Session: 2021-22 MEC 301: Solid Mechanics

Question Bank 2 (Deflection of Beams)

Q1. A simple beam AB is subjected to couples M_0 and $2M_0$ acting as shown in the Fig. 1. Calculate the location where the deflection will be maximum. Assume EI to be constant.

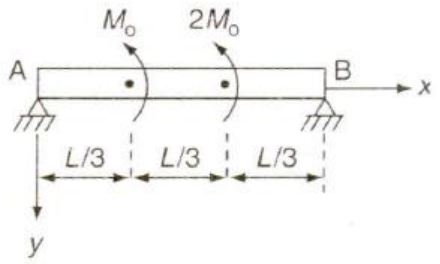
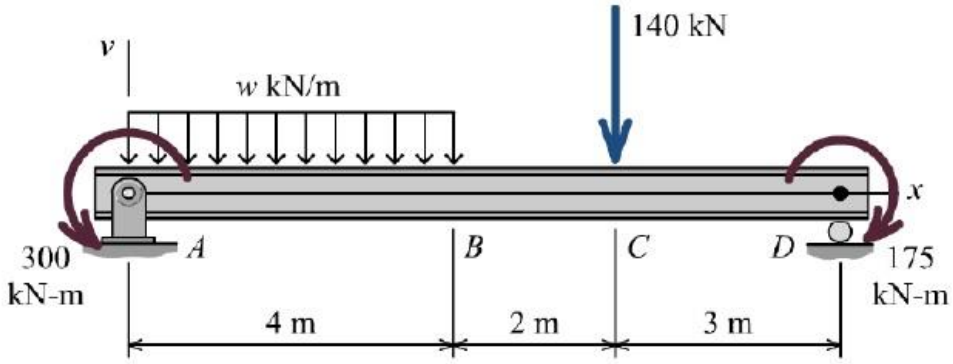


Fig. 1.

2) The simply supported beam shown in the figure consists of a W530 × 66 structural steel wide-flange shape [$E = 200$ GPa; $I = 351 \times 10^6$ mm^4].
a) If $w = 85$ kN/m, determine the beam deflection at point B.
b) If $w = 115$ kN/m, determine the beam deflection at point C.



Q3. A simply supported 6 m long rolled steel joist carries a uniformly distributed load of 9.5 KN/m per unit length. Determine slope and deflection at a distance of 3m from one end of the beam.

Q4. For the beam loaded as shown in the Figure 2 determine the equations of elastic curves using the integration method. Determine the value of maximum deflection.

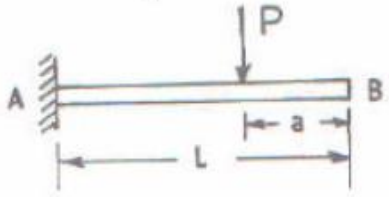


Fig. 2: A cantilever beam.

Q5. A 5-m long simply supported beam carries a point load 5kN at 3m from the left end. Determine the slope at the left end and deflection at the load point and maximum deflection. Given that E= 200 GPa and I = 100 X 10^6 mm^4.

Q6. A 3m long cantilever beam is loaded with a point load of 450N at the free end. If the section is rectangular 80mm wide X 160mm deep and E = 10GPa, calculate slope and deflection
(a) at the free end of the cantilever and (b) at a distance of 0.55m from the free end.

Q7. For the beam loaded as shown in the Figure 3 determine the equations of elastic curves using the double integration method. Determine the value of maximum deflection and deflection below the concentrated load.

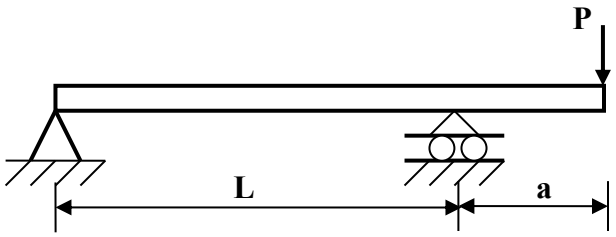


Figure 3: A cantilever beam.

Q8. A 300 mm long cantilever of rectangular section 48 mm wide and 36 mm deep carries a uniformly distributed load. Calculate the value of load w0 if the maximum deflection in the cantilever beam is not to exceed 1.5 mm. Take E = 70 GN/m^2. Derive the formula used.
Q9. For the beams loaded as shown in the Fig. 4 determine the equations of elastic curves using the integration method. Determine the values of maximum deflection, slope and their locations.

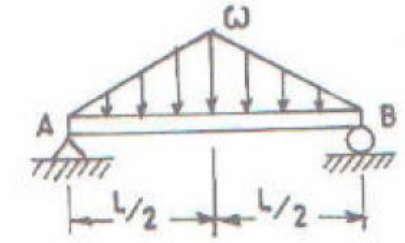


Fig. 4.

Q10. Determine the slope and deflection of the point C of the non-uniform beam shown in the Fig. 5 using moment area method and verify result by integration method.

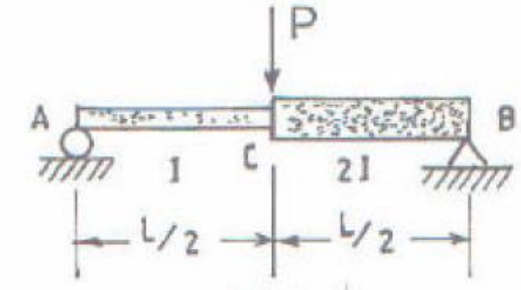


Fig. 5.

Q11. Determine the maximum deflection and slope and deflections under the moment.

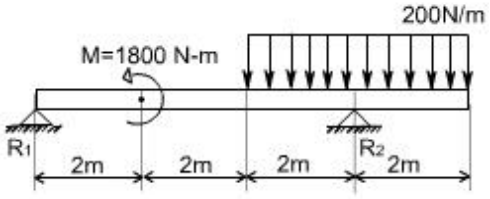


Fig. 6.

Q12. Determine the slope and deflectin of the points C and D and location of the maximum delfection.

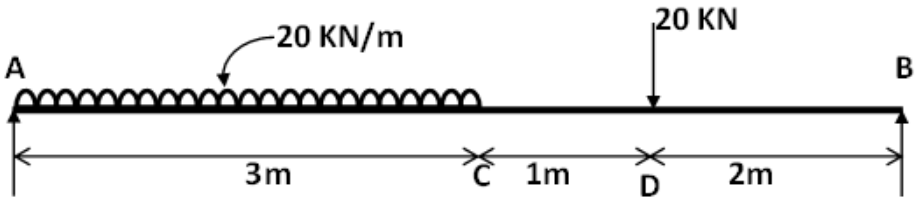


Fig. 7.

Q13. Determine the slope and deflectin at the free end of the cantilever beam shown below.

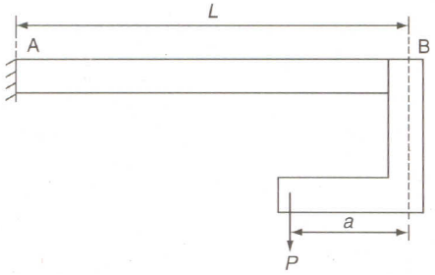


Fig. 8

Q14. A beam of uniform cross section, 10 m long, is simply supported at the ends. It carries point loads of 110 KN and 60 KN at a distances of 2m and 5m, respectively, from the left end. Calculate, the deflection under and the maximum deflection. Given that E= 200 X 10^6 KN/m^2 and I = 110 X 10^{-4} m^4.

Q15. Determine the deflection under the 2kN load and maximum deflection.

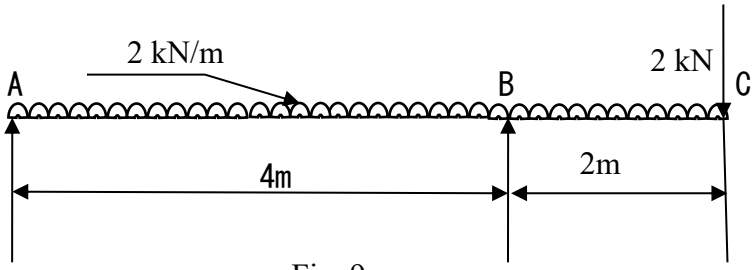


Fig. 9