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Question Paper Code: 94103

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

Fourth Semester

Civil Engineering

19UCE403- Strength of Materials

(Regulations 2019)

Duration: Three hours

Maximum: 100 Marks

PART A - (5x 1 = 5 Marks)

Answer All Questions

- Area under load diagram gives CO1- U
(a) SFD (b) Change in SFD (c) BMD (d) Change in BMD
- There are two beams of equal length L and a load P is acting on centre of both CO4- Ana
beams. One of them is simply supported at both ends while the other one is
fixed at both ends. Deflection of centre of simply supported beam will be
_____ times that of deflection of centre of fixed beam.
(a) 1 (b) 2 (c) 3 (d) 4
- Which structure will perform better during earthquake? CO1- U
(a) Statically determinate (b) Statically indeterminate
(c) Both a and b (d) Depends upon magnitude of earthquake
- If the Euler's load for steel column is 100kN, and the failure load is CO3- App
125kN, the Rankine's load is equal to
(a) 125kN (b) 155.5kN (c) 55.5kN (d) 60.5kN
- For $\sigma_1 \neq \sigma_2$ and $\sigma_3 = 0$, what is the physical boundary for Rankine CO1- U
failure theory?
(a) A rectangle (b) An ellipse (c) A square (d) A parabola

PART – B (5 x 3= 15Marks)

- Calculate average shear stress for a rectangular beam 100 mm wide and 250 CO2- App
mm deep is subjected to a maximum shear force of 50 kN.

7. Explain the Theorem for conjugate beam method? CO1- U
8. Define statically indeterminate beams. CO1- U
9. A thin cylindrical shell is subjected to internal pressure p . The Poisson's ratio of the material of the shell is 0.3. Due to internal pressure, the shell is subjected to circumferential strain and axial strain. Determine The ratio of circumferential strain to axial strain. CO3-App
10. List the theories of failure CO1- U

PART – C (5 x 16= 80Marks)

11. (a) A Cast Iron pipe of external diameter 800mm and internal diameter 700mm is simply supported at its end . Thelength of the pipe is 7.5m. Determine the intensity of the pipe that can carry the maximum bending stress is notexceeding 140N/mm^2 . CO2-App (16)
- Or
- (b) A rectangular beam 120mm wide and 300mm deep is simply supported over a span of 4m.What udl the beam may carry if the bending stress is not to exceed 120Mpa. The width of the beam is 120mm. CO2-App (16)
12. (a) A cantilever 2 m long carries a load of 15Kn at a distance of 1 m from the fixed end and a load of 10 kN at the free end. Determine the deflection at the free end. Use conjugate beam method. CO2-App (16)
 $E=200 \times 10^6 \text{ kN/m}^2$, $I=15 \times 10^{-6} \text{ m}^4$.
- Or
- (b) A simply supported beam of span 6m is subjected to a concentrated load of 45 KN at 2m from the left support. CO2-App (16)
 Calculate the deflection under the load point.
 Take $E=200 \times 10^6 \text{ N/mm}^2$ and $I=14 \times 10^{-6} \text{ m}^4$
13. (a) A continuous beam ABC covers two consecutive span AB and BC of lengths 4m and 6m, carrying udl of 6 kN/m and 10 kN/m respectively if the ends A & C are simply supported, find the support moments at A ,B & C. Draw also BM and SF diagrams. CO2-App (16)
- Or
- (b) A continuous beam ABCD 20 m long is fixed at A, simply supported at D and carried on the supports B and C at 5 m and 12 m from the left end A. It carries two concentrated loads of 80 kN and 40 kN at 3 m and 8 m respectively from A and uniformly distributed load of 12 kN/m over the span CD. Analyse the beam CO2-App (16)

by theorem of three moments and draw the shear force and bending moment diagrams.

14. (a) A hollow steel tube of 200 mm external diameter and 25 mm thick is 4m long & used as a column. If one end is fixed & other end is hinged. Find the load the column can carry. Use Euler's formula & Factor of safety as 2. CO3- App (16)

Or

- (b) A closed cylindrical pipes carries liquid with a pressure of 3 N/mm², diameter of the pipe is 250mm and length of pipe is 750mm. Determine circumferential stress and longitudinal stress developed in the cylinder. Also calculate change in diameter, change in length, change in volume. Thickness is 3mm. $E=2.1 \times 10^5$ N/mm², $\mu = .286$. CO3- App (16)

15. (a) Determine the position of the shear centre of a channel having dimensions flanges: 120 mm x 20 mm and web: 160 mm x 10 mm. CO3-App (16)

Or

- (b) A beam of T-section (flange: 100 mm X 20 mm; web: 50mm X 10mm) is 2.5 meters in length and is simply supported at the end. It carries a load of 3.2 kN inclined at 20° to the vertical and passing through the centroid of the section. CO3-App (16)

