M.E. First Semester (Civil (Structural Engineering)) (New-CGS)

13085 : Theory of Elasticity and Elastic Stability : 1 SFSE 2

P. Pages : 1

Time : Three Hours

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AW - 3614

Max. Marks : 80

Notes : 1. Answer **three** question from Section A and **three** question from Section B.
2. Assume suitable data wherever necessary.
3. Illustrate your answer necessary with the help of neat sketches.
4. Use of Drawing instrument is permitted.
5. Use of pen Blue/Black ink/refill only for writing the answer book.

SECTION – A

1. a) Explain the concept of isotropy in theory of elasticity. **4**

b) What is meant by rigid body displacement? Explain in short. **3**

c) Explain plane stress condition and plain strain condition. **7**

2. a) Derive the strain compatibility equations for a 2 D stress analysis. **6**

b) Explain the general state of stress acting on a point with neat sketches. **7**

3. Derive for general three dimensional stress analysis : **13**
i) Differential equation of equilibrium.
ii) Boundary condition.

4. Derive the expression for compatibility condition for plane stress condition when body forces are present. **13**

5. Derive the equation of deflection curve for a cantilever loaded at free end. **13**

SECTION – B

6. a) Evaluate the critical load that the column can carry assuming function for deflection as $y = A.\sin\left(\frac{\pi x}{L}\right)$ using energy concept. **7**

b) Derive the expression for critical load that the column can carry, if both ends are fixed. **7**

7. Explain Rayleigh Ritz method taking shape function as $y = cx^2$ for one end fixed and the other end free column. **13**

8. Evaluate expression for strain energy due to Saint Venant and warping torsion combination. **13**

9. Explain Galerkin method to find the critical load that one end fixed and other end hinged column can carry. **13**

10. Derive the expression for differential for lateral buckling of a beam. **13**

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