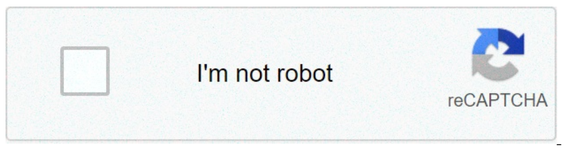

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Capabilities include automatic CNC machining, hand winding or hand forming, hand operated or automatic grinding, stress relief heating, and painting. Special packaging is available upon request. Page 2 You need to log in to continue DenunciarChapter 8 Note to the Instructor for Probs. 8-41 to 8-44. These problems, as well as many others in this chapter are best implemented using a spreadsheet. 8-1 (a) Thread depth= 2.5 mm Ans. Width = 2.5 mm Ans. dm = 25 - 1.25 - 1.25 = 22.5 mm dr = 25 - 5 = 20 mm l = p = 5 mm Ans. (b) Thread depth = 2.5 mm Ans. Width at pitch line = 2.5 mm Ans. dm = 22.5 mm dr = 20 mm l = p = 5 mm Ans. _____ 8-2 From Table 8-1, 1.226 869 0.649 519 1.226 869 0.649 519 0.938 194 2 r m d d p d d p d p d pd d p 2 2(0.938 194) . 4 4t dA d p Ans _____ 8-3 From Eq. (c) of Sec. 8-2, tan 1 tan tan 2 2 1 tan R R m m R fP F f P d Fd fT f 0 / (2) 1 tan 1 tantan . / 2 tan tanR m T Fl f fe A T Fd f f ns Chap. 8 Solutions - Rev. A, Page 1/69 Using f = 0.08, form a table and plot the efficiency curve. , deg. e 0 0 0 0.678 20 0.796 30 0.838 40 0.8517 45 0.8519 _____ 8-4 Given F = 5 kN, l = 5 mm, and dm = d p/2 = 25 5/2 = 22.5 mm, the torque required to raise the load is found using Eqs. (8-1) and (8-6) 5 22.5 5 0.09 22.5 5 0.06 45 15.85 N m . 2 22.5 0.09 5 2R T A ns The torque required to lower the load, from Eqs. (8-2) and (8-6) is 5 22.5 0.09 22.5 5 5 0.06 45 7.83 N m . 2 22.5 0.09 5 2L T A ns Since TL is positive, the thread is self-locking. From Eq.(8-4) the efficiency is 5 5 0.251 . 2 15.85 e Ans _____ 8-5 Collar (thrust) bearings, at the bottom of the screws, must bear on the collars. The bottom segment of the screws must be in compression. Whereas, tension specimens and their grips must be in tension. Both screws must be of the same-hand threads. _____ 8-6 Screws rotate at an angular rate of 1720 28.67 rev/min 60 n Chap. 8 Solutions - Rev. A, Page 2/69 (a) The lead is 0.25 in, so the linear speed of the press head is V = 28.67(0.25) = 7.17 in/min Ans. (b) F = 2500 lbf/screw o 2 0.25 / 2 1.875 in sec 1 / cos(29 / 2) 1.033 md Eq. (8-5): 2500(1.875) 0.25 (0.05)(1.875)(1.033) 221.0 lbf · in 2 (1.875) 0.05(0.25)(1.033)R T Eq. (8-6): 2500(0.08)(3.5 / 2) 350 lbf · in 350 221.0 571 lbf · in/screw 571(2) 20.04 lbf · in 60(0.95) 20.04(1720) 0.547 hp . 63 025 63 025 c total motor T T T TnH A ns _____ 8-7 Note to the Instructor: The statement for this problem in the first printing of this edition was vague regarding the effective handle length. For the printings to follow the statement “The overall length is 4.25 in.” will be replaced by “ A force will be applied to the handle at a radius of 123 in from the screw centerline.” We apologize if this has caused any inconvenience. 3 3 3.5 in 3.5 3 33.5 3.125 8 8 41 kpsi 32 32(3.125) 41 000 (0.1875) 8.49 lbf y y L T F M L F F S M FS d F F ns 3.5(8.49) 29.7 lbf · in .T A (b) Eq. (8-5), 2 = 60 , l = 1/10 = 0.1 in, f = 0.15, sec = 1.155, p = 0.1 in Chap. 8 Solutions - Rev. A, Page 3/69 clamp clamp clamp 3 0.649 519 0.1 0.6850 in 4 (0.6850) 0.1 (0.15)(0.6850)(1.155) 2 (0.6850) 0.15(0.1)(1.155) 0.075 86 29.7 392 lbf . 0.075 86 0.075 86 m R R R d F T T F TF A ns (c) The column has one end fixed and the other end pivoted. Base the decision on the mean diameter column. Input: C = 1.2, D = 0.685 in, A = (0.6852)/4 = 0.369 in2, Sy = 41 kpsi, E = 30(106) psi, L = 6 in, k = D/4 =0.171 25 in, L/k = 35.04. From Eq. (4-45), 1/21/2 2 62 1 2 1.2 30 102 131.7 41 000y l CE k S From Eq. (4-46), the limiting clamping force for buckling is 2 clamp cr 23 3 3 6 1 2 41 10 10.369 41 10 35.04 14.6 10 lbf 2 1.2 30 10 y y S lF P A S k CE Ans (d) This is a subject for class discussion. _____ 8-8 T = 8(3.5) = 28 lbf in 3 1 0.6667 in 4 12m d l = 1 6 = 0.1667 in, = 029 2 = 14.50, sec 14.50 = 1.033 From Eqs. (8-5) and (8-6) total 0.1667 0.15 0.6667 1.033 0.15 10.6667 0.1542 2 0.6667 0.15 0.1667 1.033 2 FFT F 28 182 lbf . 0.1542 F Ans _____ Chap. 8 Solutions - Rev. A, Page 4/69 8-9 dm = 1.5 0.25/2 = 1.375 in, l = 2(0.25) = 0.5 in From Eq. (8-1) and Eq. (8-6) 3 32.2 10 (1.375) 2.2 10 (0.15)(2.25)0.5 (0.10)(1.375) 2 (1.375) 0.10(0.5) 2 330 371 701 lbf · in RT Since n = V/l = 2/0.5 = 4 rev/s = 240 rev/min so the power is 701 240 2.67 hp . 63 025 63 025 TnH A ns _____ 8-10 dm = 40 4 = 36 mm, l = p = 8 mm From Eqs. (8-1) and (8-6) 36 8 (0.14)(36) 0.09(100) 2 (36) 0.14(8) 2 (3.831 4.5) 8.33 N · m (in kN) 2 2 (1) 2 rad/s 3000 477 N · m 2 477 57.3 kN . 8.33 F FT F F F n H T HT F Ans 57.3(8) 0.153 . 2 2 (477) Fle A T ns _____ 8-11 (a) Table A-31, nut height H = 12.8 mm. L ≥ l + H = 2(15) + 12.8 = 42.8 mm. Rounding up, L = 45 mm Ans. (b) From Eq. (8-14), LT = 2d + 6 = 2(14) +6 = 34 mm From Table 8-7, ld = L LT = 45 34 = 11 mm, lt = l ld = 2(15) 11 = 19 mm, Ad = (142) / 4 = 153.9 mm2. From Table 8-1, At = 115 mm2. From Eq. (8-17) Chap. 8 Solutions - Rev. A, Page 5/69 153.9 115 207 874.6 MN/m . 153.9 19 115 11 d t b d t t d A A Ek A A l A l ns (c) From Eq. (8-22), with l = 2(15) = 30 mm 0.5774 207 140.5774 3 116.5 MN/m . 0.5774 0.5 0.5774 30 0.5 142ln 5 2ln 50.5774 2.5 0.5774 30 2.5 14 mk Ed Ans l d l d 8-12 (a) Table A-31, nut height H = 12.8 mm. Table A-33, washer thickness t = 3.5 mm. Thus, the grip is l = 2(15) + 3.5 = 33.5 mm. L ≥ l + H = 33.5 + 12.8 = 46.3 mm. Rounding up L = 50 mm Ans. (b) From Eq. (8-14), LT = 2d + 6 = 2(14) +6 = 34 mm From Table 8-7, ld = L LT = 50 34 = 16 mm, lt = l ld = 33.5 16 = 17.5 mm, Ad = (142) / 4 = 153.9 mm2. From Table 8-1, At = 115 mm2. From Eq. (8-17) 153.9 115 207 808.2 MN/m . 153.9 17.5 You're Reading a Free Preview Pages 7 to 8 are not shown in this preview. You're Reading a Free Preview Pages 13 to 26 are not shown in this preview. 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