

CE 203 STRUCTURAL MECHANICS I (Section 3)

Second Semester 1429 / 2008 (072)

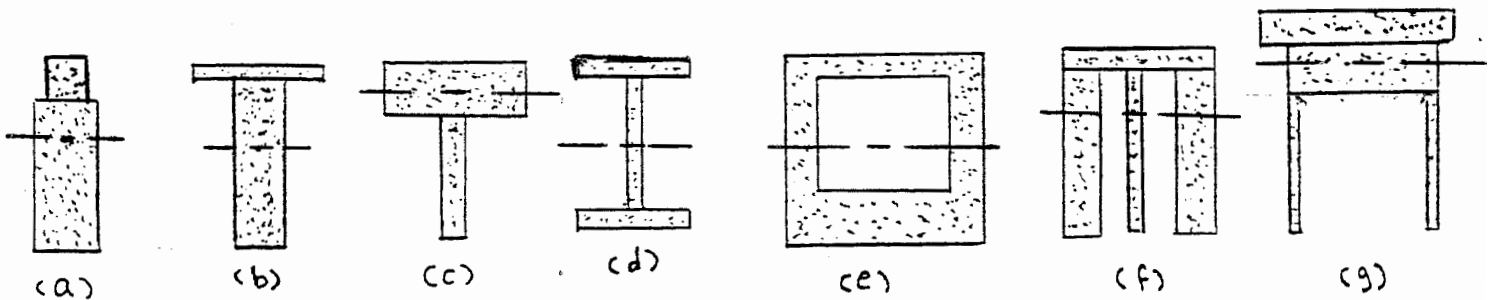
H.W. # 10

Due on Sunday 6-5-1429 / 11-5-2008 (any time)

Deadline for submission: **Monday 7-5-1429 / 12-5-2008 (before you sit in class)**

- 1) Sketch the shear flow and shear stress distributions for each of the beam cross sections shown in Fig. P1. [Secs. 7.1 - 7.4]* (10 pts.)
- 2) A beam is to be fabricated from two sections of 2-in. standard steel pipe ($A = 1.07 \text{ in}^2$; $I = 0.666 \text{ in}^4$) and a $\frac{1}{4}$ -in. thick steel plate by four fillet welds as depicted in Fig. P2. If the maximum transverse shear force that the beam must resist is 2000 lb, determine whether $\frac{1}{8}$ -in. fillet welds with a capacity of 100 lb/in. each will be sufficient. [Secs. 7.1 - 7.4]* (15 pts.)
- 3) A beam has the cross section shown in Fig. P3.
 - a) Determine the allowable shear force if the shear resistance of each nail is 500 N.
 - b) If the nails are replaced by glue, and if the shear force is known to be 1200 N, what is the required strength of the glue? [Secs. 7.1 - 7.4]* (20 pts.)
- 4) A "box beam" has the cross section shown in Fig. P4. Note that (b) is similar to (a) except it is rotated 90° . If $V = 10 \text{ kN}$, $M = 50 \text{ kN.m}$, and the shear resistance of each nail = 5 kN, determine the maximum normal stress and the maximum permissible spacing of the nails for each scheme (a and b). Which one is more efficient in bending and which scheme is better in shear? Explain. [Secs. 7.1 - 7.4]* (25 pts.)
- 5) The beam shown in Fig. P5 is made of a material for which the allowable stresses are $\sigma_t = 150 \text{ MPa}$, $\sigma_c = 120 \text{ MPa}$, $\tau = 80 \text{ MPa}$. Determine the maximum load W which can be applied. [Secs. 7.1 - 7.4]* (30 pts.)

* Also review Chapter 11, Sections 1 & 2.



----- C.A.

Fig. P1

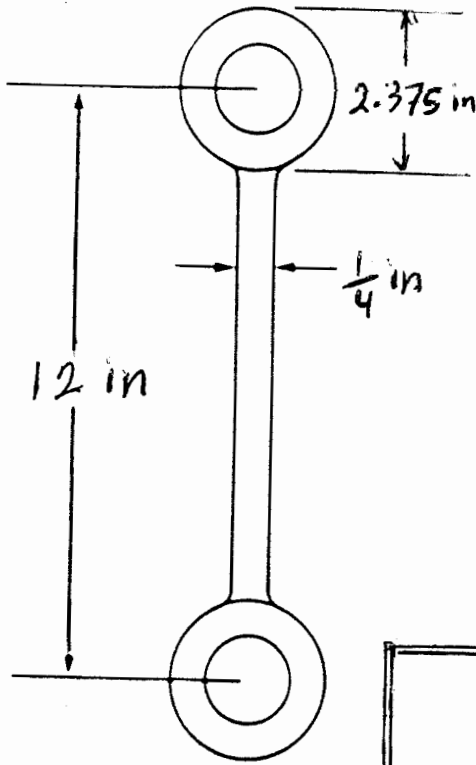
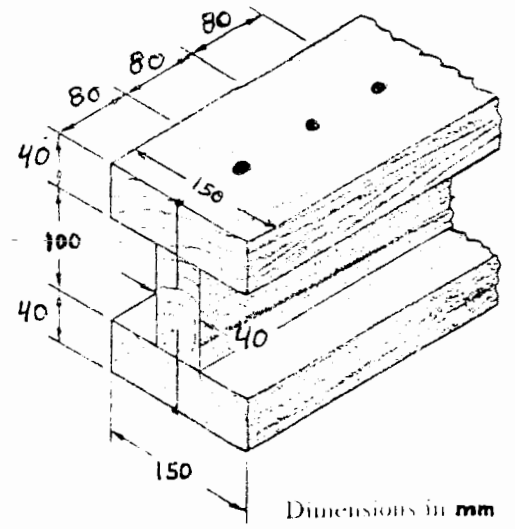


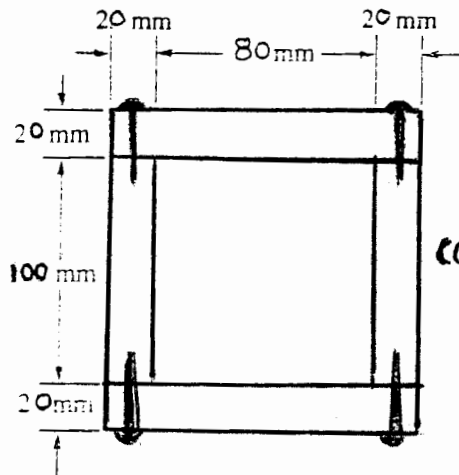
Fig. P2

Fig. P4

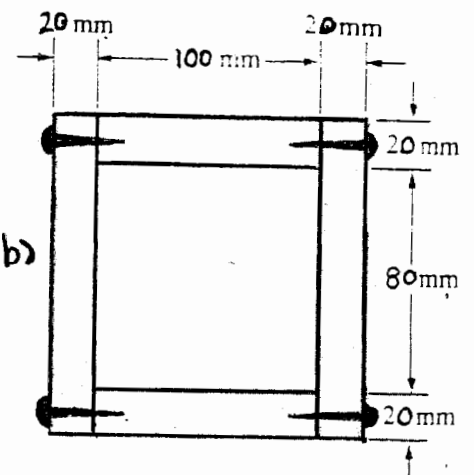
Fig. P3



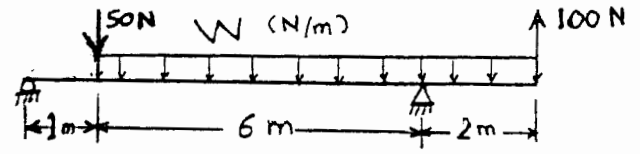
Dimensions in mm



(a)

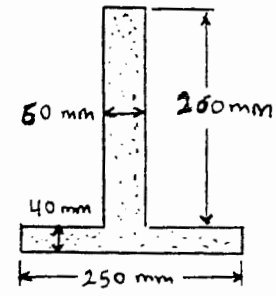


(b)



Beam

Fig. P5



x-sec.

Do your work *yourself*!! Remember that the homework carries 20% of the course grade; in addition, *solving it is the best way to understand the subject.* Of course, you can seek my help anytime in the homework as well as in anything else.

As an engineer, review the guidelines for submitting homework assignments given to you in class **BEFORE** you start solving and writing the homework. **FOLLOW ALL THESE GUIDELINES.** *Cheating, copying, etc. is*!!!!!!