num2str(i) ' in meters = ']);
 U(i,3) = input(['End position of UDL ' num2str(i) ' in meters = ']);
end
disp('Enter Triangular Loads');
nT = input('Number of Triangular Loads = ');
T = zeros(nT, 4);
for i = 1:nT
 T(i,1) = input(['Triangular Load ' num2str(i) ' starting intensity in kN/m =
']);
 T(i,2) = input(['Triangular Load ' num2str(i) ' ending intensity in kN/m =
']);
 T(i,3) = input(['Start position of Triangular Load ' num2str(i) ' in meters =
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 T(i,4) = input(['End position of Triangular Load ' num2str(i) ' in meters =
']);
end
disp('Enter Moments Applied to the Beam');
nM = input('Number of applied moments = ');
M_input = zeros(nM, 2);
for i = 1:nM
 M_input(i,1) = input(['Moment ' num2str(i) ' magnitude in kNm = ']);
 M_input(i,2) = input(['Location of Moment ' num2str(i) ' from left end in
meters = ']);
end
%% Shear Force Calculation
n = 1000;
delta_x = L/n;
x = (0:delta_x:L)';
V = zeros(length(x),1);
for ii = 1:length(x)
 xi = x(ii);
 V(ii) = 0;
  % Add support reactions
 for i = 1:nS
     if xi >= S(i,2)
         V(ii) = V(ii) + ForceReactions(i);
     end
 end
  % Subtract point loads
 for j = 1:nP
     if xi >= P(j,2)
         V(ii) = V(ii) - P(j,1);
     end
 end
  % Subtract uniformly distributed loads
 for j = 1:nU
     if xi > U(j,2) && xi <= U(j,3)
         V(ii) = V(ii) - U(j,1) * (xi - U(j,2));
     elseif xi > U(j,3)
         V(ii) = V(ii) - U(j,1) * (U(j,3) - U(j,2));
     end
 end
  % Subtract triangular loads (Now treated as UDL + triangular component)
 for j = 1:nT
     q_start = T(j,1);
     q_end = T(j,2);
     a_t = T(j,3);
     b_t = T(j,4);
     L_t = b_t - a_t;

     if xi > a_t && xi <= b_t
         % The base UDL part (constant at q_start)
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        V(ii) = V(ii) - q_start * (xi - a_t);

        % The triangular varying part
        q_var = ((q_end - q_start) / L_t) * (xi - a_t);
        V(ii) = V(ii) - (q_var * (xi - a_t) / 2);
    elseif xi > b_t
        % The total equivalent load from the triangular distribution
        avg_q = (q_start + q_end) / 2;
        V(ii) = V(ii) - avg_q * L_t;
    end
 end
end
%% Bending Moment Calculation with Initial Moment Correction
M = cumtrapz(x, V) - MomentReactions(1);
% Apply the effect of applied moments
for j = 1:nM
   idx = find(x >= M_input(j,2), 1);
   if ~isempty(idx)
       M(idx:end) = M(idx:end) - M_input(j,1);
   end
end
[Mmax, idx] = max(M);
xMmax = x(idx);
disp(['Maximum bending moment = ' num2str(Mmax) ' kNm'])
disp(['Bending moment at x=0 = ' num2str(M(1)) ' kNm'])
%% Plot Shear Force and Bending Moment Diagrams
figure;
subplot(2,1,1);
plot(x, V, 'r', 'linewidth', 1.5);
grid on;
title('Shear Force Diagram')
xlabel('x (m)'); ylabel('V (kN)');
subplot(2,1,2);
plot(x, M, 'r', 'linewidth', 1.5);
grid on;
title('Bending Moment Diagram')
xlabel('x (m)'); ylabel('M (kNm)');
line([xMmax xMmax], [0 Mmax], 'LineStyle', '--', 'Color', 'b');
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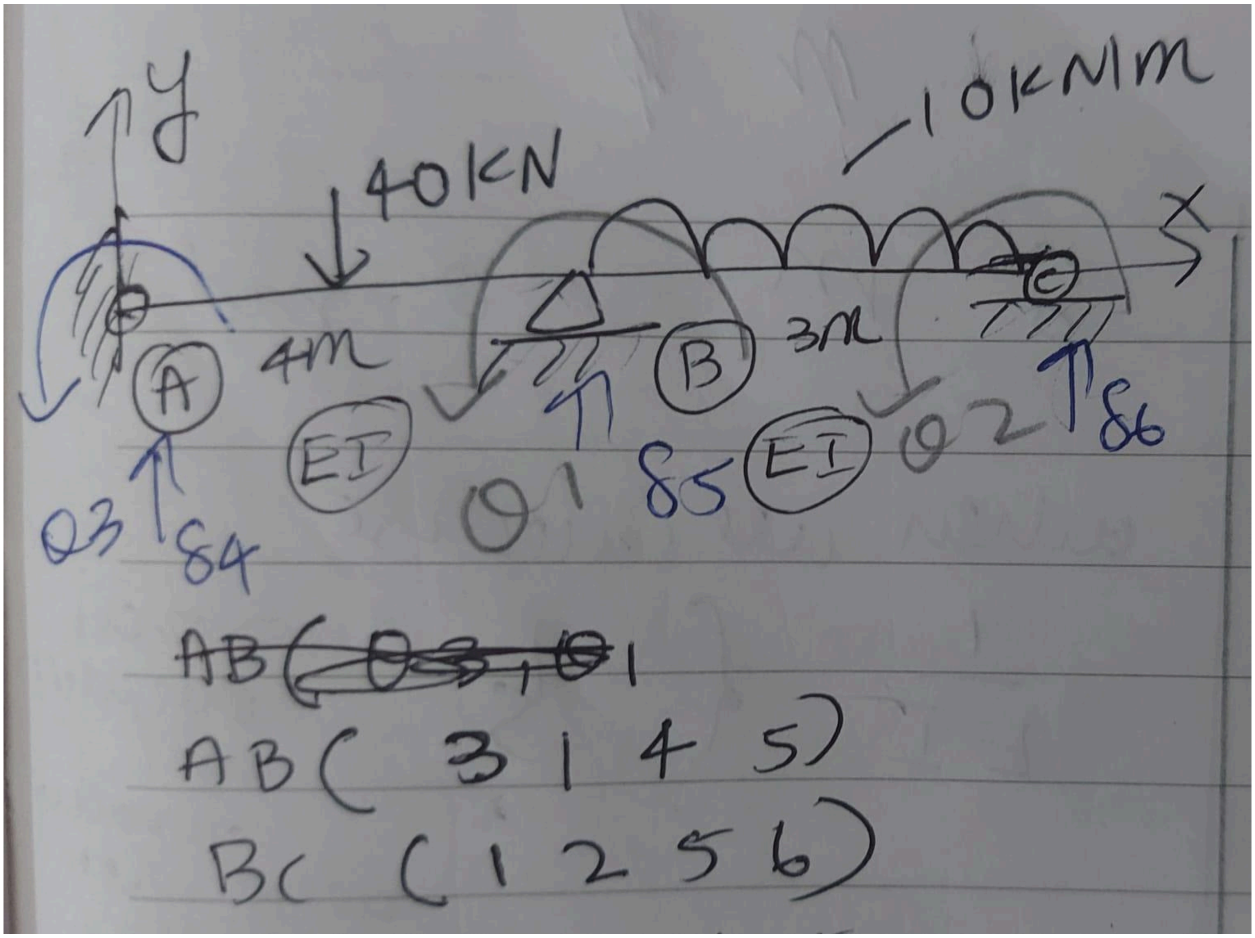
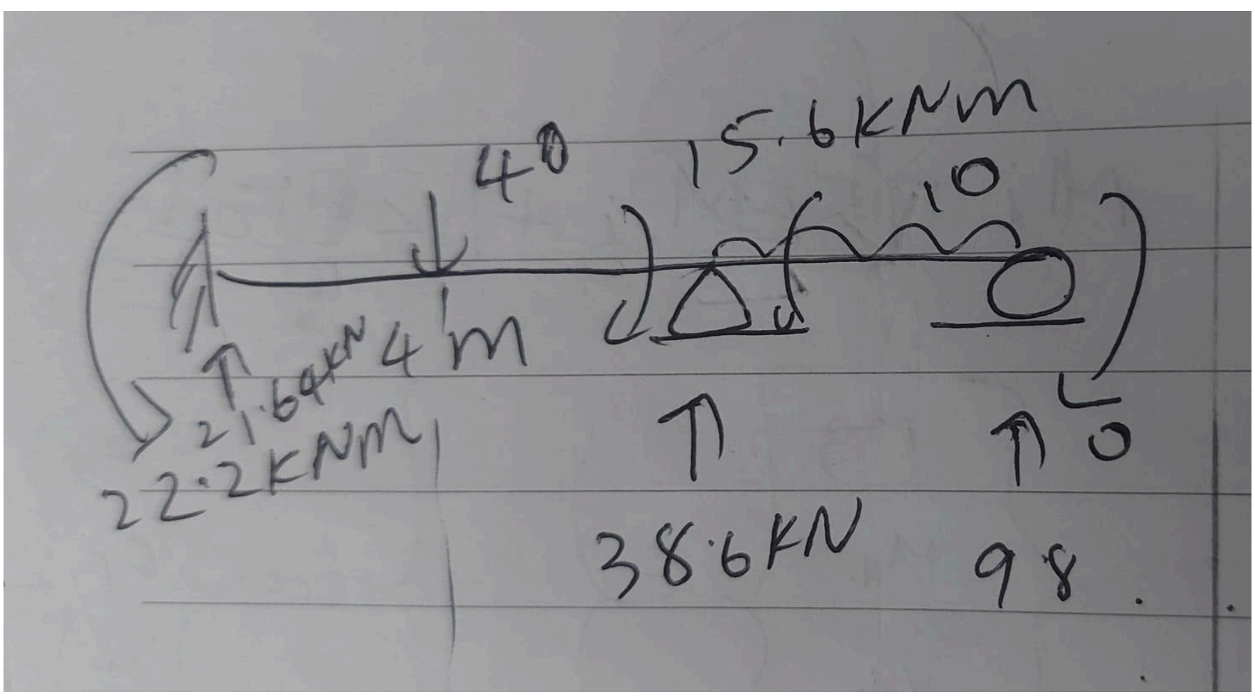
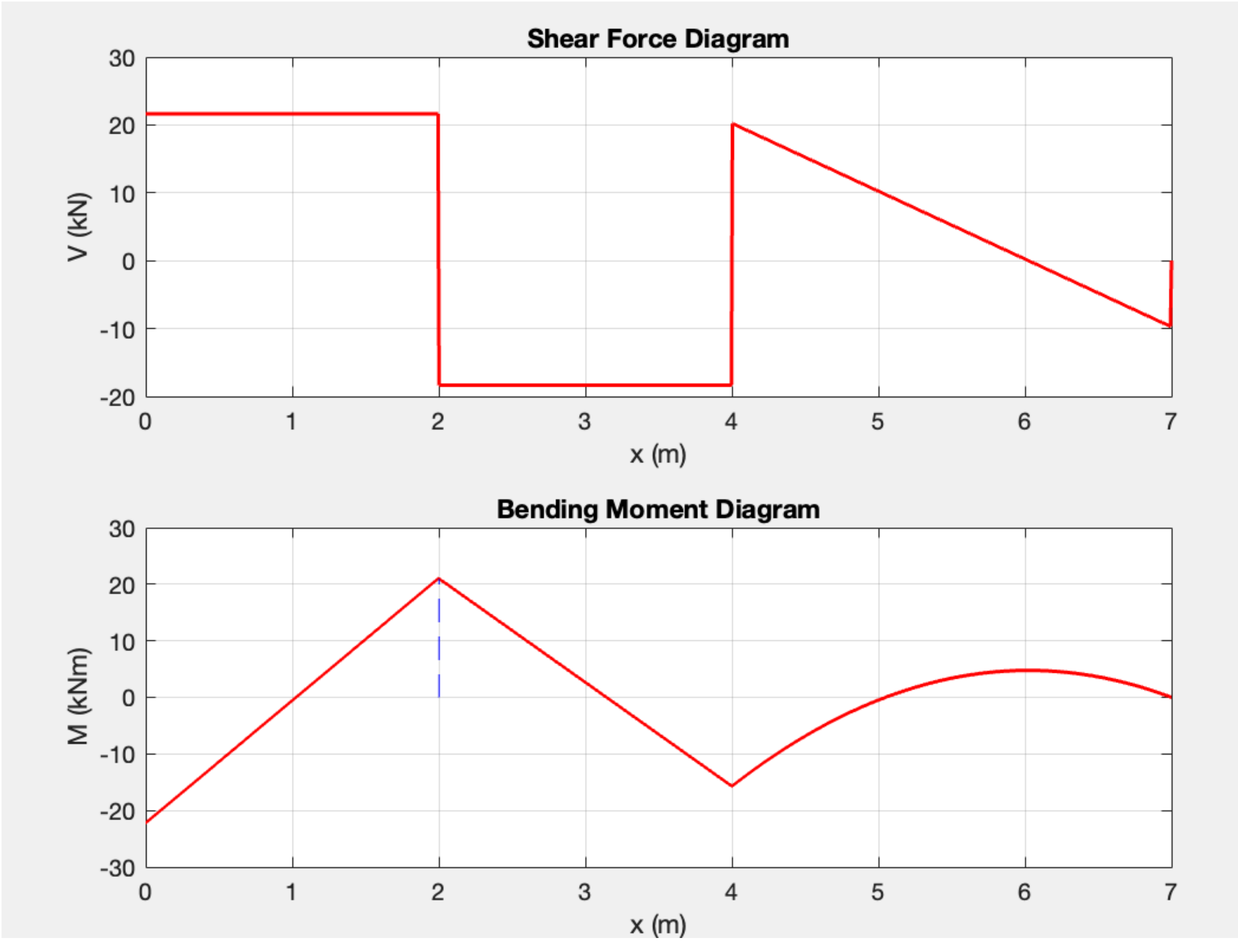
SAMPLE INPUT 1

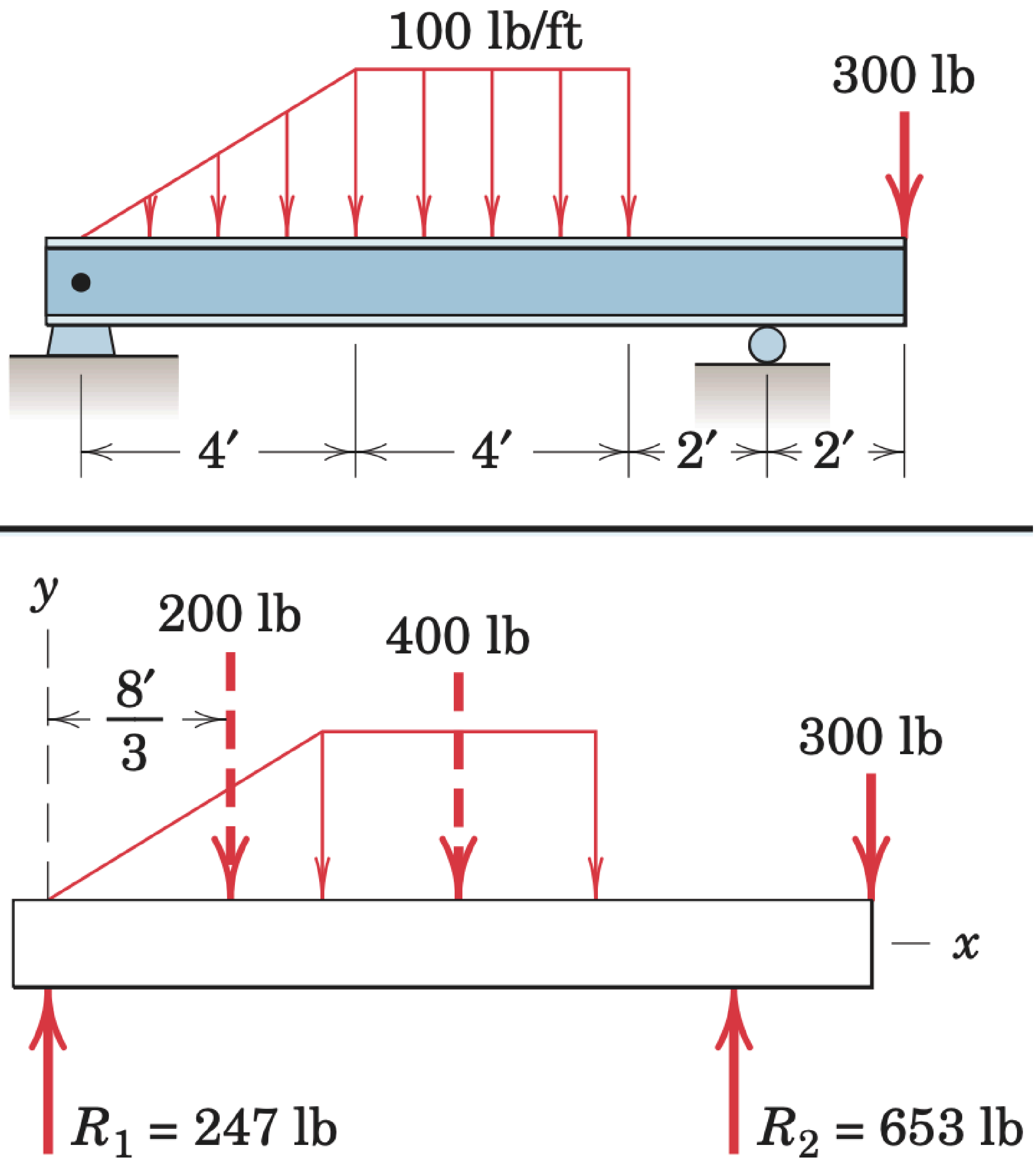




Simply Supported Beam with Multiple Supports
Length of beam in meters = 7
Enter Supports (Hinge/Roller/Fixed)
Number of supports = 3
Location of Support 1 in meters = 0
Type of Support 1 (Hinge/Roller/Fixed) = Fixed
Location of Support 2 in meters = 4
Type of Support 2 (Hinge/Roller/Fixed) = Hinge
Location of Support 3 in meters = 7
Type of Support 3 (Hinge/Roller/Fixed) = Roller
Enter support reactions:
Force Reaction for Support 1 (Fixed) in kN: 21.64
Moment Reaction for Support 1 in kNm: 22.2
Force Reaction for Support 2 (Hinge) in kN: 38.6
Moment Reaction for Support 2 in kNm: 0
Force Reaction for Support 3 (Roller) in kN: 9.8
Moment Reaction for Support 3 in kNm: 0
Enter Point Loads
Number of point loads = 1
Load 1 magnitude in kN = 40
Location of Load 1 from left end in meters = 2
Enter Uniformly Distributed Loads
Number of UDLs = 1
UDL 1 intensity in kN/m = 10
Start position of UDL 1 in meters = 4
End position of UDL 1 in meters = 7
Enter Triangular Loads
Number of Triangular Loads = 0
Enter Moments Applied to the Beam
Number of applied moments = 0
Maximum bending moment = 20.9833 kNm
Bending moment at x=0 = -22.2 kNm

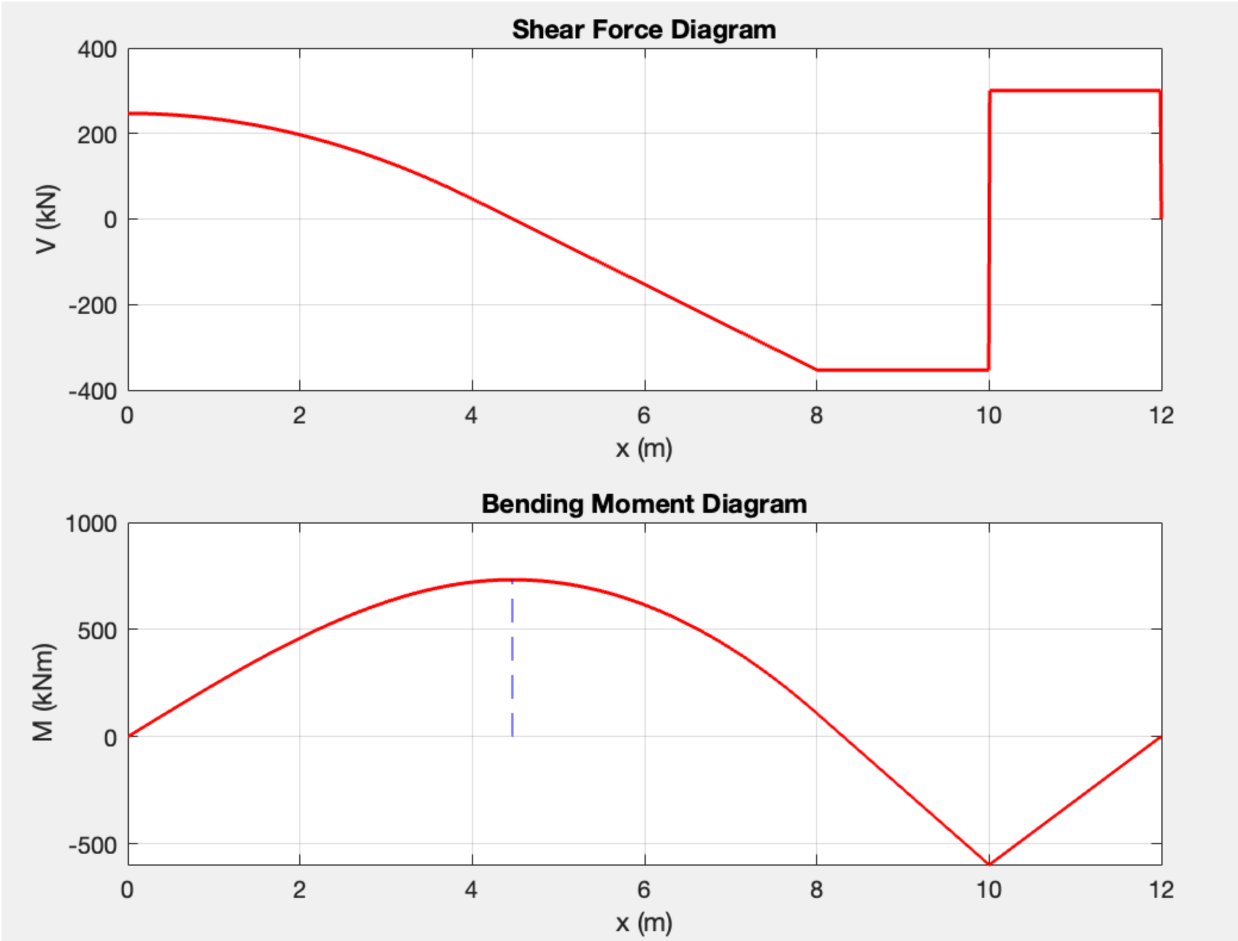

Shear Force Diagram
V (kN)
x (m)
Bending Moment Diagram
M (kNm)
x (m)

SAMPLE INPUT 2



Simply Supported Beam with Multiple Supports
Length of beam in meters = 12
Enter Supports (Hinge/Roller/Fixed)
Number of supports = 2
Location of Support 1 in meters = 0
Type of Support 1 (Hinge/Roller/Fixed) = Hinge

Location of Support 2 in meters = 10
Type of Support 2 (Hinge/Roller/Fixed) = Roller
Enter support reactions:
Force Reaction for Support 1 (Hinge) in kN: 247
Moment Reaction for Support 1 in kNm: 0
Force Reaction for Support 2 (Roller) in kN: 653
Moment Reaction for Support 2 in kNm: 0
Enter Point Loads
Number of point loads = 1
Load 1 magnitude in kN = 300
Location of Load 1 from left end in meters = 12
Enter Uniformly Distributed Loads
Number of UDLs = 1
UDL 1 intensity in kN/m = 100
Start position of UDL 1 in meters = 4
End position of UDL 1 in meters = 8
Enter Triangular Loads
Number of Triangular Loads = 1
Triangular Load 1 starting intensity in kN/m = 0
Triangular Load 1 ending intensity in kN/m = 100
Start position of Triangular Load 1 in meters = 0
End position of Triangular Load 1 in meters = 4
Enter Moments Applied to the Beam
Number of applied moments = 0
Maximum bending moment = 732.3753 kNm
Bending moment at x=0 = 0 kNm


Shear Force Diagram
V (kN)
400
200
0
-200
-400
0
2
4
6
8
10
12
x (m)
Bending Moment Diagram
M (kNm)
1000
500
0
-500
0
2
4
6
8
10
12
x (m)