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

Question Paper Code: 41144

B.E. / B.Tech. DEGREE EXAMINATION, NOV 2016

Fourth Semester

Civil Engineering

14UCE404 - MECHANICS OF SOLIDS - II

(Regulation 2014)

Duration: Three hours Maximum: 100 Marks

Answer ALL Questions

PART A - (10 x 1 = 10 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. In case of solid shaft the strain energy in torsion per unit volume is equal to

   (a) $\tau^2 / 2C$ (b) $\tau^2 / 4C$ (c) $\tau^2 / 6C$ (d) $\tau^2 / 8C$

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. A continuous beam is one which is

   (a) fixed at both ends
   (b) fixed at one end and free at the other end
   (c) supported on more than two supports
   (d) extending beyond the supports

5. The maximum deflection of a fixed beam carrying a central point load lies at

   (a) fixed ends (b) centre of beam
   (c) 1/3 from fixed ends (d) none of these

6. 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) $Wl^3/24EI$

7. Lame's theorem deals with the design of

(a) long column (b) short column (c) thick cylinder (d) beams

8. A cylinder can be assumed as a thin cylinder when the diameter to thickness ratio is

(a) <20 (b) >20 (c) 10 (d) negligible

9. In case of unsymmetrical bending, the direction of neutral axis is

(a) perpendicular to the plane of bending
(b) not perpendicular to plane of bending
(c) either (a) or (b)
(d) none of these

10. 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 2 = 10 Marks)

11. Define strain energy.

12. What is a fixed beam?

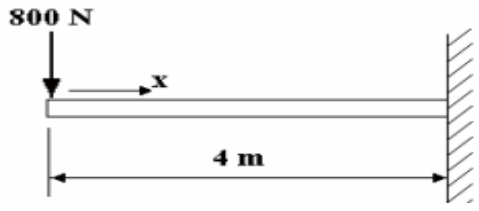
13. Name the various methods of determining slope and deflection of a beam.

14. Define 'core' of a section.

15. What is stress concentration?

PART - C (5 x 16 = 80 Marks)

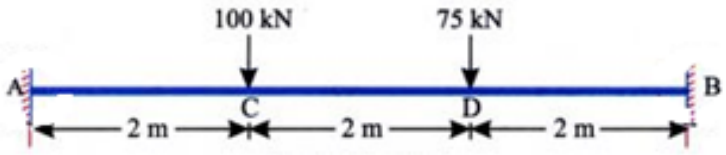
16. (a) Determine the strain energy in the cantilever beam shown in figure. The flexural stiffness EI is $200kNm^2$ (16)



Or

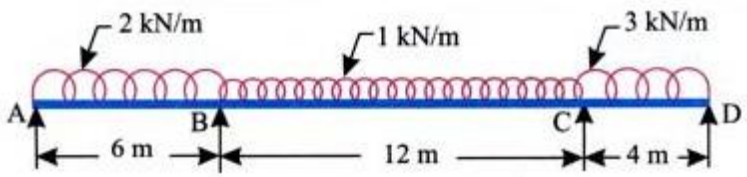
(b) A solid bar is 20 mm dia. And 0.8 m long. It is subjected to a torque of 30 Nm. Calculate the maximum shear stress and the strain energy stored. Take G=90GPa. (16)

17. (a) A fixed beam carries point loads as shown in figure. Analyse the beam and draw the S.F and B.M diagrams. (16)

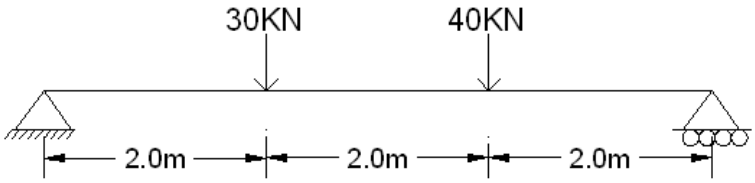


Or

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



18. (a) For the beam shown in figure, find the deflection at C and slope at D. I = 40 x 10^7 mm^4 , E = 200 GPa. (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)

19. (a) Derive an expression for a crippling load when one end is fixed and other end is free. (16)

Or

(b) A column with one end hinged and other end fixed has a length of 5m and a hollow circular cross-section of outer dia 100 mm and wall thickness 10mm. If E = 1.60 x 105 N/mm^2 and crushing stress σc= 350 N/mm^2, find the load that the column may

carry with a factor of safety of 2.5 according to Euler theory and Rankine-Gordon theory. (16)

20. (a) An 80 mm x 60 mm x 8 mm unequal angle is placed with the longer leg vertical and is used as a beam. It is subjected to a bending moment of 180 x 10^3 Nm acting in the vertical plane through the centroid of the section. Determine the maximum bending stress induced in the section. (16)

Or

(b) Calculate the thickness of metal necessary for a cylindrical shell of internal dia. 160 mm to withstand an internal pressure of 25 MN/m^2, if maximum permissible tensile stress is 125 MN/m^2. (16)

———————