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Paper Code : PC- ROB 402/PC-AUE 401/PC-ME403 Strength of Materials

UPID : 004432

Time Allotted : 3 Hours *Full Marks :70*

The Figures in the margin indicate full marks.
Candidate are required to give their answers in their own words as far as practicable

Group-A (Very Short Answer Type Question)

1. Answer any ten of the following : [1 x 10 = 10]

(I) Polar moment of Inertia is summation of _____

(II) What is neutral axis of a beam?

(III) What are reasons for a beam to deflect?

(IV) Shear stress at the center of shaft in case of torsion is _____

(V) What is deferential formula for finding beam deflection?

(VI) Hoop stress is how many times the longitudinal stress in case of thin sphere?

(VII) Write the Moment of Inertia of a circle about its diameter.

(VIII) Volumetric stain is how many times of hoop stain in case of thin spherical shell?

(IX) Write the relation between elastic modulus and modulus of rigidity.

(X) When Shear stress is zero, what is the state of bending moment?

(XI) Draw The diagram of Mohr's Circle for pure shear.

(XII) Is always neutral axis passes through centroid of the beam?

Group-B (Short Answer Type Question)

Answer any three of the following : [5 x 3 = 15]

2. Show the stress versus strain curve of a ductile and brittle material. On that curves, show different points. Also show the modulus of toughness on the curve. [5]

3. Derive the Bending Formula of a Beam. [5]

4. Establish the relation between Elastic Modulus**(E)** and Bulk Modulus(**K)** of a material. [5]

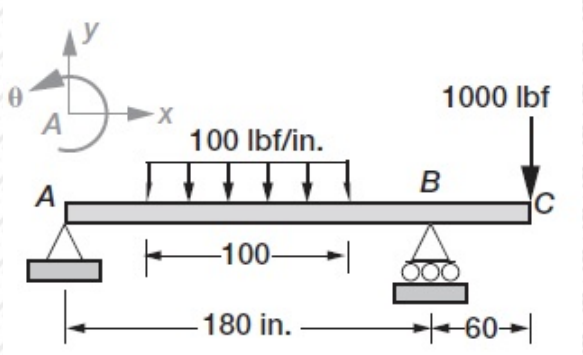
5. A beam is 3m long and simply supported. In between 1m to 2m, a uniformly distributed load of **5kN/m** is given. Find the shear force and bending moment Diagrams of the beam after deducing the equations. [5]

6. Define Poisson's ratio. [5]
Deduce the range of Poisson's ratio of a material.
Brittle materials do not any specific yield point, so how yield stress are determined for brittle materials?

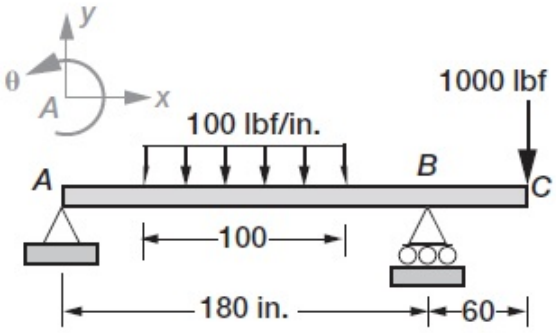
Group-C (Long Answer Type Question)

Answer any three of the following : [15 x 3 = 45]

7. (a) Find the Shear force diagram of the beam given below [6]



(b) Find also the Bending Moment diagram of the beam given below [9]



8. (a) Find The Euler's Critical load for a column with two end fixed. [9]

   (b) A straight bar of alloy, 1m long and 12.5mm by 4.8mm in section, is mounted in a strut-testing machine and loaed axially until it buckles. Assuming the Euler formula to apply, estimate the maximum central deflection before the material attains its yield point of 208N/mm^2. E=70000N/mm^2. [6]

9. (a) Determine the transverse shear of a I-section. Show the plot of the shear stress. [9]

   (b) Determine the transverse shear of a circular cross-section. Show the plot of the shear stress. [6]

10. (a) Find the value of Maximum deflection of simply supported beam of length with Uniformly distributed load W_o N/m. EI flexural rigidity of the beam. [8]

    (b) What are the limitations of Euler's Column theory? [2]

    (c) Derive Rankine-Gordon formula. [5]

11. A simply supported beam 8m long, is given a distributed force 4kN/m. A concentrated load of 10KN is given at point 3m from LHS of the beam, A concentrated moment of 10KN-m is given at 3m from RHS of the beam. Determine the shear force and bending moment diagram of the beam. Show the equations in the analysis. [15]

*** END OF PAPER ***