

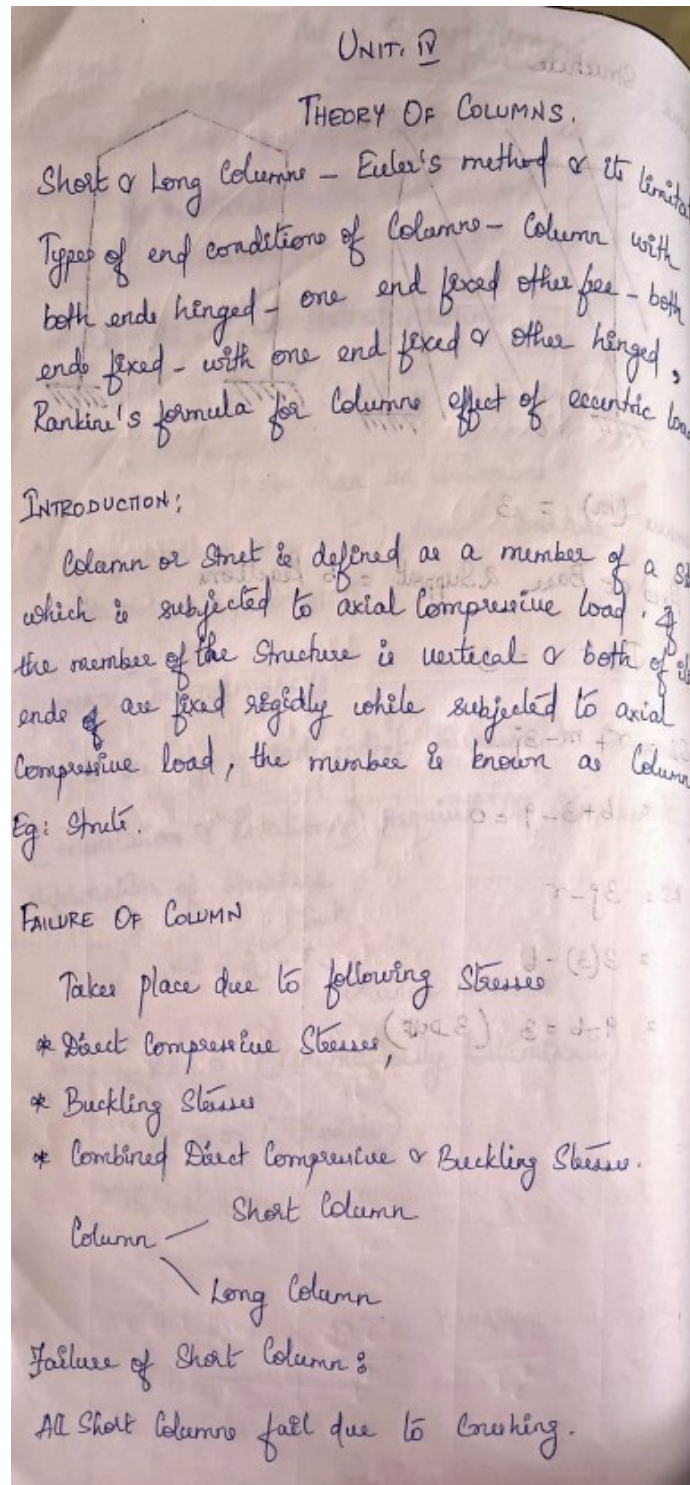


SNS COLLEGE OF TECHNOLOGY

DEPARTMENT OF AGRICULTURAL ENGINEERING

23AGT205-STRENGTH OF MATERIALS FOR AGRICULTURAL ENGINEERING

NOTES UNIT IV





SIGN CONVENTION:

(a) Positive: Diagram showing a column AB fixed at A. The deflection curve is concave upwards, labeled "Concavity". Points B'' and B' are marked on the dashed lines extending from the ends.

(b) Negative: Diagram showing a column AB fixed at A. The deflection curve is concave downwards, labeled "Concavity".

EQUATIONS @ EYER'S THEORY

S.No	End conditions of column	Crippling load in terms of		Relation between effective length and actual length (K)
		Actual length	Effective length	
1.	Both ends hinged	$\frac{\pi^2 EI}{L^2}$	$\frac{\pi^2 EI}{L_e^2}$	$L_e = L$
2.	One end fixed & other end is free	$\frac{\pi^2 EI}{4L^2}$	$\frac{\pi^2 EI}{L_e^2}$	$L_e = 2L$
3.	Both ends fixed	$\frac{4\pi^2 EI}{L^2}$	$\frac{\pi^2 EI}{L_e^2}$	$L_e = \frac{L}{2}$
4.	One end fixed and other is hinged	$\frac{4\pi^2 EI}{L^2}$	$\frac{\pi^2 EI}{L_e^2}$	$L_e = \frac{L}{\sqrt{2}}$



Failure of Long Column

→ Not only due to crushing, but also due to bending.

ASSUMPTIONS:

- * Column is initially perfectly straight and the load is applied axially.
- * Cross section of the column is uniform throughout its length.
- * Column material is perfectly elastic, homogeneous & isotropic & obeys Hooke's law.
- * Length of the column is very large as compared to its lateral dimensions.
- * The direct stress is very small as compared to the bending stress.
- * Column will fail by buckling alone.
- * Self weight of column is negligible.

END CONDITIONS:

- 1) Both ends of column are hinged or pinned
- 2) One end is fixed & the other end is free
- 3) Both the ends of the column are fixed
- 4) One end is fixed and the other is pinned.