Iden.1203   **Strength of Materials (1+1)**

Marks: 50
Time: 2 hours
(10x1=10)

I **A** **Fill in the blanks**

1   The ratio of the effective length to the least radius of gyration is known as ....

2   A .... is a compression member of a truss, a .... is a principal compression member in crane.

3   If the flexural rigidity is not uniform throughout the length of the beam, then .... method is used for finding the slope and deflection

4   For a Hinge support in a given beam slope exists and deflection is ...., while in conjugate beam Shear force exists and bending moment is ....

5   A moment which is applied to a structural joint to produce .... without translation gets distributed among the connecting members at the joint in the same proportion as their ....

B **Match the following**

6   Hinge support   a. Slenderness ratio < 50
7   Fixed end   b. S.F exists and BM is zero
8   Short steel column   c. S.F and BM are zero
9   Free end   d. Slenderness ratio >200
10 Long steel column   e. S.F and B.M exists

II **Write Short notes on any FIVE of the following**   (5x2=10)

1   Enumerate the methods for finding out the slope and deflection of a beam. Explain any one.
2   Enumerate the assumptions made in Euler's theory of long columns.
3   State the assumptions made in Euler's theory of long columns.
4   What is conjugate beam? State its applications.
5   Enumerate the various causes of failure of dams.
6   State Clapeyron's theorem of three moments.
7   How do you classify statically indeterminate beams?

III **Answer any FIVE of the following.**   (5x4=20)

1   A cantilever of length l carries a point load at a distance l_1 from the fixed end. Calculate the slope and deflection at the free end for the conjugate beam.
2   A 4 m simply supported beam carries a concentrated load of 20 kN in the middle of the beam. If E = 200 GPa and I = 50 x 10^6 mm^4, calculate the deflection under the load using conjugate beam method.
3   Derive the relation for the Euler's Crippling load for a column when one end is fixed and the other end is hinged
4   A cast iron circular column of 20 cm external diameter, 2 cm thickness and 4 m long carries a load of 15 at an eccentricity of 2.5 cm. Find the extreme stresses on the column section.

P.T.O

5   A dam section of 8 m high with 7.5 m of water impounded has a base width of the dam 5m. The weight of masonry structure is 2240 kg/Cu.m. The water face of the dam vertical. Find the minimum and maximum stress intensities at the base.

6   A hallow iron cast of 4.5 m long, with internal diameter of 200 mm and 20 mm thick fixed at both ends. Calculate the safe load by Rankine's formula using a factor of safety 2.5. Find the ratio of Euler's to Rankine's loads. Take $E = 1 \times 10^5$ N/mm^2 and Rankine constant as 1/1600 for both ends pinned case and $f_c = 550$ N/mm^2.

7   A 2.5 m long Strut of 6 cm diameter is fixed at one end while its other end is hinge Find the safe load for the member using Euler's formula allowing a factor safety of 3 Take $E = 2.1 \times 10^6$ kg/cm^2.

IV   Write an essay on any ONE of the following

(1x10=1

1   Determine the deflections at point C , D and E in a simply supported beam as shown belo Plot the elastic curve. Take $E = 200$ KN/mm^2 and $I = 60 \times 10^6$ mm^4.
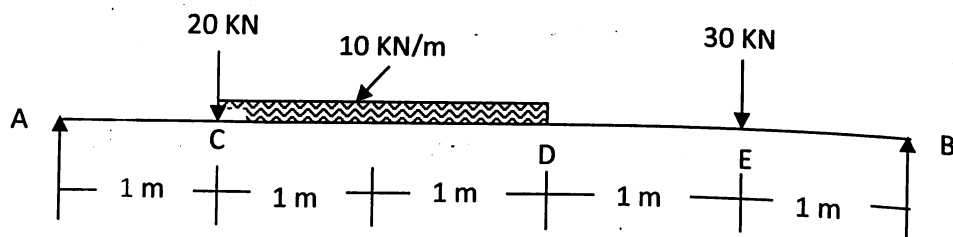
2   A simply supported horizontal girder of 14 m is loaded by two concentrated loads of 12 t and 8 t at a distance of 3m and 4.5 m respectively from the two ends respectively. Calculat the deflection of the girder under each loads. Take $I = 16 \times 10^4$ cm^4 and $E = 2.1 \times 10^6$ kg/cm^2.

****