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YOUTUBE QUESTIONS PRACTICE

STRENGTH OF MATERIAL

COMBINED STRESSES

Q :) A circular shaft can transmit a torque of 5KN-m.If the torque is torque to 4 KN-m, then the maximum value of bending moment that can be applied to the shaft is

A : 1 KN-m

B : 2 KN-m

C : 3 KN-m

D : 4 KN-m

Q :) strain energy per unit volume of a solid circular shaft φ under axial tension is

A : $\frac{\sigma^2}{8E}$

B : $\frac{\sigma^2}{16E}$

C : $\frac{\sigma^2}{2E}$

D : $\frac{\sigma^2}{4E}$

Q :) Two shafts of same length and material are joined in series. If the ratio of their diameters is 2, then the ratio angle of twist will be-

A : 2

B : 4

C : 8

D : 16

Q :) For a hollow shaft of external and internal diameters 10 cm and 5 cm respectively, the torsional sectional modulus will be approximately-

A : 184 cm3cm3

B : 275 cm3cm3

C : 368 cm3cm3

D : 536 cm3

Q :) A rectangular bar has been subjected to torsion. The maximum shear stress will occur___.

A : At the centre

B : At the corner

C : At the middle of longer side

D : Along the diagonal

Q :) 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 μ = 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

Q :) 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

Q :) 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

Q :) 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. $\frac{M+\sqrt{M^2+T^2}}{2}$

Q :) 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

Q :) 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. $\frac{M}{2T}$

Q :) 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. $\frac{16}{\pi D^3}\left(M+\sqrt{M^2+T^2}\right)$

Q :) 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

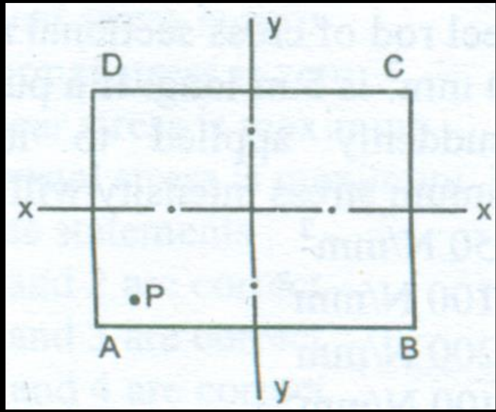
A. $\frac{1}{2E}(\sigma_1^2 + \sigma_2^2 - 2\mu\sigma_1\sigma_2)$

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. $\frac{1}{2E}(\sigma_1^2 - \sigma_2^2 - 2\mu\sigma_1\sigma_2)$

Q :) A reinforced cement concrete footing as shown in fig. 10.9 carries a concentrated load at p so to produce maximum



Bending stresses due to eccentricities about x-x axis and y-y axis 100 kN/m^2 and 150 kN/m^2 respectively. If the direct stress due to loading is 175 kN/m^2 (compressive), then the intensity of resultant stress at corner B will be

a. 425 kN/m^2 compressive
b. 125 kN/m^2 compressive
c. 75 kN/m^2 tensile
d. 225 kN/m^2 compressive

Q :) A rectangular block of size 200 mm × 100 mm × mm is subjected to a shear stress of 100 N/mm^2. If modulus of rigidity of material is 1×10^5 N/mm^2, strain energy stored will be

a. 10 N.m
b. 25 N.m
c. 50 N.m
d. 100 N.m

★ TORSION ★

Q :) Euler's crippling load for a column of length L with one end fixed and the other hinged is

A : $\frac{\pi^2 EI}{L^2}$

B : $\frac{4\pi^2 EI}{L^2}$

C : $\frac{\pi^2 EI}{4L^2}$

D : $\frac{2\pi^2 EI}{L^2}$

Q :) Euler,s formula is valid for

A : Short columns only

B : Long columns only

C : Both short and long columns

D : None of the above

Q :) The maximum dimension of a core section for a rectangular cross-section under economic loading on a column (b x d)

A : b/6

B : d/6

C : d/8

D : b/3 and d/3

Q :) Two shaft of solid circular cross-section are identical except for their diameters ‘d_1 ‘ . They are subjected to the same torque ‘T’. The ratio of the strain energies stored U_1 / U_2 will be

A. $\left(\frac{d_1}{d_2}\right)^4$

B. $\left(\frac{d_1}{d_2}\right)^2$

C. $\left(\frac{d_2}{d_1}\right)^2$

D. $\left(\frac{d_2}{d_1}\right)^4$

Q :) A shaft turns at 150 rpm under a torque of 1500 Nm. Power transmitted is

a. 15 π kw
b. 10 π kw
c. 7.5 π kw
d. 5 π kw

Q :) If the diameter of a shaft subjected to torque alone is double, then the horse power P can be increased to

a. 16 P
b. 8 P
c. 4 P
d. 2 P

Q :) A bar AB of diameter 40 mm and 4 m long is rigidly fixed at its ends. A torque of 600 Nm is applied at a section of the bar, 1 m from end A . The fixing couples T_A and T_B at the supports A and B respectively, are

a. 450 Nm and 150 Nm
b. 200 Nm and 400 Nm
c. 300 Nm and 150 Nm
d. 300 Nm and 100 Nm

Q :) The ratio of maximum shear stress developed in a solid shaft of diameter D and a hollow shaft of external diameter D and internal diameter d for the same torque is given by

A. $\frac{D^2+d^2}{D^2}$

B. $\frac{D^2-d^2}{D^2}$

C. $\frac{D^2-d^4}{D^4}$

D. $\frac{D^4-D^4}{d^4}$

Q :) A solid circular shaft of 6m length is built in a its ends and subjected to an externally applied torque 60kN-m at a distance of 2 m from left end. The reactive torques at the left end and the right end are respectively

a. 20 kN.m and 40 kN.m
b. 40 kN.m and 20 kN.m
c. 15 kN.m and 45 kN.m
d. 30 kN.m and 30 kN.m

Q :) If the internal radius of a hollow shaft is n times the external radius, then ratio of torques carried by the hollow shaft and solid shaft of same cross-section area and subjected to the same maximum shearing stress is

A : $1 - n^2$

B : $\frac{1+n^2}{1+n^2}$

C : $\frac{\sqrt{1+n^2}}{1-n^2}$

D : $\frac{1+n^2}{\sqrt{1-n^2}}$

COLUMN

Q :) If the crushing stress in the material of a mild steel column is 3300 kg/cm^2 , Euler's formula for crippling load is applicable for slenderness ratio equal to/greater than

a. 40
b. 50
c. 60
d. 80

Q :) Match List-I with List – and select the correct

List - I	List – II
A. Shear centre	1. Tension
B. Principal plane	2. Slope
C. Fixed end	3. Shear stress
D. Middle third rule	4. Twisting

Codes:

a. A – 4, B – 3, C – 2, D – 1

b. A – 3, B – 1, C – 4, D – 2

c. A – 4, B – 1, C – 2, D – 3

d. A – 4, B – 2, C – 3, D – 1

Q :) Which one of the following rules ascertains the maximum permissible eccentricity of loads on circular column so that stresses will always be compressive ?

a. Middle fourth rule
b. Middle third rule
c. Middle half rule
d. Middle tow-third rule

Q :) The slenderness Ratio of a compression member in the context of Ramkine’s formula is defined as

A. $\frac{\text{length}}{\text{least lateral dim ension}}$

B. $\frac{\text{effective length}}{\text{least radius of gyration}}$

C. $\frac{\text{effective length}}{\text{least lateral dim ension}}$

D. $\frac{\text{length}}{\text{least radius of gyration}}$