The American University in Cairo
School of Sciences and Engineering
Mechanical Engineering Department
MENG 453 – Finite Element Method & Applications in Design
Problem Sheet # 4
Fall 2001
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8.1. Find the deflection at the load and the slopes at the ends for the steel shaft shown in Fig. P8.1. Consider the shaft to be simply supported at bearings *A* and *B*.

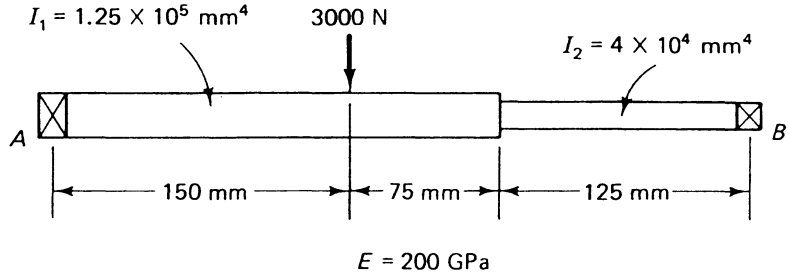
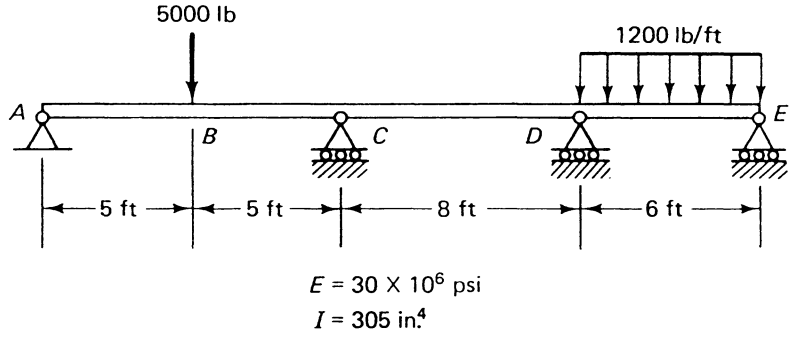


Figure P8.1 Problems 8.1 and 8.4

8.2. A three-span beam is shown in Fig. P8.2. Determine the deflection curve of the beam and evaluate the reactions at the supports.



4.1 The structure shown in Figure P4-1 has a horizontal steel beam welded to a rigid column on the left and simply supported on the right end. There is also a steel rod with pinned attachments to the column and the beam providing support for the beam. The beam cross section is shown on the right, and the rod diameter is 25mm. Evaluate the effectiveness of the steel rod for reducing stress in the beam by analyzing models with and without the rod and comparing results.

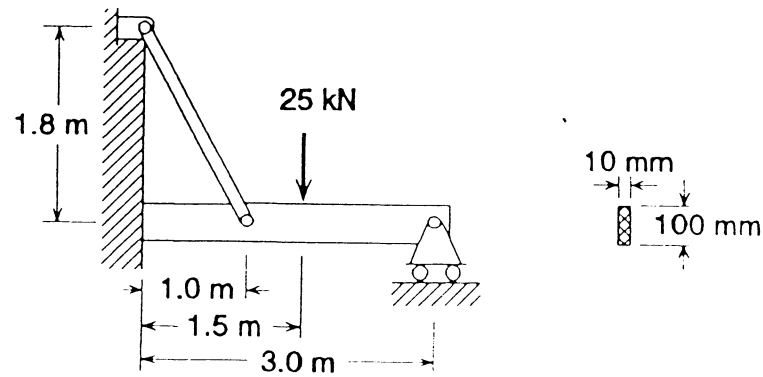
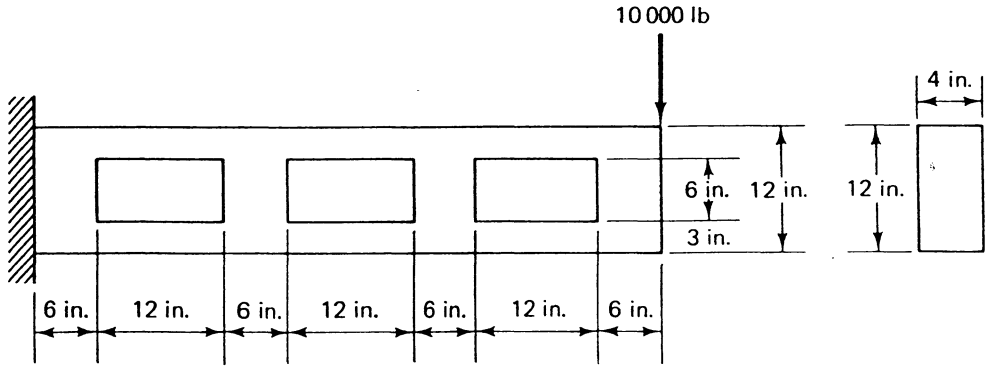


Figure P4 - 1.

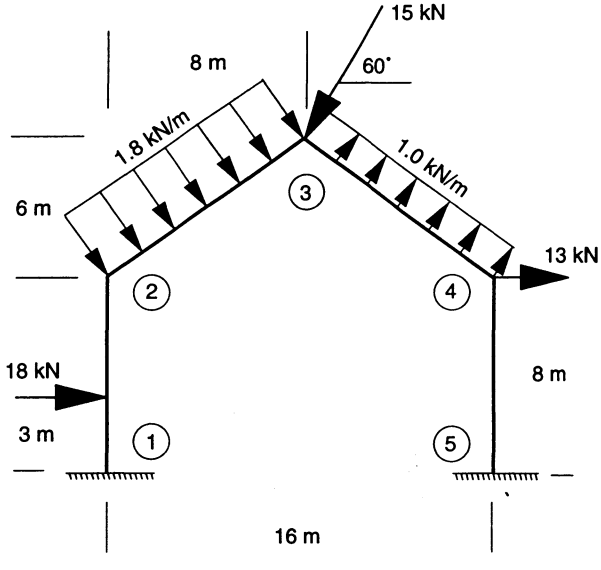
8.6. Figure P8.6 shows a cantilever beam with three rectangular openings. Find the deflections for the beam shown and compare the deflections with a beam without openings.



$E = 30 \times 10^6$ psi

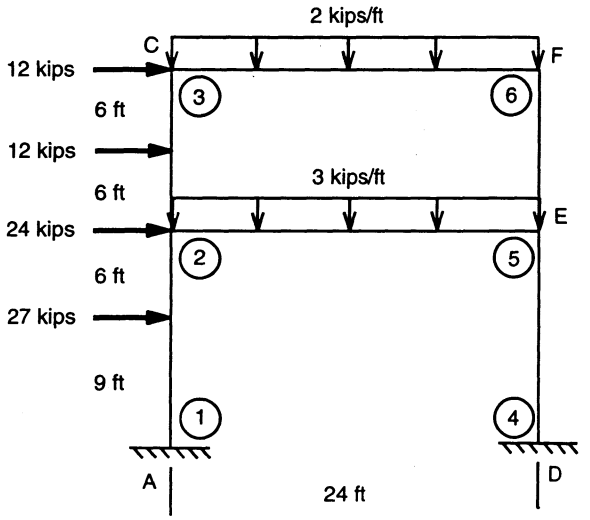
Figure P8.6

4.6. For the plane frame shown, develop the global load vector. Use the five nodes shown and the four members between them. The distributed loads are normal to the members on which they act. The global x axis passes through nodes 1 and 5; the global y axis passes through nodes 1 and 2.



Problem 4.6

4.7. For the plane frame shown, develop the global load vector. Use the six nodes shown and the six members between them. The distributed loads are normal



Problem 4.7

to the members on which they act. The global x axis passes through nodes 1 and 4; the global y axis passes through nodes 1, 2, and 3.