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

Question Paper Code: 94103

B.E./B.Tech. DEGREE EXAMINATION, NOV 2024

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

1. In a beam with transverse loading, point of contra-flexure occurs at a section where CO1- U

   (a) Bending moment is minimum (b) Bending moment is zero

   (c) Bending moment is maximum (d) Shear Force is maximum

2. In simply supported beam deflection is maximum at _____ CO1- U

   (a) Midspan (b) Supports (c) Point of loading (d) Through out

3. 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

4. If the Euler's load for steel column is 100kN, and the failure load is 125kN,the Rankine's load is equal to CO3- App

   (a) 125kN (b) 155.5kN (c) 55.5kN (d) 60.5kN

5. For $\sigma 1\ 2 \neq \sigma$ and $\sigma 3 = 0$, what is the physical boundary for Rankine failure theory? CO1- U

   (a) A rectangle (b) An ellipse (c) A square (d) A parabola

PART – B (5 x 3= 15Marks)

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

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.	Write shear center formula for I section and Channel Section	CO1- R	

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 . The length of the pipe is 7.5m. Determine the intensity of the pipe that can carry the maximum bending stress is not exceeding 140 N/mm^2.	CO2-App	(16)
		Or		
	(b)	A simply supported beam of span 6m carries udl of 1.5kN/m run with a concentrated load of 1kN, 2kN, 3kN at a distance of 1.5m, 3m, 4.5 m from left end. Draw SFD and BMD.	CO2-App	(16)
12.	(a)	A simply supported beam of span 9m carries two point loads 210kN & 125kN at 2m and 6m from left support. The self weight of beam is 26kN/m. Determine max slope and deflection at the center. EI is a constant.	CO2-App	(16)
		Or		
	(b)	A simply supported beam of span 6m is subjected to a concentrated load of 45 KN at 2m from the left support. Calculate the deflection under the load point. Take $E=200*10^6$ N/mm^2 and $I=14*10\text{-}^6$ m^4	CO2-App	(16)
13.	(a)	A fixed beam AB of length 6m carries point loads of 160 KN and 120 KN at a distance of 2m and 4m from the left end A. Find the fixed end moments and the reactions at the supports. Draw B.M and S.F 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 by theorem of three moments and draw the shear force and	CO2-App	(16)

bending moment diagrams.

14.	(a)	A Steel bar of rectangular section 40mm X 50mm pinned at each end is subjected to axial compression. The bar is 2m long. Determine the buckling load and the corresponding axial stress using Euler's formula. Also calculate slenderness ratio if the proportional limit of the material is 200N/mm2. Take $E=2x10^5 N/mm^2$	CO3- App	(16)
		Or		
	(b)	A closed cylindrical pipes carries liquid with a pressure of 3 N/mm^2, 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, chance in length, change in volume. Thickness is 3mm.E=2.1 x 10^5 N/mm^2,μ =.286.	CO3- App	(16)
15.	(a)	Determine the diameter of a bolt which is subjected to an axial pull of 9 kN together with a transverse shear force of 4.5 kN using i) Maximum principal stress theory ii) Maximum principal strain theory.	CO3-App	(16)
		Or		
	(b)	A cylindrical shell of mild steel plate and 1.2 m in diameter is to be subjected to an internal pressure of 1.5MN / m^2. If the material yield 200 MN / m^2. Calculate the thickness of the p[late on the basis of the following three theories, assuming the factor of safety 3 in each case i) Maximum principal stress theory ii). Maximum shear stress theory iii) Maximum shear strain energy theory.	CO3-App	(16)

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