



KERALA AGRICULTURAL UNIVERSITY

B.Tech (Agrl.Engg.) 2016 Admission
II Semester Final Examination-July-2017

Iden.1203

Strength of Materials (1+1)

Marks: 50

Time: 2 hours
(10x1=10)

I Fill up the blanks

- 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 $E = 200 \text{ GPa}$ and $I = 140 \times 10^6 \text{ mm}^4$
- 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

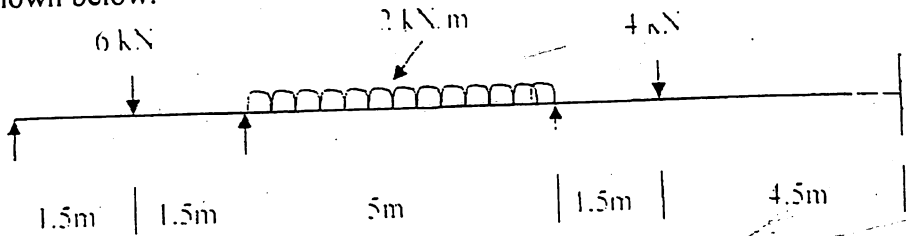
25 kN at 2.5 m from the left support. If $E = 200 \text{ GPa}$ and $I = 50 \times 10^6 \text{ mm}^4$, calculate the deflection under the load using conjugate beam method.

- 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.

