86. The transmitted torque of a hollow shaft is 3400 N-m at a shearing stress of 55 MPa. If the outside diameter is 1.25 times that of the inside diameter, what is the inside diameter, in mm?
a) 64.87 b) 46.87 c) 84.67 d) 74.64

Solution: $s_s = \dfrac{16T}{\pi D^3(1-\beta^4)}$ where, $\beta = \dfrac{D_i}{D_o} = \dfrac{1}{1.25} = 0.8$

$$D = \sqrt[3]{\frac{16\,T}{\pi s_s(1-\beta^4)}} = \sqrt[3]{\frac{16(3.4)}{\pi(55\,000)[1-(0.8)^4]}} = 81.092 \text{ mm}$$

$$D_i = \frac{D_o}{1.25} = \frac{81.092}{1.25} = 64.87 \text{ mm}$$

87. Two extension coil springs are hooked in series that support a single weight of 100 kg. The first spring is rated at 4 kN/m and the other spring is rated at 6 kN/m. Determine the total deflection of the springs.
a) 408.6 mm b) 486.0 mm c) 480.6 mm d) 460.8 mm

Solution: $\delta_t = \delta_1 + \delta_2 = \dfrac{F}{k_1} + \dfrac{F}{k_2} = F\left(\dfrac{k_1 + k_2}{k_1 k_2}\right) = (100 \text{ kg})(9.8066 \text{ N/kg})\left[\dfrac{4+6}{4(6)}\right] = 408.6 \text{ mm}$

88. If the ultimate shear strength of a steel plates is 42 000 psi, what force is necessary to punch a 0.75 inch diameter hole in a 0.625 inch thick plate?
a) 61 850 lb b) 65 810 lb c) 61 580 lb d) 60 185 lb

Solution: $F = s_u A_s = s_u(\pi d\, t) = (42000 \text{ lb/in}^2)(\pi)(0.75 \text{ in})(0.625 \text{ in}) = 61850.1 \text{ lb}$

89. A single square thread power screw is to raise a load of 70 kN. The screw has a major diameter of 36 mm and a pitch of 6 mm. The coefficient of thread friction and collar friction are 0.13 and 0.10 respectively. If the collar mean diameter is 90 mm and the screw turns at 60 rpm, find the axial linear speed of the screw.
a) 5 mm/s b) 6 mm/s c) 7 mm/s d) 5.5 mm/s

Solution: For the linear speed of the screw,

$V_n = n\,(L) = (60 \text{ rpm})(6 \text{ mm/rev}) = 360 \text{ mm/min} = 6 \text{ mm/s}$

90. A double thread ACME screw driven by a motor at 400 rpm raises the attached load of 900 kg at a speed of 10 m/min. The screw has a pitch diameter of 36 mm; the coefficient of friction on threads is 0.15. The friction torque on the thrust bearing of the motor is taken as 20 % of the total input. Determine the lead angle.
a) 12.465° b) 14.265° c) 15.462° d) 16.452°

Solution: For the lead, $L = \dfrac{V}{n} = \dfrac{10}{400} = 0.025 \text{ m} = 25 \text{ mm}$

For the lead angle, $\lambda = \tan^{-1}\left(\dfrac{L}{\pi D_m}\right) = \tan^{-1}\left(\dfrac{25}{36\pi}\right) = 12.465°$

91. It is a Grashof four-bar mechanism in which the shortest link is the frame or fixed link and the other two cranks completely rotate with their axes. How do you call this Grashof four-bar mechanism?
a) Drag-link mechanism b) Crank-rocker mechanism
c) Double-rocker mechanism d) Triple-rocker mechanism

a) Drag-link mechanism

92. It is a mechanism that includes an oscillating link or reciprocating slider that moves forward slowly and returns quickly, with constant speed input. What is this mechanism commonly called?
a) Slider-crank mechanism b) Crank-rocker mechanism
c) Quick-return mechanism d) Drag-link mechanism

c) Quick-return mechanism

93. What is the intensity and direction of internal force acting at given point on particular plane?
a) Load b) Strain c) Stress d) Sustained load

c) Stress

94. It is the capacity of a material to absorb energy when it is deformed elastically and then, upon unloading, to increase this energy. What is this capacity of a material?
a) Resilience b) Toughness c) Rigidity d) Ductility

a) Resilience

95. How do you call the strain energy per unit volume required to stress a material from an unloaded state to the point of yielding?
a) Modulus of roughness b) Modulus of elasticity
c) Modulus of rigidity d) Modulus of resilience

d) Modulus of resilience

96. What is the ability of the material to absorb energy up to fracture?
a) Toughness b) Rigidity c) Resilience d) Stiffness

a) Toughness

This study resource was shared via CourseHero.com

This study source was downloaded by 100000834532629 from CourseHero.com on 10-19-2021 02:47:18 GMT -05:00

https://www.coursehero.com/file/96428605/Screenshot-20210608-060148png/