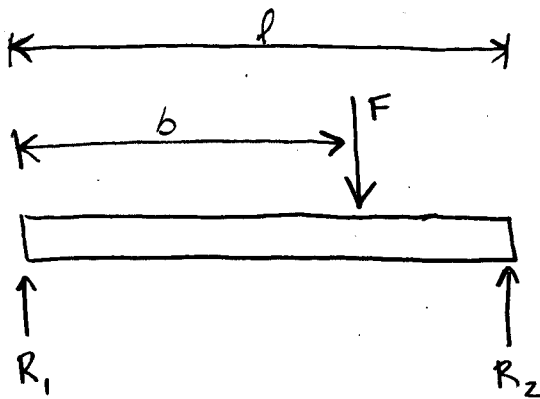


6.23 NORTON

ME 340

8/1/98



$$\sum F_y = 0; R_1 + R_2 = F$$

$$\sum M_1 = 0; Fb = R_2 l$$

$$R_2 = \frac{Fb}{l}$$

$$R_1 = F - \frac{Fb}{l}$$

MAX MOMENT UNDER F . . .

$$M = R_1 b = b \left(F - \frac{Fb}{l} \right) = R_2 (l - b) = \frac{Fb}{l} (l - b)$$

$$F_{\max} = F, \quad F_{\min} = -\frac{F}{2}$$

$$F_a = \frac{F + \frac{F}{2}}{2} = \frac{3}{4} F$$

$$F_m = \frac{F - \frac{F}{2}}{2} = \frac{1}{4} F$$

$$\sigma'_a = \frac{M_a c}{I}; \quad \sigma'_m = \frac{M_m c}{I}$$

ASSUME $C_{\text{LOAD}} = C_{\text{SIZE}} = C_{\text{SURF}} = C_{\text{TEMP}} = C_{\text{RELIAB}} = 1.0$

$$S_e = S_e' = 0.5 S_{ut} \quad (\text{STEEL @ } 5 \times 10^8 \text{ CYCLES})$$

$$S_e = S_e' = 0.4 S_{ut} \quad (\text{AL @ } 5 \times 10^8 \text{ CYCLES})$$

$$N_f = \frac{S_e S_{ut}}{\sigma'_a S_{ut} + \sigma'_m S_e} \rightarrow S_{ut} = \frac{N [\sigma'_a + 0.5 \sigma'_m]}{0.5} \quad (\text{STEEL})$$

$$S_{ut} = \frac{N [\sigma'_a + 0.4 \sigma'_m]}{0.4} \quad (\text{ALUMINUM})$$

NOTE: THE ANSWER GIVEN IN THE BACK OF THE BOOK IS BASED ON TWO ASSUMPTIONS:

① BEAM IS RECTANGULAR

② SIZE CORRECTION BASED ON EQUIVALENT DIAMETER (DESCRIPTION P 376-377)

EXTRA CREDIT TO ANYONE WHO TOOK THE TIME TO FIGURE THIS OUT.

Problem 6.23

Row	i	b	F	l	c	mat'l	Falt	Fmean	Malt	Mmean	sigma alt	sigma mean	Sut
a	1.00	0.60	500	2.85E-08	2.00E-02	0.5	375	125	90	30	6.32E+07	2.11E+07	4.42E+08
b	0.70	0.40	850	1.70E-08	1.00E-02	0.5	638	212.5	109	36	6.43E+07	2.14E+07	4.50E+08
c	0.30	0.20	450	4.70E-09	1.25E-02	0.5	338	112.5	23	8	5.98E+07	1.99E+07	4.19E+08
d	0.80	0.60	250	4.90E-09	1.10E-02	0.5	188	62.5	28	9	6.31E+07	2.10E+07	4.42E+08
e	0.85	0.50	750	1.80E-08	9.00E-03	0.5	563	187.5	116	39	5.79E+07	1.93E+07	4.05E+08
f	0.50	0.40	950	1.17E-08	1.00E-02	0.5	713	237.5	57	19	4.87E+07	1.62E+07	3.41E+08
g	0.60	0.50	250	3.20E-09	7.50E-03	0.5	188	62.5	16	5	3.66E+07	1.22E+07	2.56E+08
h	0.20	0.13	500	4.00E-09	5.00E-03	0.4	375	125	17	6	2.13E+07	7.11E+06	1.81E+08
i	0.40	0.30	200	2.75E-09	5.00E-03	0.4	150	50	11	4	2.05E+07	6.82E+06	1.74E+08
j	0.20	0.15	80	6.50E-10	5.50E-03	0.4	60	20	2	1	1.90E+07	6.35E+06	1.62E+08
k	0.40	0.30	880	4.30E-08	1.45E-02	0.4	660	220	50	17	1.67E+07	5.56E+06	1.42E+08
l	0.90	0.80	600	4.20E-08	7.50E-03	0.4	450	150	40	13	7.14E+06	2.38E+06	6.07E+07
m	0.70	0.60	500	2.10E-08	6.50E-03	0.4	375	125	32	11	9.95E+06	3.32E+06	8.46E+07
n	0.85	0.70	120	7.90E-09	1.00E-02	0.4	90	30	11	4	1.41E+07	4.69E+06	1.20E+08