1. At a point a structure, there are two mutually perpendicular tensile stresses of 800 kg/cm^2 and 400 kg/cm^2 . If the poisson's ratio is $\mu = 0.25$ what would be the equivalent stress in simple tension according to maximum principal strain theory
   a. 1200 kg / cm^2 e
   b. 1200 kg / cm^2 e
   c. 1200 kg / cm^2 e
   d. 1200 kg / cm^2 e

2. According to maximum shear stress failure criterion, yielding in material occurs when
   a. Maximum shear stress = 1 / 2 x yield stress
   b. Maximum shear stress = √2 x yield stress
   c. Maximum shear stress = √2 /3 x yield stress
   d. Maximum shear stress = 2 x yield stress

3. A rectangular block of size 200 mm x 100 mm x 50mm is subjected a shear stress of 500 kg/cm^2 . If the modulus of rigidity of the material is 1 x 10^{-6} kg / cm^2 the strain energy stored will be
   a. 1000 kg cm
   b. 500 kg cm
   c. 125 kg cm
   d. 10 kg cm

4. A shaft is subjected to a bending moment M and a torque T. the equivalent bending moment 'M_{eq} ' on the shaft is given by
   A. $\frac{M+\sqrt{M^2+T^2}}{4}$
   B. $\frac{M^2+\sqrt{M+T}}{2}$
   C. $\frac{M-\sqrt{M^2+T^2}}{2}$
   D. $\frac{M+\sqrt{M^2+T^2}}{2}$

5. A certain steel has proportionality limit of 3000 kg / cm^2 in simple tension. It is subjected to principal stresses of 1200 kg / cm^2 (tensile) 600 kg/ cm^2 (tensile) and 300 kg /cm^2 (compressive) the factor or safety according to maximum shear theory is
   a. 1.50
   b. 1.75
   c. 1.80
   d. 2.00

6. A Circular shaft is subjected to a twisting moment T. and bending moment M. the ratio of maximum bending stress to shear stress is given by
   A. $\frac{2M}{T}$
   B. $\frac{M}{T}$
   C. $\frac{2T}{M}$
   D. $\frac{M}{2T}$

7. A section of a solid circular shaft with diameter D is subjected to bending moment M and torque T. the expression for maximum principal stress at the section is
   A. $\frac{2M+T}{\pi D^3}$
   B. $\frac{16\pi}{D^3}\left(M+\sqrt{M^2+T^2}\right)$
   C. $\frac{16\pi}{D^3}\left(\sqrt{M^2+T^2}\right)$
   D. $\frac{16}{\pi D^3}\left(M+\sqrt{M^2+T^2}\right)$

8. In a two-dimensional stress, it is assumed that the principal stress σ_1 and σ_2 are such that $\sigma_1 > \sigma_2$ then according to the maximum shear stress theory the failure occurs when (where σ_y is the yield stress μ= poisson's ratio and E the modulus of elasticity)
   A. $\frac{1}{E}[\sigma_1 - \mu\,\sigma_2] \geq \frac{\sigma_y}{E}$
   B. $[\sigma_1^2 + \sigma_2^2 + 2\mu\,\sigma_1\,\sigma_2] \geq \sigma_Y^2$
   C. $(\sigma_1 - \sigma_2) \geq \sigma_Y$
   D. $[\sigma_1^2 + \sigma_2^2 - \sigma_1 - \sigma_2] \geq \sigma_Y$

9. According to the distortion energy theory. Failure will NOT occur when (symbols have the usual meaning)
   A. $\left[\frac{(\sigma_1-\sigma_2)^2+(\sigma_2-\sigma_3)^2+(\sigma_3-\sigma_1)^2}{2}\right]^{\frac{1}{2}} \leq \sigma_0$
   B. $\left[\frac{(\sigma_1-\sigma_2)^2+4\tau^2}{2}\right]^{\frac{1}{2}} \leq \sigma_0$
   C. $\left[(\sigma_1^2+\sigma_2^2+\sigma_2^3) - \frac{1}{\mu}(\sigma_1\sigma_2) + (\sigma_1\sigma_2+\sigma_2\sigma_3+\sigma_3\sigma_1\right]^{\frac{1}{2}} \leq \sigma_0$
   D. $\left[\frac{(\sigma_1-\sigma_2)^2+(\sigma_1-\sigma_2)^2+4\tau^2}{2}\right]^{\frac{1}{2}} \leq \sigma_0$

10. All the failure theories give nearly the same result
    a. When one of the principal stresses at a point is large in comparison to the other
    b. When shear stresses act
    c. When both the principal stresses are numerically equal
    d. For all situations of stress

11. As per the maximum principal stress theory, which is shaft is subjected to bending moment M and torque T, and if σ is the allowable stress in axial tension, then the diameter 'd' of the shaft is given by
    A. $D^3 = \frac{16}{\pi\sigma}\left[M+\sqrt{M^2+T^2}\right]$
    B. $D^3 = \frac{4}{\pi\sigma}\left[M+\sqrt{M^2+T^2}\right]$
    C. $D^3 = \frac{32}{\pi\sigma}\left[M+\sqrt{M^2+T^2}\right]$
    D. $D^3 = \frac{8}{\pi\sigma}\left[M+\sqrt{M^2+T^2}\right]$

12. A cube is subjected to equal tensile stress on all the three faces. If the yield stress of the material σ_y then based on the strain energy theory, the maximum tensile stress will be
    A. $\frac{\sigma_y}{\sqrt{3(1-\mu)}}$
    B. $\frac{\sigma_y}{\sqrt{3(2-\mu)}}$
    C. $\frac{\sigma_y}{\sqrt{3(1-\mu)}}$
    D. $\frac{\sigma_y}{\sqrt{3(1-\mu)}}$

13. At a point in a steel member, the major principal stress is 200 Mpa (tensile) and the minor principal stress is compressive. If the uniaxial tensile tensile yield stress is 250 Mpa, then according to the maximum shear stress theory, the magnitude of the minor principal stress (compressive) at which yielding will commence is
    a. 200 Mpa
    b. 100 Mpa
    c. 50 Mpa
    d. 25 Mpa

14. The limit of proportionality of a certain steel sample is 300 Mpa in simple tension. It is subjected to principal stresses of 150 Mpa (tensile) 60 Mpa (tensile) and 30 MPA (tensile) according to the maximum principal stress theory, the of safety in this case would be
    a. 10
    b. 5
    c. 4
    d. 2

15. A material of young's modulus 'E' and poisson's ratio 'µ' is subjected to two principal stress σ_1 and σ_2 at a point in a two dimensional stress system. The strain energy per unit volume of the material is
    A. $\frac{1}{2E}(\sigma_1^2+\sigma_2^2-2\mu\sigma_1\sigma_2)$
    B. $\frac{1}{2E}(\sigma_1^2+\sigma_2^2+2\mu\sigma_1\sigma_2)$
    C. $\frac{1}{2E}(\sigma_1^2-\sigma_2^2+2\mu\sigma_1\sigma_2)$
    D. $\frac{1}{2E}(\sigma_1^2-\sigma_2^2-2\mu\sigma_1\sigma_2)$

16. A shaft of diameter 'd' is subjected to bending moment 'M' and twisting moment 'T' . The developed principal stress will be
    A. $\pm\frac{16}{\pi d^3}\sqrt{M^2+T^2}$
    B. $\frac{16}{\pi d^3}(M\pm\sqrt{M^2+T^2})$
    C. $\frac{16}{\pi d^3}(T\pm\sqrt{M^2+T^2})$
    D. $\frac{16}{\pi d^3}(\sqrt{M^2+T^2}\pm M)$