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Question Paper Code: 31414

B.E. / B.Tech. DEGREE EXAMINATION, NOVEMBER 2015

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. What do you mean by strain energy?
2. State the Castigliano's theorems.
3. Write the various types of support conditions.
4. Define shear force.
5. Calculate the deflection at mid span of a simply supported beam of span ' L ' subjected to a uniformly distributed load of ' W kN/m.
6. What is a slope in a fixed end of a cantilever beam subjected to a point load of ' W ' at the free end?
7. How the columns are classified?
8. List out any two assumptions made in Euler's column theory.
9. Define Lamé's theory.
10. What is meant by compound cylinder?

PART - B (5 x 16 = 80 Marks)

11. (a) A simply supported beam of span L has an overhang of length 'A' on the left. The vertical load W is applied at the end of the overhang. Calculate the deflection of the point of application of the load by Castigliano's theorems. (16)

Or

- (b) A cantilever of length L carries a point load W at its free end. The member is circular in section having diameter D for a distance $L/2$ from the fixed end and a diameter $D/2$ for the remaining length. Find the deflection at the free end. (16)

12. (a) A continuous beam ABC of uniform flexural rigidity consists of spans AB & BC of length $8m$ & $12m$. The beam is simply supported at A , B & C . The span AB carries a point load of $6kN$ at its middle point. The span BC is subjected to a clockwise couple of $180 kN/m$ at its middle point. Find the support moments and support reactions, and also draw a shear force and bending moment diagrams. (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 $E = 1 \times 10^5 N/mm^2$ and $I = 2 \times 10^7 mm^4$. (16)

13. (a) A simply supported beam of length $5m$ carries a point load of $5 kN$ at a distance of $3m$ from a left end. If $E = 2 \times 10^5 N/mm^2$ and $I = 1 \times 10^8 mm^4$. Determine the slope at the left support and deflection under the point load using conjugate beam method. (16)

Or

- (b) A beam ABC simply supported at the ends, has moment of inertia $4I$ for the length AC and I for the length CB and is loaded with point load W at C . Determine
- 1.) Slope at end A
 - 2.) Deflection at mid span
 - 3.) Maximum deflection
- (16)

14. (a) A hollow C.I column whose outside diameter is $200mm$ and has a thickness of $20mm$. It is $4.5m$ long and is fixed at both ends. Calculate the safe load by Rankine's formula using a factor of safety of 4. Calculate the slenderness ratio and the ratio of Euler's and Rankine's critical loads. Take $f_c = 550 N/mm^2$ and $a = 1/1600$, $E = 0.8 \times 10^5 N/mm^2$. (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) Find the thickness of the metal necessary for a steel cylindrical shell of internal diameter $200mm$ to withstand an internal pressure of $50 N/mm^2$. The maximum hoop stress in the section is not to exceed $150 N/mm^2$. (16)

Or

- (b) A compound tube is composed of a tube of $250mm$ internal diameter and $25mm$ thick was shrunk on a tube of $250mm$ external diameter and $25mm$ thick. The radial pressure at the junction is $8 N/mm^2$. The compound tube is subjected to an internal pressure of $84.5 N/mm^2$. Find the variation of the hoop stress over the wall of the compound tube. (16)
