#1)

$$L_{min} = t_1 + t_2 + t_n + 2t_w + 2p$$

$$= 0.6 + 0.6 + 0.4375 + 2(0.095) + 2/13$$

$$= 1.98 \leftarrow$$

ans) (b)

#2) $\tau = \frac{F}{2A_d} = \frac{5000}{2(0.196)} = 12755$ Psi

where $A_d = \frac{\pi}{4}(d^2) = \frac{\pi}{4}(0.5)^2 = 0.196$

$S_y = 92000$ Psi

$$n = \frac{0.58 S_y}{12755} = 4.18 \leftarrow$$

ans C)

#3)

$L = 0.75$

$L_T = 2d + 0.25 = 2(0.25) + 0.25 = 0.75$

$l = t + d/2 = 0.25 + \frac{0.25}{2} = 0.375$

$$K_t = \frac{AE}{L} = \frac{0.0318 * 30 * 10^6}{0.375} = 2.54 * 10^6$$

$K = K_t = 2.54$ Mlbs/in ←

ans (c)

#4)

$$K'_m = f(D, d, t, \epsilon)$$

where $d = 0.5$

$D = 1.5d = 0.75$

$t = \ell/2 = \frac{0.8}{2} = 0.4$

where $\ell = 0.5 + 0.3 = 0.8$

From EXCEL

$K'_m = 37.2$

$K = \frac{K'_m}{2} = 18.6$ Mlbs/in

Ans (a)

#5)

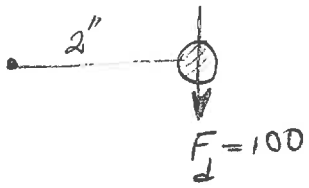
$$\ell = t + 2t_w + d/2$$

$$\ell = 0.6 + 2(0.045) + 0.25 = 1.04''$$

ans (c)

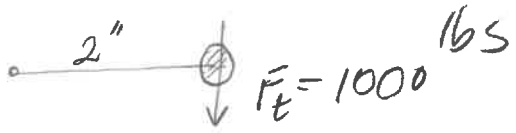
#6)

$$F_d = \frac{F}{N} = \frac{600}{6} = 100 \text{ lbs}$$



$$T = F_t(2) \cdot 6$$

$$600(20) = 12\ F_t$$



$$\Rightarrow F_t = 1000 \text{ lbs}$$

$$A_d = \frac{\pi}{4} d^2 = \frac{\pi}{4}(0.25)^2 = 0.049$$

$$\Rightarrow F_{tot} = F_t + F_d \Rightarrow F_{tot} = 1100 \text{ lbs}$$

$$\tau = \frac{F_{tot}}{A_d} = \frac{1100}{0.049} = 22449 \text{ Psi}$$

$$n = \frac{0.58\, S_y}{\tau} = \frac{0.58(92000)}{22449}$$

$$\Rightarrow n \cong 2.38$$

#7) $T_R = \frac{F d_m}{2}\left(\frac{L + \pi f d_m}{\pi d_m - f L}\right)$

$150 = \frac{F(1)}{2}\underbrace{\left(\frac{0.5 + \pi(0.1)(1)}{\pi(1) - (0.1)(0.5)}\right)}_{0.263} \Rightarrow F = 1140 \text{ lbs} \leftarrow$

#8) $n = 100 \text{ rpm} = \frac{100}{60} \text{ cyc/sec}$

$p = 0.25 \Rightarrow L = 2p = 0.5$

$V = \left(\frac{100}{60}\right)(0.5) = 0.833 \text{ in/s}$

$V = 50 \text{ in/min} \leftarrow$

Ans (a)

#9) $f \geq \tan\lambda$

$f \geq \frac{L}{\pi d} = \frac{0.5}{(1)} = 0.159$

Ans (e)

#10)

Answer (d)

#11) Grade 7 $\Rightarrow S_p = 105$ ksi $\quad A_t = 0.1419$

$F_e = 1000$ lbs

$K_m = K_b$

$F_i = 0.9\, F_p$

$F_b = F_i + C F_e \qquad C = \dfrac{K_b}{K_b + K_m} = 0.5$

where $F_i = 0.9\, F_p = 0.9(14899.5) = 13409.5$ lbs

where $F_p = A_t S_p = 0.1419\,(105000)$

$F_p = 14899.5$

Setting $F_b = F_p$

$14899.5 = 13409.5 + 0.5\, F_e^*$

$\Rightarrow F_e^* = \dfrac{14899.5 - 13409.5}{0.5}$

$F_e^* = 2980$ lbs ◄

#12)

$$F_m = F_i - (1-c) F_e$$

Setting $F_m = 8000$

$$8000 = 13409.5 - 0.5 F_e^{**}$$

$$F_e^{**} = 10819 \text{ lbs} \leftarrow$$

#13) 18.6 Ksi

#14)

$$\sigma_a = \frac{\sigma_{max} - \sigma_{min}}{2} = \frac{180-120}{2} = 30 \text{ MPa}$$

#15)

$$n_f = \frac{S_e (S_{ut} - \sigma_i)}{\sigma_a (S_{ut} + S_e)} = \frac{20.6 (115-55)}{25 (115 + 20.6)}$$

$$n_f = 3.6 \leftarrow$$

or

$$n_f = \frac{S_e (S_{ut} - \sigma_i)}{S_{ut} \sigma_a + S_e (\sigma_m - \sigma_i)}$$

σ_a