Iden.1203   **Strength of Materials (1+1)**   **Marks: 50**
                                                                    Time: 2 hours

I   **Fill up the blanks**   (10x1=10)

1   The ratio between equivalent length of a column for both ends fixed
    is ------------
2   A fixed beam may be otherwise called as ------------
3   A continuous beam is one which is supported on more than ------------
    supports.
4   Fixing moment over a simply supported beam is ------------
5   The maximum eccentricity of a load on a circular section to have same
    type of stress is ------------ of the diameter.
6   In a loaded beam the point of contra-flexure occurs at a section
    where ------------
7   A simply supported beam of span *l* is carrying a point load W at its
    centre. The deflection of the beam at its centre is ------------
8   If the actual beam has both ends fixed, then the ends of the conjugate
    beam will be ------------
9   The fixed end moments for a fixed beam of span *l* with concentrated load
    W at the centre is ------------
10 Stiffness factor for beam simply supported at both ends is ------------

II   **Write short notes on any FIVE**   (5x2=10)

1   What is meant by eccentric loading? Explain its effect on short column.
2   State the Clapeyron's theorem of three moments.
3   Assumptions in Euler's Column theory.
4   What is meant by crippling load?
5   How will you apply the theorem of three moments to the fixed beam?
6   With the help of the moment area method, obtain relations for slope of a
    cantilever of span *l* subjected to concentrated load W at the free end.
7   Show that for no tension in the base of a short column, the line of action
    of the load should be within the middle third.

**III**   **Answer any FIVE**   (5x4=20)

1   Derive the relation for the Euler's Crippling load for a column with both
    ends hinged.
2   A rectangular column 220 mm wide and 160 mm thick is carrying a
    vertical load of 100 kN at an eccentricity of 50 mm in a plane bisecting
    the thickness. Determine the maximum and minimum intensities of stress
    in the section.
3   A cantilever beam 2.5 m long carries a point load of 2 kN at the free end
    and a uniformly distributed load of 2 kN/m over a length of 1.5 m from
    the fixed end. Find the deflection at the free end, if E = 200 GPa and I =
    140×10^6 mm^4
4   Derive the expression for slope at supports and deflection at the centre of
    a simply supported beam with uniformly distributed load for the whole
    span from first principles.
5   A fixed beam AB of span 4.5 m is subjected to point loads of 15 kN and
    25 kN at distances of 1.5 and 3 m from support A. determine the fixing
    moments at A and B.

6   A simply supported beam of span 6 m carries a single concentrated load of 25 kN at 2.5 m from the left support. If E = 200 GPa and I = 50 x 10^6 mm^4, calculate the deflection under the load using conjugate beam method.

7   A hollow column of 200 mm external diameter and 160 mm internal diameter is used as a column of 4.5 m length. Calculate Rankine's crippling load when the column is fixed at both the ends. Take allowable stress as 350 MPa and Rankine's constant as 1/1600.

IV   **Write essay on any ONE**   (1x10=10)

1   Draw the bending moment diagram and shear force diagram for the beam shown below.
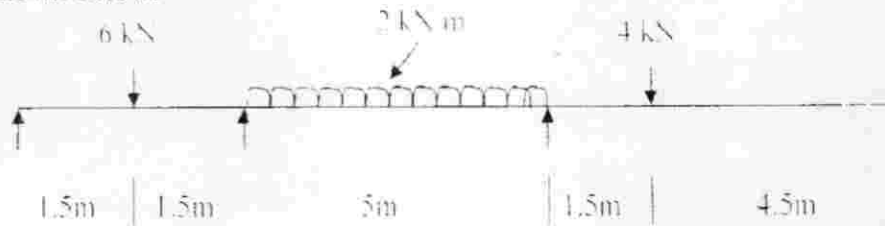
2   Find the maximum deflection for the beam shown below. EI constant.

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