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Roll No

CE-305-CBGS

B.Tech., III Semester

Examination, December 2020

Choice Based Grading System (CBGS)

Strength of Materials

Time : Three Hours

Maximum Marks : 70

Note: i) Attempt any five question.

ii) All questions carry equal marks.

iii) In case of any doubt or dispute the English version question should be treated as final.

1. a) Define the following terms.

i) Young's Modulus of Elasticity

ii) Poisson's ratio

iii) Hook's Law Mohr's Circle of Stress.

b) A concrete column of cross-sectional area of 350×350 mm is reinforced by four longitudinal 30mm diameter round steel bars placed at each corner. If the column carries comprehensive load of 400kN, determine comprehensive stresses produced in the concrete and steel bars. Assume that Young's modulus of elasticity of steel is 15 times of that concrete.

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PTO

[2]

350×350 mm |

400kN

stresses ?

H«

15

2. a) Find the free end deflection in cantilever beam with uniformly distributed load by Maculay's method.
 - b) Derive the expression of the value of constant (h^2) in curved beam for rectangular cross section area beam.
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3. a) Derive the expression for shear stress distribution over I-section.
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 - b) The Young's Modulus of material is $21 \times 10^4 \text{ N/mm}^2$ and its modulus of Rigidity is $8.4 \times 10^4 \text{ N/mm}^2$ and determine its Poisson's ratio and Bulk modulus.

2

2

4. a) What do you understand by shear centre? Also write its importance.

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Contd...

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- b) Determine the principal moment of Inertia for unequal angle section (60×40×6)mm.

5. a) What is meant by effective length of a column? Also define Slenderness Ratio.

Column

- b) Find an expression for crippling load for a long column when both ends of column are fixed.

EH $\frac{1}{4}$ long column { OgHo n Ho crippling load

6. Write short notes (any three)

- a) Differentiate column and struts.
b) Define the point of contra-flexure in a beam.
c) Assumption for pure Torsion theory.
d) Define flexural rigidity and its significance.

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7. a) The stresses at point of a machine component are 150MPa and 50MPa both tensile. Find the intensities of normal shear and resultant stresses on a plane inclined at an angle of 55° with the axis of major tensile stress. Also find the maximum shear stress magnitude.

150MPa σ_1

55°

- b) Write the assumption of theory of simple bending and prove the relations,

$$\frac{M}{I} = \frac{\sigma}{y} = \frac{E}{R}$$

$$\frac{M}{I} = \frac{\sigma}{y} = \frac{E}{R} \quad |$$

8. Briefly define any three of the following.

- Principal Planes
- Temperature Stresses
- Stresses distribution in thin pressure vessels
- Concept of Pure Torsion

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