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**Question Paper Code: 54103**

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

Fourth Semester

Civil Engineering

15UCE403-MECHANICS OF SOLIDS - II

(Regulation 2015)

Duration: Three hours

Maximum: 100 Marks

Answer ALL Questions

PART A - (5 x 1 = 5 Marks)

1. The strain energy stored by the body within at elastic limit when loaded externally is called CO1- R  
(a) Resilience (b) Proof resilience  
(c) Modulus of resilience (d) Strain energy
2. The product EI is called CO2- R  
(a) Flexural rigidity (b) Torsional rigidity  
(c) Second moment of area (d) Moment of area
3. A fixed beam of length 6 m carries a point load 120 kN at its centre. The fixed end moment at the ends is CO3- R  
(a) 40 kNm (b) 90 kNm (c) 120 kNm (d) 150 kNm
4. A cylinder can be assumed as a thin cylinder when the diameter to thickness ratio is CO4- R  
(a) <20 (b) >20 (c) 10 (d) Negligible
5. In a channel section symmetrical about XX axis, shear centre lies at CO5 R  
(a) The centre of the vertical web (b) The centre of the top flange  
(c) The centroid of the section away (d) None of the above

PART – B (5 x 3= 15 Marks)

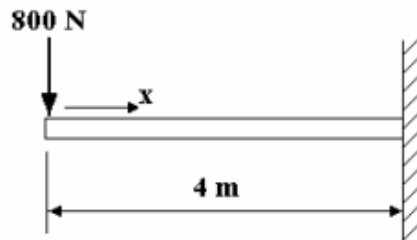
6. Define Strain Energy CO1- R
7. What are the methods for finding out the slope and deflection at a section? CO2- R
8. What are the advantages of fixed beam over simply supported beam? CO3- R
9. Define Equivalent length of the column. CO4- R
10. What are the reasons for unsymmetrical bending? CO5- R

PART – C (5 x 16= 80 Marks)

11. (a) A solid bar is 20 mm dia. And 0.8 m long. It is subjected to a torque of 30 Nm. Calculate the maximum shear stress and the strain energy stored. Take  $G=90\text{GPa}$ . CO1- App (16)

Or

- (b) Determine the strain energy in the cantilever beam shown in fig. The flexural stiffness  $EI$  is  $200\text{kNm}^2$ . CO1- App (16)

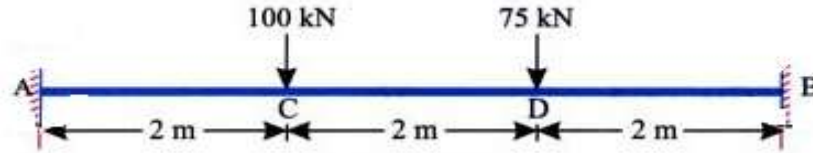


12. (a) A steel girder of uniform section 14 m long is simply supported at its ends. It carries point loads of 90 kN and 60 kN at two points 3 m and 4.5 m from the two ends respectively. Calculate the deflection of the girder at the points under the two loads. Use Macaulay's method. CO2- App (16)

Or

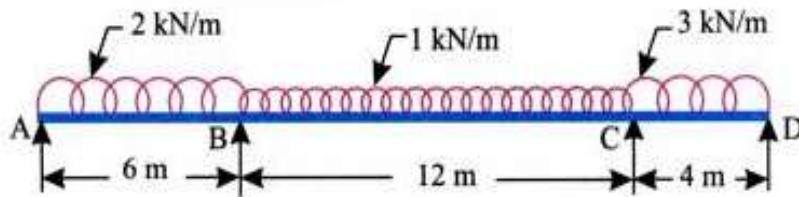
- (b) A cantilever 150 mm wide and 200 mm deep projects 2 m out of a wall, and is carrying a point load of 40 kN at the free end. Determine the slope and deflection of the cantilever at the free end. Take  $E = 2.1 \times 10^5 \text{ N/mm}^2$  CO2- App (16)

13. (a) A fixed beam carries point loads as shown in fig. Draw the S.F and B.M diagrams CO3- Ana (16)



Or

- (b) Analyze the continuous beam shown in fig. and draw the B.M diagram. CO3- Ana (16)



14. (a) A bar of length 4 m when used as a simply supported beam and subjected to a u.d.l of 30 kN/m over the entire span, deflect 15 mm at the centre. Determine the crippling loads when it is used as a column with following end conditions  
 (i) Both ends hinged,  
 (ii) One end hinged and other end fixed,  
 (iii) Both ends fixed.

Or

- (b) A thin cylinder of internal diameter 1.25 m contains a fluid at an internal pressure of 2 N/mm<sup>2</sup>. Determine the maximum thickness of the cylinder if  
 (i) The longitudinal stress is not to exceed 30 N/mm<sup>2</sup>  
 (ii) The hoop stress is not to exceed 45 N/mm<sup>2</sup>

15. (a) Determine principal moment of inertia for the angle section CO5- U (16)  
80x80x15 mm. given  $I_{xx}=I_{yy}= 87.36 \times 10^{-8} \text{ m}^4$ .

Or

- (b) Derive the formula for position of shear centre for channel CO5- U (16)  
section.