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

Question Paper Code: 44104

B.E. / B.Tech. DEGREE EXAMINATION, MAY 2022

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 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. In water bound macadam roads, binding material, is

(a) Sand (b) Stone dust (c) Cement (d) Brick dust

9. The maximum spacing of contraction joints in rigid pavements is

(a) 2.5 *m* (b) 3.5 *m* (c) 4.5 *m* (d) 5.5*m*

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 the classification of urban and non-urban roads as suggested by Nagpur plan.

12. What are the three condition based on design of sight distance at interaction?

13. List the components of flexible pavement.

14. Define core.

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

PART - C (5 x 16 = 80 Marks)

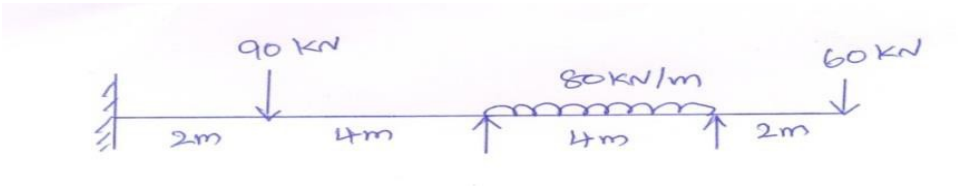
16. (a) (i) Describe the factors governing highway alignment. (8)

(ii) Write brief note on Highway Development in India. (8)

Or

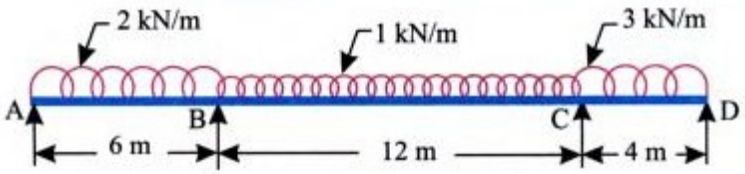
(b) A solid bar is 20 mm dia. And 0.8 m long. It is subjected to a torque of 30 Nm. Calculate the maximum shear stress and the strain energy stored. Take G=90GPa. (16)

17. (a) Analysis the given continuous beam shown in Figure .1 and draw its BMD and SFD using Theorem of three moment equation method. EI=Constant. (16)



Or

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



18. (a) (i) Design of flexible pavements: Which is located in hilly area present traffic intensity is 350 vehicles for a design period of 8 years and a traffic growth rate of 7.5% take lane distribution factor as 0.75 take VDF 2.5; design of CBR value for soil subgrade is 10%. (8)

(ii) Discuss the merits and demerits of CBR method of flexible design. (8)

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) (i) Explain the various sub surface drainage system with neat sketches. (8)

(ii) Explain the construction procedure of cement concrete road as per IRC specification. (8)

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)