Reg. No. : | | | | | | | | | | |

Question Paper Code: 54013

B.E. / B.Tech. DEGREE EXAMINATION, NOV 2017

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 elastic limit when loaded externally is called

   (a) Resilience (b) Proof resilience (c) Modulus of resilience (d) None of these

2. A beam of length L, fixed at both ends, carries a point load W at its centre. If EI is the flexural rigidity of the beam, the maximum deflection in the beam is

   (a) $Wl^3/48EI$ (b) $Wl^3/192EI$ (c) $Wl^3/96EI$ (d) $Wl^3/24EI$

3. A beam of length 6 m carries a point load 120 kN at its centre. The beam is fixed at both ends. The fixing moment at the ends is

   (a) 40 kNm (b) 90 kNm (c) 120 kNm (d) 150 kNm

4. The ratio of the effective length of a column and minimum radius of gyration of its cross-sectional area, is known as

   (a) buckling factor (b) slenderness ratio
   (c) crippling factor (d) none of the above

5. In thick cylinders the radial stress in the wall thickness is

   (a) zero (b) negligibly small
   (c) varies from the inner surface to the outer surface (d) none of these

PART - B (5 x 3 = 15 Marks)

6. Define Strain Energy and resilience.

7. Write the formula for deflection of a fixed beam with uniformly distributed load and compare the result with simply supported beam.

8. What are the advantages of fixed beam?

9. What are the assumptions involved in the derivation of Euler's critical load?

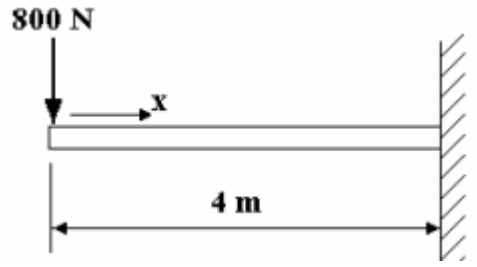
10. What are the reasons for unsymmetrical bending?

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-90GPa. (16)

Or

(b) Determine the strain energy in the cantilever beam shown in fig. The flexural stiffness EI is 200kNm^2. (16)

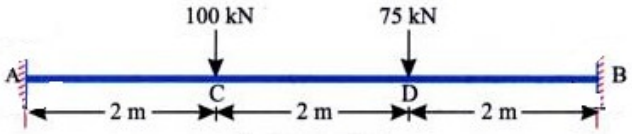


12. (a) A steel girder of uniform section 14 m long is simply supported at its ends. It carries point loads of 90 kN and 60 kN at two points 3 m and 4.5 m from the two ends respectively. Calculate the deflection of the girder at the points under the two loads. Use Macaulay's method. Take E = 210 x 10^6 kN/m^2 and I = 64 x 10^{-4} m^4. (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 = 2.1x10^5 N/mm^2. (16)

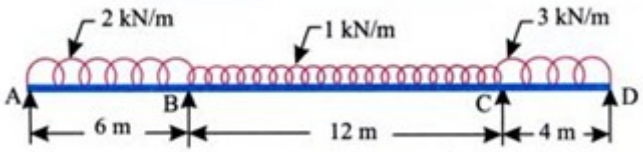
13. (a) A fixed beam carries point loads as shown in fig. Draw the S.F and B.M diagrams.



(16)

Or

(b) Analyse the beam shown in fig. and draw the B.M diagram. (16)



14. (a) Derive the Euler's crippling load for a column with one end is fixed and other end is free (16)

Or

(b) A thin cylinder of internal diameter 1.25 m contains a fluid at an internal pressure of 2 N/mm^2. Determine the maximum thickness of the cylinder if (i) The longitudinal stress is not to exceed 30 N/mm^2. (ii) The hoop stress is not to exceed 45 N/mm^2. (16)

15. (a) Determine principal moment of inertia for the angle section 80x80x15mm. Given $I_{xx}=I_{yy}= 87.36x10^{-8}$ m^4. (16)

Or

(b) Calculate the thickness of metal necessary for a cylindrical shell of internal diameter160 mm to withstand an internal pressure of 25 MN/m^2, if maximum permissible tensile stress is 125 MN/m^2. (16)

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