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**Question Paper Code: 34104**

B.E. / B.Tech. DEGREE EXAMINATION, NOV 2019

Fourth Semester

Civil Engineering

01UCE404 - MECHANICS OF SOLIDS II

(Regulation 2013)

Duration: Three hours

Maximum: 100 Marks

Answer ALL Questions.

PART A - (10 x 2 = 20 Marks)

1. State Castigliano's first theorem.
2. State the principle of Virtual work.
3. Define statically indeterminate beam.
4. What are the advantages of continuous beam over simply supported beam?
5. Write the formula for deflection of a fixed beam with eccentric point load and uniformly distributed load.
6. What is conjugate beam?
7. Write the assumptions made in Euler's theory of long column.
8. Define thick cylinders.
9. Define shear center.
10. Define compound cylinder.

PART - B (5 x 16 = 80 Marks)

11. (a) An axial pull of 50 kN is suddenly applied to a steel rod 2 m long and 10 cm<sup>2</sup> in cross –section. Calculate the strain energy that can be absorbed, if  $E = 200 \text{ GN/m}^2$  (16)

Or

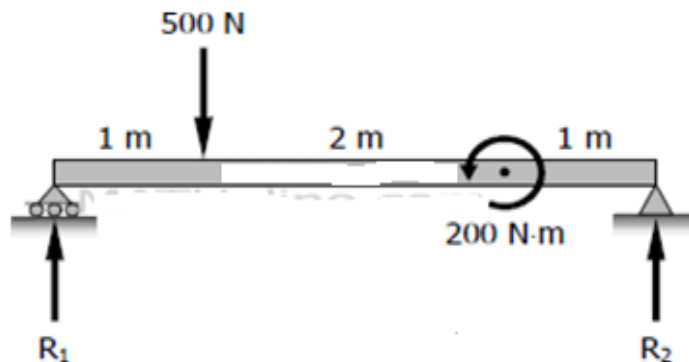
- (b) A beam simply supported over a span of 3m carries a uniformly distributed load of 20 kN/m over the entire span. Taking  $EI = 2.25 \text{ MNm}^2$  and using Castiglian's theorem determine the deflection at the center of the beam. (16)
12. (a) A fixed beam  $AB$  of length 6m carries point load of 160 kN and 120 kN at a distance of 2m and 4m from the left end A. Find the fixed end moments and the reactions at the supports. (16)

Or

- (b) A cantilever of span 2m carries an UDL of 18 kN/m. Determine the slope and deflection at free end of the cantilever. Take  $E = 1 \times 10^5 \text{ N/mm}^2$  and  $I = 2 \times 10^7 \text{ mm}^4$ . (16)
13. (a) A cantilever of length 4m carries an u.d.l of 12kN/m for a length of 2.5m from fixed end and a point load of 10kN at free end. Determine the maximum slope and deflection using moment area method. Take  $EI = 6.3 \times 10^4 \text{ kN/m}^2$ . (16)

Or

- (b) Find the value of deflection at the point of application of the 200 N·m couple in figure by conjugate method. (16)



14. (a) Derive the expression for crippling load when both ends of the column are fixed. (16)

Or

(b) A hollow tube  $5m$  long with external and internal diameter  $40mm$  &  $25mm$  respectively was found to extend  $6.4mm$  under a tensile load of  $60kN$ . Find the buckling load for the tube when used as columns with both ends fixed. Also find the safe load for the tube taking a factor of safety 4. (16)

15. (a) Derive the formula for the deflection of beams due to unsymmetrical bending. (16)

Or

(b) A pipe of  $200 mm$  internal diameter of radial pressure and  $100 mm$  thickness contains a fluid at a pressure of  $6 N/mm^2$ . Find the maximum and the minimum hoop stress across the section. (16)

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