Roll No. .....

24064

B. Tech. 3rd Semester (Civil Engg.)

Examination – December, 2012

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 complain in this regard, will be entertained after examination.

Note : Attempt any ***five*** questions.

1. (a) Define the following : 10

(i) Shear Force, Bending Moment and Point of Contraflexure.

(ii) Conjugate beam theorems.

(iii) Principle of virtual work.

(b) Draw the shear force and bending moment diagrams for a beam shown in fig. 1 10

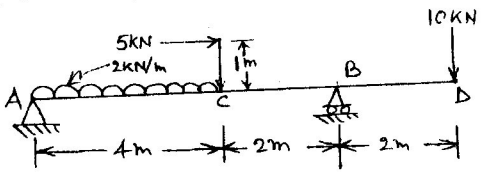

Fig. 1

2. (a) What do you understand by effective length of a column ? Explain with neat sketches, the effective lengths of various end conditions. 2 + 6 = 8

(b) Determine the Euler's buckling load for I-section joist 400 mm × 200 mm × 10 mm and 5 m long, which is used as a strut with both ends fixed. Take $E = 2.1 \times 10^6 \text{N/mm}^2$ for joist section. 12

3. Two compound shaft AB = 1.25 m and BC = 1 m having same diameter of 60 mm, made of Aluminium and Brass respectively as shown in Fig. 3. Find the maximum torque that can be applied at end C, if shear stresses in Aluminium and Brass are not exceed 80 N/mm^2 and 60 N/mm^2 respectively and the total angle of twist shall not exceed 1°. Take modulus of rigidity for Aluminium and Brass as $3 \times 10^4 \text{N/mm}^2$ and $3.5 \times 10^4 \text{N/mm}^2$ respectively. 20

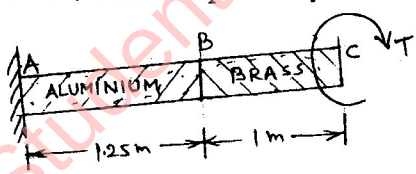

Fig. 3

4. Determine the horizontal displacement of support D of the frame shown in fig. 4 by using the principle of virtual work. The values of I are indicated along the members. $E = 200 \times 10^6 \text{KN/mm}^2$ and $I = 300 \times 10^{-6} \text{m}^4$.

20

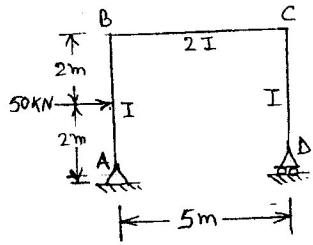

Fig. 4

5. Draw the Mohr's stress circle for direct stresses of 65 N/mm^2 (Tensile) and 35 N/mm^2 (Compressive) and estimate the magnitude and direction of the resultant stresses on planes making angles of 20° and 65° with the plane of the first principal stress. Also find the normal and tangential stresses on these planes. 10 + 10 = 20

6. A simply supported beam ABC is loaded as shown in fig. 6. Determine the location at which a concentrated load of 5 KN must act from end A to make the reactions at A & B equal. Draw the bending moment and shear force diagrams. Also locate the point of contraflexure. 20

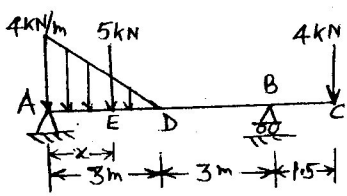

Fig. 6

7. (a) Write down the assumptions made in the theory of bending. 10

(b) A simply supported beam having cross-section as shown in Fig. 7 is loaded with a uniformly distributed load over its whole span. If the beam is 8 m long, find the uniformly distributed load if maximum permissible bending stress in tension is limited to 30 N/mm^2 and in compression to 45 N/mm^2. Also calculate the actual maximum bending stresses set up in the section ? 10

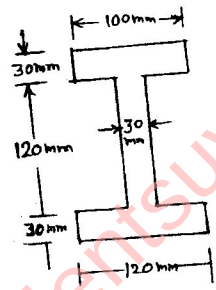

Fig. 7

8. Determine the magnitude and nature of forces in various members of Truss shown in fig. 8 20