[01 – 2202]

II/IV B.E. DEGREE EXAMINATION.

Second Semester

Civil Engineering

STRUCTURAL ANALYSIS–II

(Common with Civil Environmental Engineering and MS Civil Engineering)

(Effective from the admitted batch of 1999-2000 and after batches)

Time : Three hours Maximum : 70 marks

Question No. 1 is compulsory.

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

Answer any FOUR questions from the remaining questions.

All questions carry equal marks.

Assume suitable data wherever necessary stating the same.

1. (a) State Castigliano's First theorem.
   (b) Compute the flexural strain energy stored in the cantilever frame shown in Fig 1.

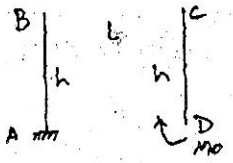

Fig. 1

6. The principal stresses at a point in an elastic material are1.5 f (Tensile) and 0.5 f (compressive). If the elastic limit in simple tension is $200N/mm^2$. Determine the value of f at failure according to the five different theories poissons ratio = 0.3

7. A hallow cast Iron column whose outside diameter is 200 mm and has a thickness of 20mm is 4.5 m long and is fixed at both ends Calculate the safe load by Rankines formulae using a factor of safety of 2.5. Find the ratio of Euler's to Rankine's loads. Take $E = 1 \times 10^5 N/mm^2$ and Rankinees constant $= \frac{1}{1600}$ for both ends pined cage and $f_c = 550N/m^2$.

8. A beam ABC is supported at A,B and C and has a hinge at D at a distance of 3m from A. AB = 7 m and BC = 10 m Draw the influence lines for

   (a) Reactions at A,B and C

   (b) Shear force at a point just to the right of B.

   (c) Bending moment at a section 1m to the right of B.

(c) Calculate the critical load of a strut which is made of a bar, circular in section and 5m long and which is pin jointed at both ends. The same bar when simply supported gives a mid span deflection of 10mm with load of 10N at the centre.

(d) What are the different methods of reducing hoop stresses in cylinders subjected to internal pressure?

(e) State Clapeyron's theorem of three moments for a continuous beam of unequal length and non-uniform plane cross-sections.

(f) Sketch the influence line for reaction at the right support of a simply supported beam of span 8m and hence, determine the value of the maximum reaction when a UDL of 6kN/m and of length 5m crosses of beam.

(g) What is difference between closed coiled helical spring and open-coiled helical spring?

2. Analyse the continuous beam loaded as shown in Fig. 2 by the method of moment distribution. Sketch the bending moment and shear force diagrams.

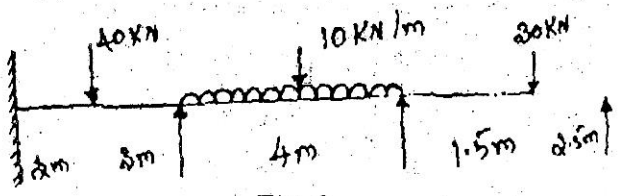

Fig. 2

3. A beam ACB simply supported at the ends, has moment of inertia. 4I for the length AC and I for the length CB, and is loaded with point load. wat C. Determine

   (a) Slope at ends

   (b) Deflection at mid span

   (c) Maximum deflection. Compute numerical values for given data using conjugate beam method $w = 10\text{kN}$ a = 2 m $I = 4000\ cm^4$ and $E = 2\times10^5\ N/mm^2$.

4. An open coiled helical spring made of steel wire 6mm diameter and 3.6cm mean coil radius with 65° Inclination of the coils with the spring axis is subjected to an axial moment M. Determine the magnitude of M if the number of terms in the spring increased by 1/8. Calculate the change in the axial length of the spring if the original number of terms are 10. $G_s = 84\ \text{kN}/mm^2$, $E_S = 210\text{kN}/mm^2$

5. A thick wall cylinder has an internal diameter of 200 mm. It has to withstand a fluid pressure of $100N/mm^2$. Find the thickness of steel required for the cylinder if the maximum shear stress is limited to $50N/mm^2$