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24064

B. Tech 3rd Sem. Civil Engg.

(Branch – XI)

Examination – December, 2011

STRUCTURAL ANALYSIS – I

Paper : CE-201-F

Time : Three hours] *[Maximum Marks : 100*

Before answering the questions, candidates should ensure that they have been supplied the correct and complete question paper. No complaint in this regard, will be entertained after examination.

Note : Attempt in all *five* questions, but at least *one* from each Section.

SECTION – A

1. (a) Explain "Elastic constants". 5

(b) A member ABCD is subjected to axial loads P_1, P_2, P_3 and P_4 as shown in Figure No. 1 Calculate the force P_2 necessary for equilibrium if P_1 = 4500 N, P_3 = 45000 N & P_4 = 13000 N. Determine the total elongation of the member if modulus of elasticity is 2.1×10^6 N/cm^2. The cross-sectional area of AB is 6.25 cm^2, BC is 25 cm^2 and CD is 12.5 cm^2. 15

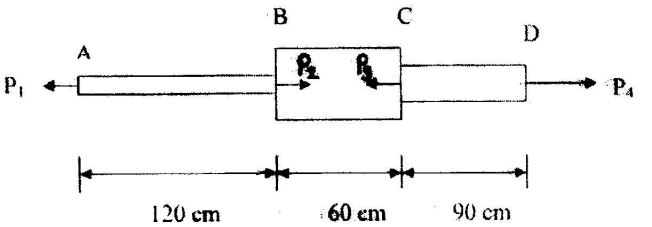

Figure No. 1 (Q. 1-b)

2. (a) What do you mean by Mohr's Circle ? What is the use of it ? 3 + 2 = 5

(b) At a point in a strained material, the principal stresses are 100 N/mm^2 (tensile) and 60 N/mm^2 (compressive). Determine normal stress, shear stress and resultant stress on a plane, inclined at 50° to horizontal axis i.e. axis of major principal stress. Also determine maximum shear stress at that point. 15

SECTION—B

3. Two wooden planks 150 mm × 50 mm each are connected to each other to form a T-section of a beam as shown in Figure No. 2. If a moment of 3.4 kN-m is applied around the horizontal neutral axis, find the stresses at the extreme fibers of the cross section. 20

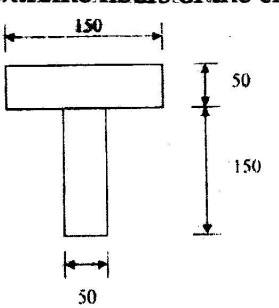

Figure No. 2 (Q. 3)

4. (a) Draw shear stress distribution diagram for rectangular and triangular sections. Also write the maximum shear stress value in the figure. 3 + 3 = 6

(b) A solid shaft is subjected to a torque of 15000 N-m. Find the necessary diameter of the shaft, if the allowable shear stress is 6000 N/cm^2. The allowable twist is 1° for a length of shaft. The length is 20 times its diameter. Take $C = 0.8 \times 10^7$ N/cm^2. 14

SECTION – C

5. (a) What are the different end conditions for column ? What will be the effective length according to these conditions ? 2.5 + 2.5 = 5

(b) A strut 2.50m long is 60mm in diameter. Find the safe compressive load for the member using Euler's formula if

(i) one end is fixed and other is hinged

(ii) one end fixed and other is free

Take $E = 2 \times 10^5$ N/mm^2 and factor of safety = 3.5 15

6. (a) State the assumptions of Euler's column theory. 5

(b) A column of circular section made of cast iron 200mm external diameter and 20mm thick is used as a column. The length of the column is 4m. Both ends of the column are fixed. The column carries a load of 200 kN at an eccentricity of 25mm from the axis of the column. Find the stresses developed in the extreme fibers. Take E = 94000 N/mm^2. 15

SECTION – D

7. Draw the shear force and bending moment diagram for the beam shown in Figure No. 3. Also determine the location of the maximum bending moment and point of contra flexure. 20

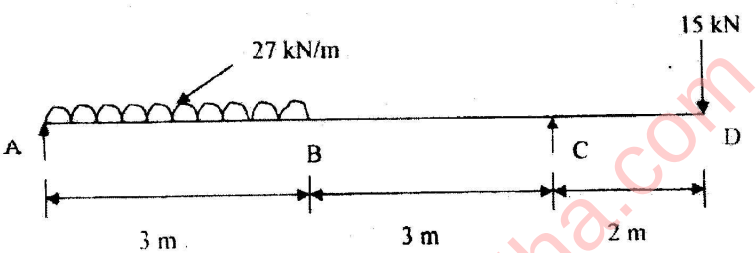

Figure No. 3 (Q. 7)

8. A simply supported beam AB, of span 10m is subjected to a point load of magnitude 50 kN at its centre. Find out the maximum slope and deflection by moment area method. Take $I = 160 \times 10^3$ cm^4 and $E = 2 \times 10^5$ N/mm^2. 20