Internal diameter = 18 cm
Length of the column = 5 m
Load carried by the column = 250 KN
Ends condition = both ends are hinged
Young's modulus = 99 GN/m^2
Eccentricity of the load = 2.5 cm (from the axis of the column)

SECTION – D

8. Draw the B.M. and S.F. diagram for the beam loaded as shown in Fig. 1.3. 20

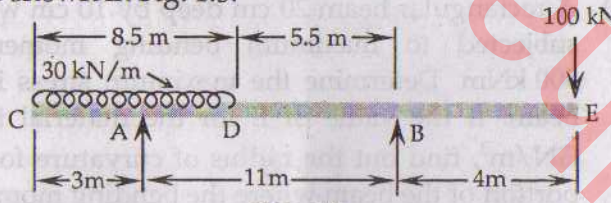

Fig. 1.3

9. (a) Determine the rotation at support and deflection at mid-span and under the loads in the simply supported beam as shown in Fig. 1.4 using moment area method. 10

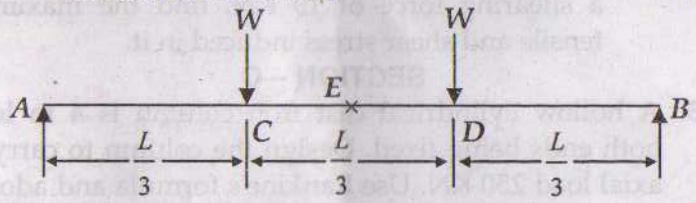

Fig. 1.4

(b) A beam ABCD is simply supported at A and D over a span of 12 m. The beam carries point load 65 KN and 45 KN at distances 3m and 6m from the end A. Neglecting the weight of the beam, find the slopes at A, B and deflection at C and D using conjugate beam method. Take $I = 12 \times 10^8$ and $E = 200\ KN/mm^2$. 10

Roll No. .....

24064

B. Tech 3rd Semester (Civil) Examination – December, 2017

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 : Question No. 1 is ***compulsory***. Students have to attempt 5 questions in total at least ***one*** questions from each Section. All questions carry equal marks.

1. (i) Define modular ratio.
(ii) Describe stress-strain diagram for mild steel.
(iii) What do you mean by Mohr's correction ?
(iv) Explain thermal stresses and thermal strains.
(v) What do you mean by Maxwell law of reciprocal theorem ? $5 \times 4 = 20$

SECTION – A

2. The composite bar consisting of steel and aluminium components shown in Fig. 1.1 connected of ***two*** grips at the ends at a temperature of 65 °C. Find the stresses in the two rod when the temperature falls to 25 °C.
(i) if the ends do not yield.

(ii) if the ends yield by 0.25 mm. Take Es = 2×10^5 N/mm^2, Ea = 0.70×10^5 N/mm^2, $\alpha_s = 1.18 \times 10^{-5}$ per °C, $\alpha_a = 2.34 \times 10^{-5}$ per °C. Areas of the steel and aluminum bars are 250 mm^2 and 375 mm^2.

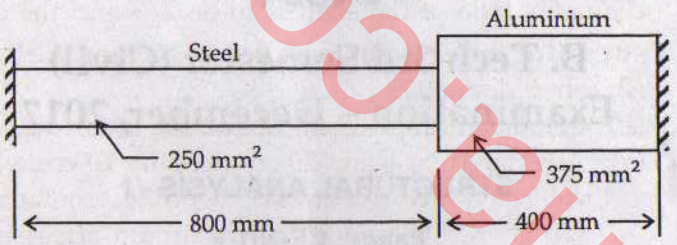

Fig - 1.1

3. (a) A rectangular block of materials is subjected to a tensile stress of 120 N/mm^2 on one plane and a tensile of 60 N/mm^2 on a plane at right angles, together with shear stresses of 65 N/mm^2 on the same planes. Find : 10

(i) The direction of the principal planes.

(ii) The magnitude of the principal stresses.

(iii) The magnitude of the greatest shear stresses.

(b) A tie bar has enlarged ends of square section 60 mm × 60 mm as shown in Fig. 1.2. If the middle portion of the bar is also square section. Find the size and length of the middle portion if the stress there is 140N/mm^2 and the total extension of the bar is 0.14 mm. Take E = 2×10^5 N/mm^2. 10

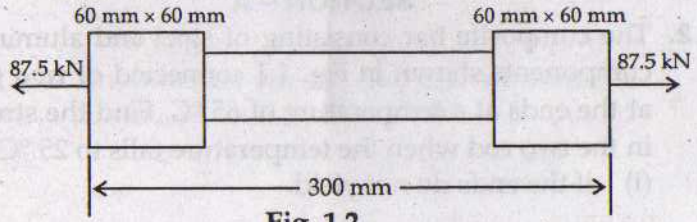

Fig. 1.2

SECTION – B

4. A hollow marine propeller shaft turning at 120 rpm is required to propel a vessel at 18 metres per sec for the expenditure of 6558.5 kW of shaft power, the efficiency of the propeller being 69 percent. The diameter ratio of the shaft is to be 2/3 and the direct stress due thrust is not to exceed 10 N/mm^2. Calculate

(i) shaft diameters

(ii) the maximum shearing stress due to torque. 20

5. (a) A rectangular beam 20 cm deep by 10 cm wide is subjected to maximum bending moment of 500 kNm. Determine the maximum stress in the beam. If the value of E for the material is 200 GN/m^3, find out the radius of curvature for that portion of the beam where the bending moment is maximum. 10

(b) An I beam has flanges 10 cm wide and 1 cm thick and web 12 cm high and 1 cm thick. If this section is subjected to a bending moment of 10 kNm and a shearing force of 10 KN, find the maximum tensile and shear stress induced in it. 10

SECTION – C

6. A hollow cylindrical cast iron column is 4 m long, both ends being fixed. Design the column to carry an axial load 250 KN. Use Rankine's formula and adopt a factor of safety is 6. The internal diameter may be as 0.98 times the external diameter. Take Fc = 650 N/mm^2 and $\alpha = 1/1600$. 20

7. Form the following data of a column of circular section, calculate the extreme stresses on the column section. Also find the maximum eccentricity in order that there may be no tension any where on the section. 20

External diameter = 28 cm