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

Question Paper Code: 44104

B.E. / B.Tech. DEGREE EXAMINATION, NOV 2018

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. Shear strain energy per unit volume is given by

   (a) $\frac{\tau^2}{4G}$ (b) $\frac{\tau^2}{2G}$ (c) $\frac{2\tau^2}{3G}$ (d) $\frac{\tau}{4G}$

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. Deflection due to shear force as compared to bending moment will be

   (a) Equal (b) Less (c) More (d) None of these

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. According to I.S. code in actual design, maximum permissible deflection is limited to

(a) (span / 200) (b) (span / 325) (c) (span / 525) (d) (span / 500)

7. Euler's formula holds good only for

(a) Short columns (b) Long columns
(c) Weak column (d) Both (A) & (B)

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. A thin spherical shell of diameter (*d*) and thickness (*t*) is subjected to an internal pressure (*p*). The stress in the shell material is

(a) pd/t (b) pd/2t (c) pd/4t (d) pd/8t

PART - B (5 x 2 = 10 Marks)

11. Define strain energy.

12. What is a fixed beam?

13. What are the advantages of continuous beams over simply supported beams?

14. Define core.

15. Give the reasons for an unsymmetrical bending of beams.

PART - C (5 x 16 = 80 Marks)

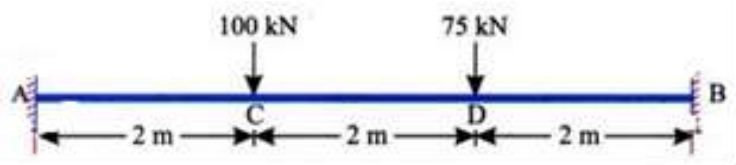
16. (a) The external diameter of a hollow shaft is twice the internal diameter. It is subjected to pure torque and it attains a maximum shear stress τ. Show that the strain energy stored per unit volume of the shaft is $\frac{5\tau^2}{16\,C}$. Such a shaft is required to transmit 5000 *kW* at 100 *rpm* with uniform torque, the maximum stress not exceeding 80 MN/m^2. Determine the shaft diameter and the energy stored per m^3. Take C = 90 GN/m^2

(16)

Or

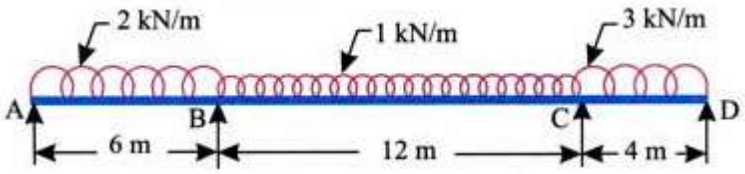
(b) A solid bar is 20 mm dia. And 0.8 m long. It is subjected to a torque of 30 Nm. Calculate the maximum shear stress and the strain energy stored. Take G=90GPa. (16)

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) Find the expression for the slope and deflection of a cantilever of length L, which carries a uniformly distributed load over a length "a" from the fixed end by Moment area method starting from fundamentals. (16)

Or

(b) A cantilever beam of length 4 *m* is subjected to a point load of 10 *kN* at 2 *m* from fixed end. If the section is rectangular 100 *mm* wide and 200 *mm* deep. Find the deflection at free end. Take $E = 2 \times 10^5$ *N/mm*^{2}. (16)

19. (a) A Cylindrical shell 3 meters long has 1 metre internal diameter and 15 mm metal thickness. Calculate the circumferential and longitudinal stresses induced and also changes in the dimensions of the shell, if it is subjected to an internal pressure of 15 kg/cm^2. Take E = 2.0 × 106 kg/cm^2 and Poisson's ratio = 0.3. (16)

Or

(b) A thin cylindrical shell is 3m long, 1.5m internal diameter and 20mm metal thickness. Calculate the circumferential and longitudinal stresses induced and also change in the dimensions of the shell if it is subjected to an internal pressure of *2N/mm*^{2}. Take E = *200GN/m*^{2} and $\frac{1}{m}$ =0.3. (16)

20. (a) A beam of Tee section having flange of 100 mm x 20 mm and web of 150 mm x 10mm and 3 m long is simply supported at its ends. It carries 4 kN at 30 ° to vertical and passing through the centroid of the section. Calculate the maximum tensile stresses and maximum compressive stresses. E = 200 kN/mm^2. (16)

Or

(b) A compound cylinder is composed of a tube of 250*mm* internal diameter and 25mm wall thickness. It is shrunk on to a tube of 200*mm* internal diameter. The radial pressure at the junction is 8 *N/mm*^{2}. Assess the variation of hoop stress across the wall of the compound cylinder, if it is under an internal fluid pressure of 60 *N/mm*^{2}. (16)