

THAPAR INSTITUTE OF ENGINEERING AND TECHNOLOGY, PATIALA

UES 010: SOLIDS AND STRUCTURES

B.E. – Second Year

Tutorial Sheet No. 9

Session: 2020-2021

(Columns)

Q1	<p>A 9m long steel ($E = 200$ GPa) pipe column has an outside diameter 220 mm and wall thickness of 8 mm. the column is supported only at its ends. Calculate the critical load for the following end conditions;</p> <p>(i) Pinned-pinned (ii) Fixed-free (iii) Fixed-pinned (iv) Fixed-fixed</p> <p style="text-align: right;">(Answers: 731 kN, 182.6 kN, 1491 kN, 2920 kN)</p>
Q2	<p>A column of rectangular cross section of dimensions 40 mm x 60 mm, having a length of 4m is fixed at one end and hinged at the other end. Determine the safe load this column can carry using Euler's formula. Take $E=210$ GPa & factor of safety =2.5.</p>
Q3	<p>A rectangular column 80 mmx100mm is braced at the mid-point along its weaker direction. Determine the critical load the column can support with pin ended conditions over a length of 3.25 m. $E= 20$ GPa.</p> <p style="text-align: center;">(Answer: 124.64 kN)</p>
Q4	<p>A timber column of rectangular cross-section of dimensions 50 mm x 100 mm, is used to support an axial compressive load. Determine the limiting length till which the column will behave as a short column. Given $\sigma_y = 30$ MPa and $E=10$ GPa.</p> <p style="text-align: right;">(Answer : 1.66 m)</p>