[01 – 2202]

II/IV.B.E. DEGREE EXAMINATION.

Second Semester

Civil Engineering

STRUCTURAL ANALYSIS – II

(Common with Civil Environmental Engineering and Dual Degree Programme in Civil Engineering)

(Effective from the admitted batch of 1999–2000)

Time : Three hours Maximum : 70 marks

Question No. 1 is compulsory.

Answer any FOUR from the remaining.

All questions carry equal marks.

Question No. 1 are to be written in the same sequence at one place only.

Assume suitable data wherever necessary stating the same.

1. (a) Define statically determinate structures

(b) Define the first theorem of Castigliano

(c) Define Torque.

(d) Draw the Kern for a square section. Support your answer.

6. The following system of the wheel loads crosses a span of 25 m.

Wheel load	16	16	20	20	20	kN
Distance between centres	3	3	4	4	4	meters

Find the maximum value of bending moment and shearing force in the span.

7. A compound tube is composed of a tube 250 mm internal diameter and 25 mm thick shrunk on a tube of 250 mm external diameter and 25 mm thick. The radial pressure at the junction is 8 N/mm^2. The compound tube is subjected to an internal fluid pressure of 84.5 N/mm^2. Find the variation of the hoop stress over the wall of the compound tube.

8. The wheel loads shown in Figure 3, roll along the warren truss. Draw the influence line for the forces X, Y and Z. Determine the maximum tensile and compressive forces in these members.

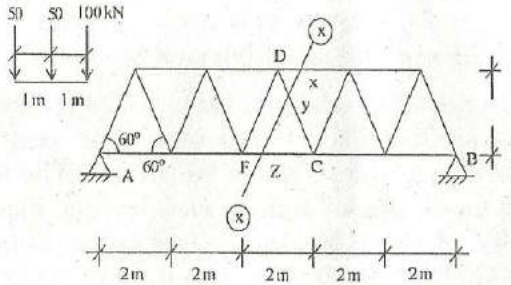

Figure. 3

(e) Mohr's correction is not necessary for cantilever trusses. Explain the reasons.

(f) A close coiled helical spring of 100 mm mean diameter is made of 10 mm diameter rod and has 20 turns. The spring carries an axial load of 200 N. Determine the shear stress.

(g) "The influence line for force in the diagonal (or) vertical member is the shear force for the panel". State whether it is for vertical (or) diagonal and mention the reason.

2. A portal frame ABCD is hinged at A and D, and has rigid joints B and C. The frame is loaded as shown in Figure 1. Using the method of minimum strain energy, analyse the frame and plot the B.M. diagram.

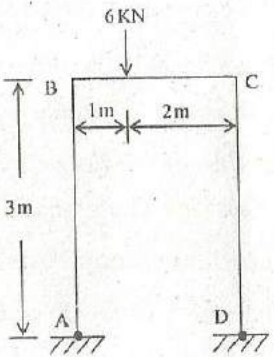

Figure. 1

3. A continuous beam ABC fixed at the ends is loaded as shown in Figure 2. Find reactions at the supports and the support moments.

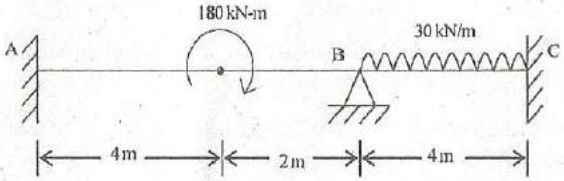

Figure. 2

4. A short length of tube 40 mm internal diameter and 50 mm external diameter, failed in compression at a load of 240 kN. When a 2 meters length of the same tube was tested as a strut with fixed ends, the load at failure was 158 kN. Assuming that f_c in Rankine's formula is given by the first test, find the value of the constant 'α' in the same formula. Find also the crippling load of this tube if it is used as a strut 3 meters long with one end fixed and the other end hinged.

5. It is required to design a close coiled helical spring which shall deflect 1 mm under an axial load of 100 N at a shear stress of 90 N/mm^2. The spring is to be made out of round wire having modulus of rigidity of 8×10^4N/mm^2. The mean diameter of the coils is to be 10 times the diameter of the wire. Find the diameter and length of the wire necessary to form the spring.