



ME-233 (Mechanics of Materials-I)

Problem Sheet #6 (Deflection of Beams)

- Pb. 6.1** For the loading shown in Fig. (6.1 – 6.4), determine
(a) The equation of the elastic curve
(b) The deflection at free end
(c) The slope at free end.
- Pb. 6.2** For the beam & loading shown in Fig. 6.5, determine:
a) The equation of elastic curve for the portion AB of the beam.
b) The slope at 'A'.
c) The slope at 'B'.
- Pb. 6.3** For the beam & loading shown in Fig.6.6, determine:
a) The equation of elastic curve for the portion BC of the beam.
b) The deflection at mid span.
c) The slope at 'B'.
- Pb.6.4** For the beam shown in Fig. 6.7 with load 'P', determine:
a) The equation of elastic curve for the portion AC of the beam.
b) The slope at 'A'.
c) The deflection at 'C'.
- Pb.6.5** For the beam & loading shown in Fig. 6.8 & 6.9
(a) Express the magnitude & location of the maximum deflection in terms of the maximum deflection in terms of W_0 , L, E & I.
(b) Calculate the value of maximum deflection.
Assume that beam AB is **W18x50** rolled shape & $W = 4.5$ Kips/ ft, $L=18$ ft & $E=29 \times 10^6$ Psi.
- Pb.6.6** (a) Determine the location & magnitude of the maximum deflection of beam 'AB' as shown in Fig.6.10
(b) Assuming that beam 'AB' is a **W360x64**, $L = 3.5$ m & $E = 200$ Gpa, calculate, the maximum allowable value of applied moment M_0 , if the maximum deflection is not exceeded 1mm.
- Pb.6.7** Determine the load, which can cause the deflection of 10mm in the beam of span 4m as shown in Fig6.7. Take $E= 6$ Gpa & beam is 140mm wide & 240mm deep. ($W = 7.25$ kN)
- Pb.6.8** A timber beam of UDL with rectangular x-section has a span of 4.8m & is simply supported at its ends. It is required to find the values of
(a) Breadth, (b) Depth of beam, if the maximum bending stress is not exceeded 7MPa & value of maximum deflection & maximum bending moment are 9.5mm & 27kNm respectively. (204mm, 337mm)



Pb.6.9 A simply supported beam 3m long is supported at its ends is carrying a point load at its center. If slope at the ends of the beam not exceeded 1degree, find the deflection at the center of the beam. (17.5mm)

Pb.6.10 A simply supported beam of span 6m is subjected to UDL over entire span. If the deflection at the center of the beam is not exceeded 4mm, find the value of load applied take $E = 200 \times 10^9 \text{ Pa}$, $I = 300 \times 10^6 \text{ mm}^4$. (14.2kn/m)

Note: For W360x64 & W18x50 consult Mechanics of Materials

Beer Johnston book appendix tables.

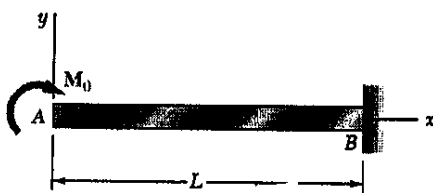


Fig. 6.1

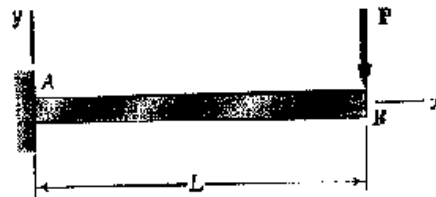


Fig. 6.2

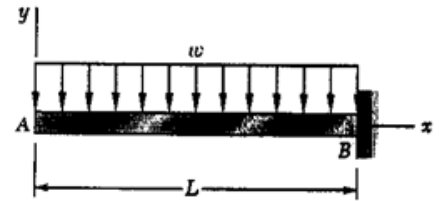


Fig. 6.3

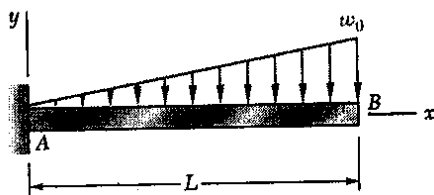


Fig. 6.4

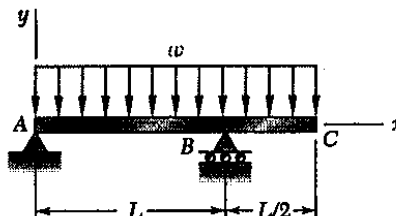


Fig. 6.5

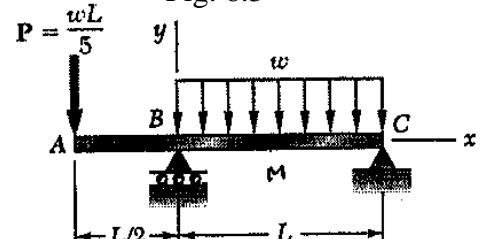


Fig. 6.6

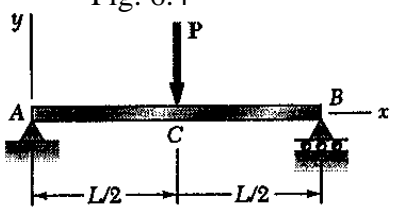


Fig. 6.7

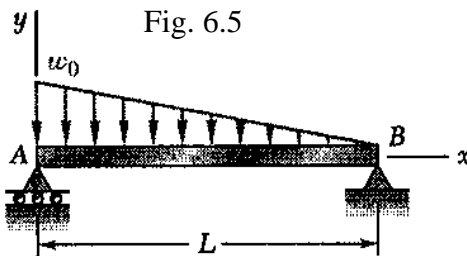


Fig. 6.8

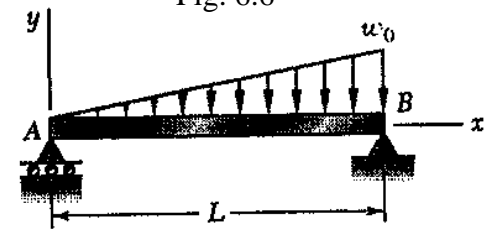


Fig. 6.9

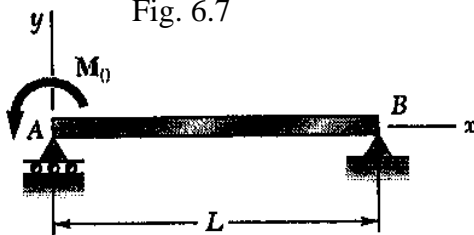


Fig. 6.10

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