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

Question Paper Code: 44104

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

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. Area under load-deflection curve gives

   (a) Strain energy (b) Maximum stress
   (c) Rigidity (d) Modulus of elasticity

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. The static indeterminacy value for propped cantilever beam is

   (a) 3 (b) 1 (c) 2 (d) 4

4. A continuous beam has

   (a) One support (b)) two support
   (c) more than two supports (d) very long span

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 a thick cylinder the Stress distribution across the wall thickness will be

(a) linear (b) parabolic (c) hyperbolic (d) cubic

PART - B (5 x 2 = 10 Marks)

11. State Maxwell reciprocal theorem with neat sketch.

12. Compare fixed beam with simple supported beam.

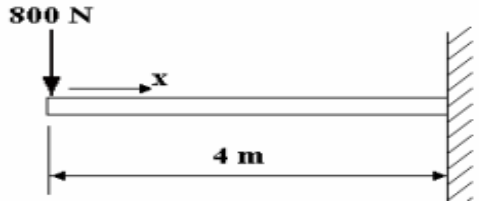
13. What are the advantages of continuous beams over simply supported beams?

14. Define core.

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

PART - C (5 x 16 = 80 Marks)

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



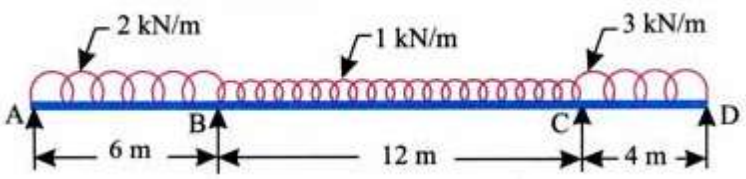
Or

(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 of 6m span carries a uniformly distributed load of *30kN/m* over the 3*m* length starting from the left end and a concentrated load of 60*kN* at a distance of 4.5*m* from the left hand end. Calculate the moments at the supports and draw bending moment and shear force diagram. (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 beam ABCD is simply supported at its ends A and D over a span of 30 *metres*. It is made up three portions AB,BC, and CD each 10 *metres* in length. The moments of inertia of sections of these portions are I, 3I and 2I respectively, where I = 300 x 10^{-4} m^4. The beam carries a point load of 225 *kN* at B and a point load of 450 *kN* at C. If E = 200 x 10^6 kN/m^2. Calculate (i) slope at A and D. (ii) Deflection at B and C. Neglect the weight of the beam (16)

19. (a) A hollow cylindrical cast iron column of 150*mm* external diameter and 15*mm* thickness ,3*m* long and is hinged at one end and fixed at the other end (i) Compare the crippling loads given by Euler's and Rankine's formulae (ii) for what length the critical load by Euler's and Rankine's formulae will be equal. Take E = 8 x 10^4 N/mm^2, σc = 550 N/mm^2 and a = $\frac{1}{1600}$. (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 80 x 80 x 10 *mm* angle is used as simply supported beam over a span of 2.4 *m*. It carries a load of 400 *kN* along the vertical axis passing through the centroid of the section. Determine the resulting bending stress on the outer corners of the section along the middle section of beam. (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)