BTS 164 (C)

B.TECH. DEGREE III SEMESTER (SUPPLEMENTARY) EXAMINATION IN CIVIL ENGINEERING
JUNE 2002

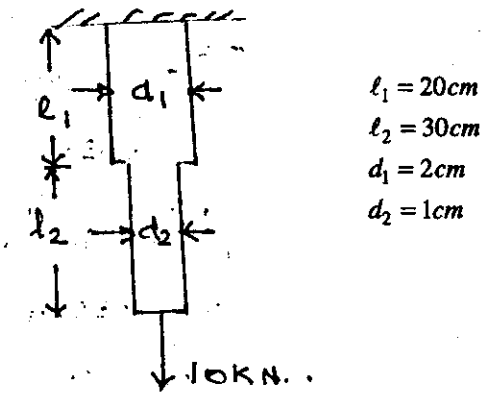
CE 303 STRENGTH OF MATERIALS

(1998 Admissions)

Time: 3 Hours Maximum Marks: 100

I. (a) Define the following terms:
- (i) Stress
- (ii) Strain
- (iii) Hook's law
- (iv) Limit of proportionality (8)

(b) A compound bar of steel 50cm long is loaded with 10kN as shown in figure below. Find its change in length and volume. Take $E = 0.21 MN / mm^2$. (12)



$\ell_1 = 20cm$
$\ell_2 = 30cm$
$d_1 = 2cm$
$d_2 = 1cm$

OR

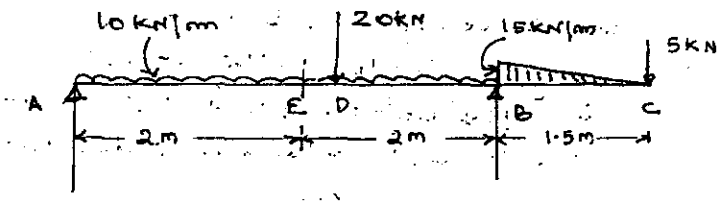
II. (a) Derive expression for stresses on inclined plane of a block subjected to normal stresses and shear stresses along two planes at right angles. (8)

(b) An element has a tensile stress of 500N/mm² and compressive stress of 300N/mm² acting at mutually perpendicular planes and two equal shear stresses of 150N/mm² on these planes. Find the principal stresses and maximum shear stress with direction. (12)

(Turn over)

III. (a) Define shear force and bending moment. Establish relationship between bending moment and shear force. (6)

(b) Calculate the BM and SF at section A, B, C, D and E and plot BMD and SFD for a team loaded as in figure below: (14)



OR

IV. (a) State the assumptions made in simple bending theory. (4)

(b) Derive expression for moment of resistance of a beam. (6)

(c) A timber beam rectangular in cross section is loaded with UDl of W Kg/m. If the shear stress and bending stress of 8.5 Kg/cm^2 and 85Kg/cm^2 reach maximum of these values simultaneously find the span to depth ratio. (10)

V. (a) Derive expression for deflection for a rectangular beam due to bending shear. (8)

(b) A simply supported beam of length L caarries a load W at a distance of 'a' from one end and 'b' from other end. Find magnitude and position of maximum deflection. (12)

OR

VI. A horizontal beam simply supported at ends having a length of 5.0m is loaded with 8kN/m at one end and 20 kN/m at the other end as varying load. The section is 50cm deep. Maximum bending stress is 950Kg/cm^2.

Take $E = 2 \times 10^6 Kg / cm^2$. (20)

Contd.....3.

VII. (a) Derive conditions for the boundary of the core for the case of an eccentrically loaded rectangular strut. (6)

(b) Derive Rankine's formula for columns. (6)

(c) Find Euler's crippling load for a hollow cylindrical column of external dia of 4cm and internal dia of 3cm fixed at both ends. The length of the column is 2.4m.

Take $E = 2.1 \times 10^5 N / mm^2$. (8)

OR

VIII. Calculate the safe load the column can carry if its length is 5.2m having one end fixed and other end hinged with a factor of safety of 3. The column is of I section.

(Area = 22cm^2; $I_{xx} = 840 cm^4$; $I_{yy} = 95 cm^4$).

Take Rankine's constants $a = \frac{1}{7500}$ and

fc = 3200Kg / cm^2. (20)

IX. (a) Derive Torque equation. (8)

(b) The internal dia of a hollow shaft is two third of its external dia. Compare the resistance to twisting and stiffness of a shaft with that of a solid shaft of same material and same weight. (12)

OR

X. A thin cylinder 15cm internal dia and 15.5cm external dia has its ends closed by rigid plates and then filled with water. When an external pull of 2000 Kg is applied to the ends, the water pressure is observed to fall by 0.56 Kg/cm^2. Determine the Poissons Ratio.

Take $E = 2 \times 10^6 Kg / cm^2$. Bulk modulus of water K = 25600 Kg/cm^2. (20)

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