ARCH 631. Formulas of Exam 1
from Lectures, Examples, and Assignments

$\sum F_x = R_x = 0$	$\sum F_y = R_y = 0$	$\sum M = 0$
$F_x = F\cos\theta$	$F_y = F\sin\theta$	$M = Fd$
$F = \sqrt{F_x^2 + F_y^2}$	$\tan\theta = \frac{F_y}{F_x}$	$tan = \frac{opposite}{adjacent}$
$cos = \frac{adjacent}{hypotenuse}$	$sin = \frac{opposite}{hypotenuse}$	$\delta_T = \alpha(\Delta T)L$
$R_{(case\ 1)} = \frac{wl}{2}$	$f = E\varepsilon$	$\varepsilon = \frac{\delta}{L}$
$\delta = \frac{PL}{AE}$	$W = wl$	$w = w' \times tributary\ width$
$V = \int -wdx$	$M = \int Vdx$	area of a rectangle $= b\times h$
area of a triangle $= \frac{b\times h}{2}$	area of a trapezoid $= b\times\frac{(h_1 + h_2)}{2}$	$x = V_A/w$
$M_{max(case\ 1)} = \frac{wl^2}{8}$	$f_{b-max} = \frac{M}{S} \le F_b$	$f_{v-max} = \frac{3V}{2A} \le F_v$ for a rectangle
$V_{max(case\ 1)} = \frac{wl}{2}$	$S_{req} \ge \frac{M}{F_b}$ $S_{req'd} \ge \frac{M}{F_b}$	$A_{req'd} \ge \frac{3V}{2F_v}$ for a rectangle
$\Delta_{max(case\ 1)} = \frac{5wl^4}{384EI}$	$\Delta_{max} \le \Delta_{limit}$	$\Delta_{limit(LL\ or\ TL)}$ in form of $L/number$
1.4D 1.2D + 1.6L + 0.5(L_r or S or R) 1.2D + 1.6(L_r or S or R) + (L or 0.5W) 1.2D + 1.0W + L + 0.5(L_r or S or R) 1.2D + 1.0E + L + 0.2S 0.9D + 1.0W 0.9D + 1.0E	$I_x = \frac{bh^3}{12}$ for a rectangle	$T_v = \frac{wl}{2}$
	$I_y = \frac{b^3h}{12}$ for a rectangle	$T_h = \left(\frac{wL}{2}\cdot\frac{L}{4}\right)\frac{1}{h}$
	$P_{cr} = \frac{\pi^2 EI}{(L_e)^2} = \frac{\pi^2 EA}{\left(L_e/r\right)^2}$	$T = \sqrt{T_v^2 + T_h^2}$
$w = \gamma A$	$f_c = \frac{P}{A} \le F_c'$	$I_x = \sum I_x + \sum A\cdot d_y^2$
$W = mg$	$S = \frac{I}{c}$	$I_y = \sum I_y + \sum A\cdot d_x^2$
$g = 9.81\ m/s^2$	$L_e = KL$	$L_r = L_o(0.25 + \frac{15}{\sqrt{K_{LL}A_T}})$
$R_y = \frac{wL}{2}$	$R_x = \left(\frac{wL}{2}\cdot\frac{L}{4}\right)\frac{1}{h}$	$R = \sqrt{R_x^2 + R_y^2}$

$f_t = \frac{P}{A}$	$f_v = \frac{P}{A}$	$f_p = \frac{R}{A}$
$f_v = \frac{VQ}{Ib}$	$Q_y = \bar{x}A = \sum_{i=1}^{n} \bar{x}_i A_i$	$nF_{connector} \geq \frac{VQ_{connected\ area}}{I} \cdot p$
$s = x\left[1 + \frac{2}{3}\left(\frac{y}{x}\right)^2 + \dots\right]$	$y = {4h(Lx - x^2)}/{L^2}$	$L_{total} = L(1 + {3}/{8}\, {h^2}/{L^2} - {32}/{5}\, {h^4}/{L^4})$