**Problem One** – (a) For Section S24x100, find area $A_1$, depth $d_1$, thickness of web $t_{w1}$, thickness of flange $t_{f1}$, ratio $b_{f1}/(2t_{f1})$ and $Z$.

(b) For Section ST12x50, find area $A_2$, depth $d_2$, thickness of web $t_{w2}$, thickness of flange $t_{f2}$, ratio $b_{f2}/(2t_{f2})$ and $\bar{y}$.

(c) Calculation $Z$ for S24x100 using information from above and compare it to the table value.

(d) Compare values from the S section in (a) to the values from ST section in (b) and discuss similarities and other relationships.

**Problem Two** – (a) From Table 1-1 find the Plastic Section Modulus $Z$ for W16x100 and W14x550.

(b) From Table 3-2, which is sorted using $Z$ values, find using values of part (a) the sections W16x100 and W14x550 and record the LRFD limits $\phi_b M_{px}$ and the ASD limits $M_{px}/\Omega_b$.

(c) Use the $Z$ values of the sections and a yield limit of $F_y = 50$ ksi, find $M_{px}$. Afterward, use $\phi_b = 0.9$ and $\Omega_b = 1.67$ to see if you could duplicate the values from Table 3-2. Note: to get the exact values you need to do round off of calculations properly. For example, 7625 should be recorded as 7630, 3 digits only. Using 0.6 instead of 1/1.67 might make your calculation off a little as well. This is just an educational process.

**Problem Three** – (a) From Steel Manual Table 3-2, find $L_p$ and $L_r$ for W36x652 ($Z_x = 2910$) in the unit of feet. Use AISC Equation F2-5 and AISC Equation F2-6 (book Page 205) to calculate $L_p$ and $L_r$ and compare (answer would be in inches). Get values for $r_{ts}$, $J$, $S_x$, $h_o$ and $r_y$ from Steel Manual Table 1-1. The value of $c$ is 1 for all I-shape beams.

(b) Repeat Part (a) for W12x16 ($Z_x = 20.1$).

**Problem Four** – Given a beam of length $L = 20$ ft and $x$ is a coordinate starting from the left end, find using Table 3-23:

(a) For a simply supported beam, find the maximum moment and the location $x$ of that maximum if the uniform load is $w(x) = 3.5$ kips/ft.

(b) For a simply supported beam, find the maximum moment and the location $x$ of that maximum if the uniform load is $w(x) = 4.5$ kips/ft, starting from $x = 4$ ft to $x = 10$ ft.

(c) For a simply supported beam, find the maximum moment and the location $x$ of that maximum if a concentrated load of 10 kips is applied at $x = 12.5$ ft.

(d) For a beam fixed at both ends, find the maximum moment and the location $x$ of that maximum if a concentrated load of 10 kips is applied at $x = 12.5$ ft.

(e) For a beam fixed at the right end but supported on the left end, find the maximum moment and the location $x$ of that maximum if a concentrated load of 10 kips is applied at $x = 12.5$ ft.