전산구조진동해석 (실습3)

부정정보 문제 해석 실습 및 숙제

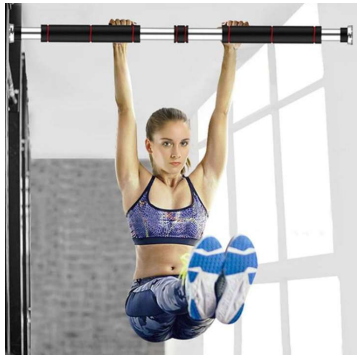
실습과제 제출 마감일 : 2025. 10. 01. 수업시간 중

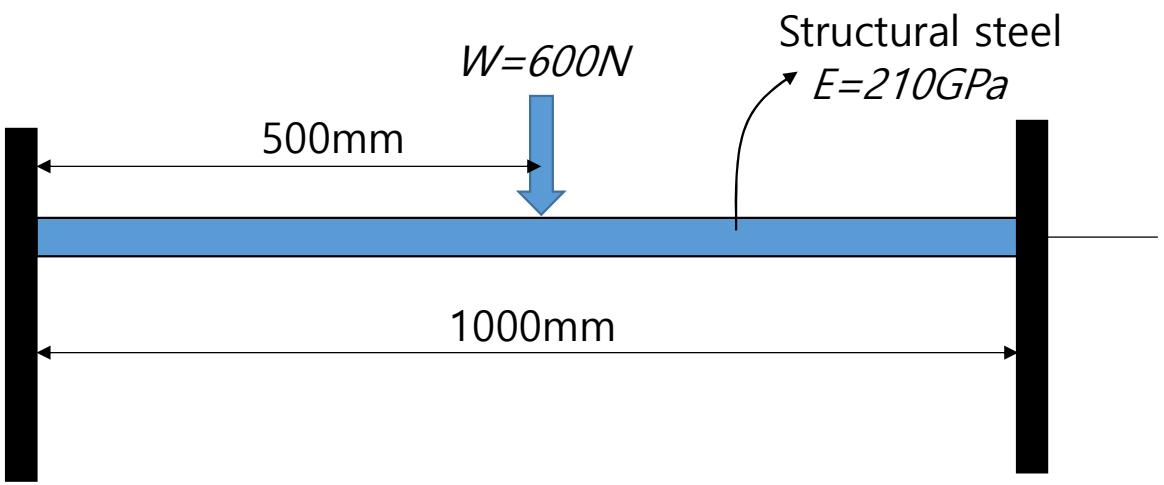
숙제 제출 마감일 : 2025. 10. 10. PM 6

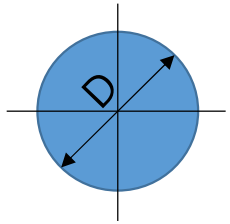
제출방법 : 본 PPT에 채워서 이메일(kthmax@cju.ac.kr)로 제출

학번 : 17415009
이름 : 서보근

실습(중실축)





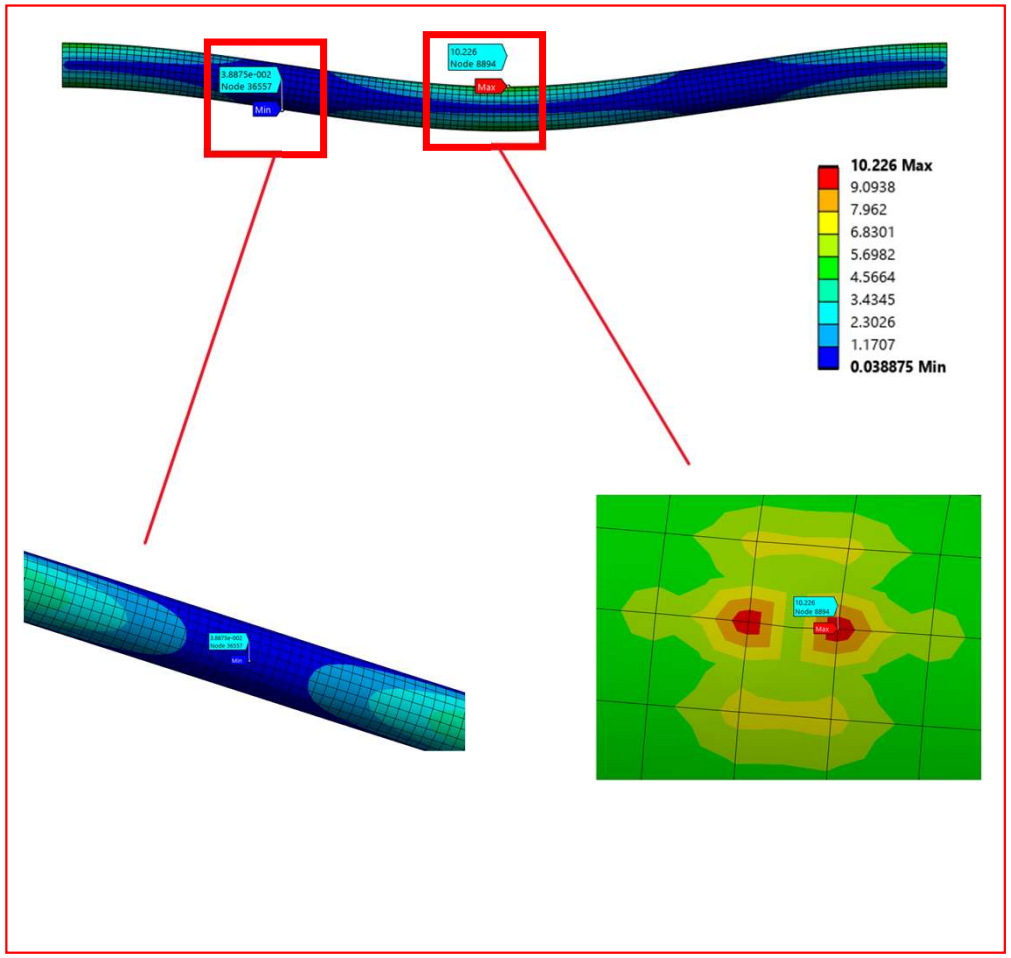


Fill in the blank. (refer to the 2, 3 and 4 page)
Solve the maximum deflection (δ_{max}) at the center of the beam. Unit is mm.

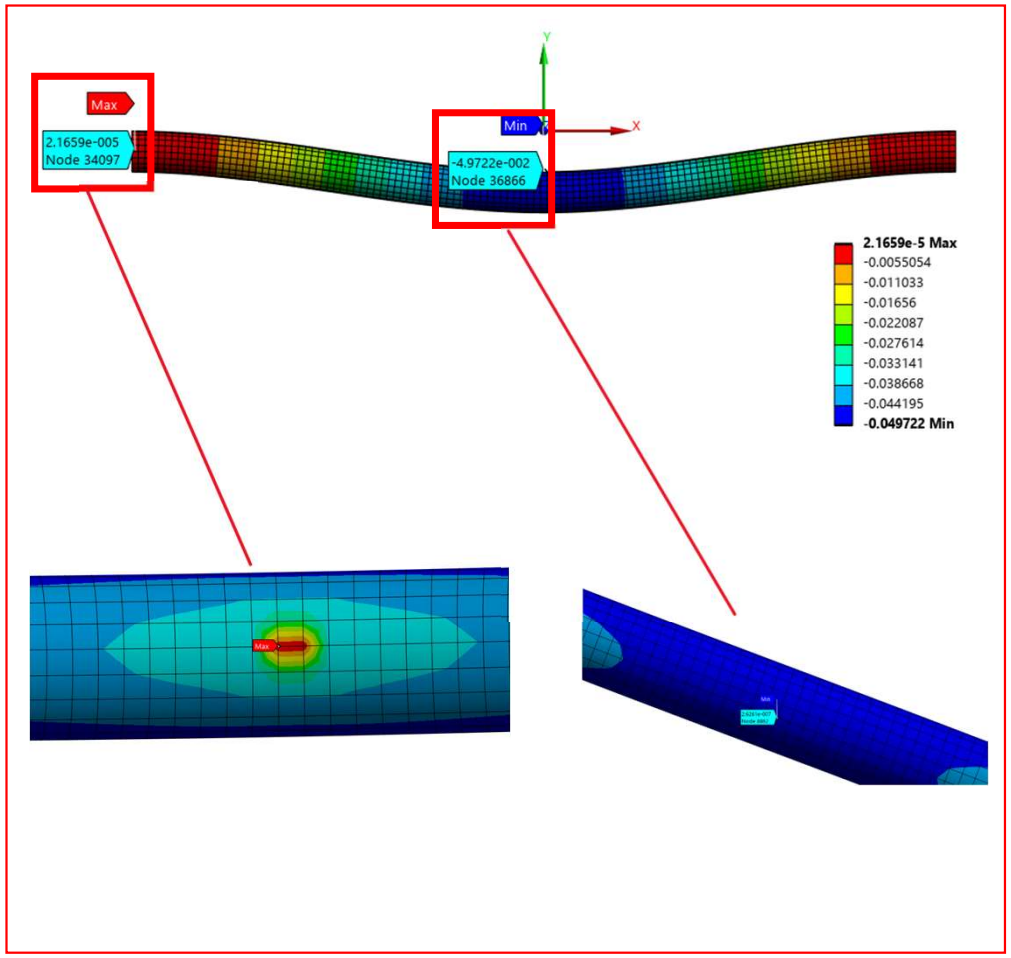
Type	I_x (m^4)	W (*N*)	L(m)	*E* (*N*/m^2)	δ_{max} (mm)		
					Calculation (이론값)	Simulation (해석값)	Error(%) (오차)
Solid type	3.068e-7	600	1	2.10e11	4.8504e-2	4.9722e-2	2.544

실습과제 결과

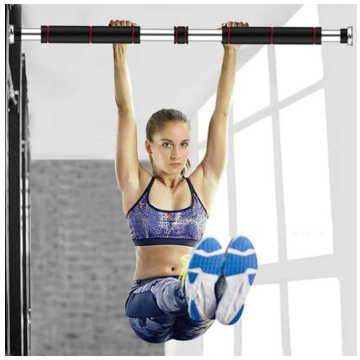
등가응력=유효응력(Equivalent Stress=von Mises Stress)

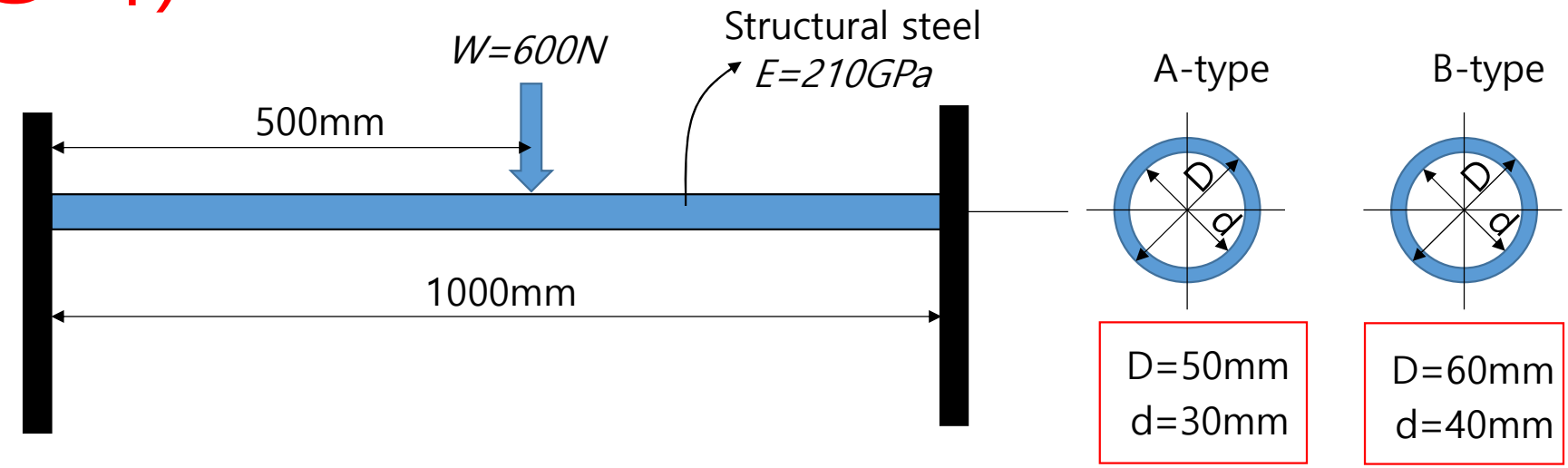


Y축 변형량(Y-direction Deformation)



숙제(중공축)



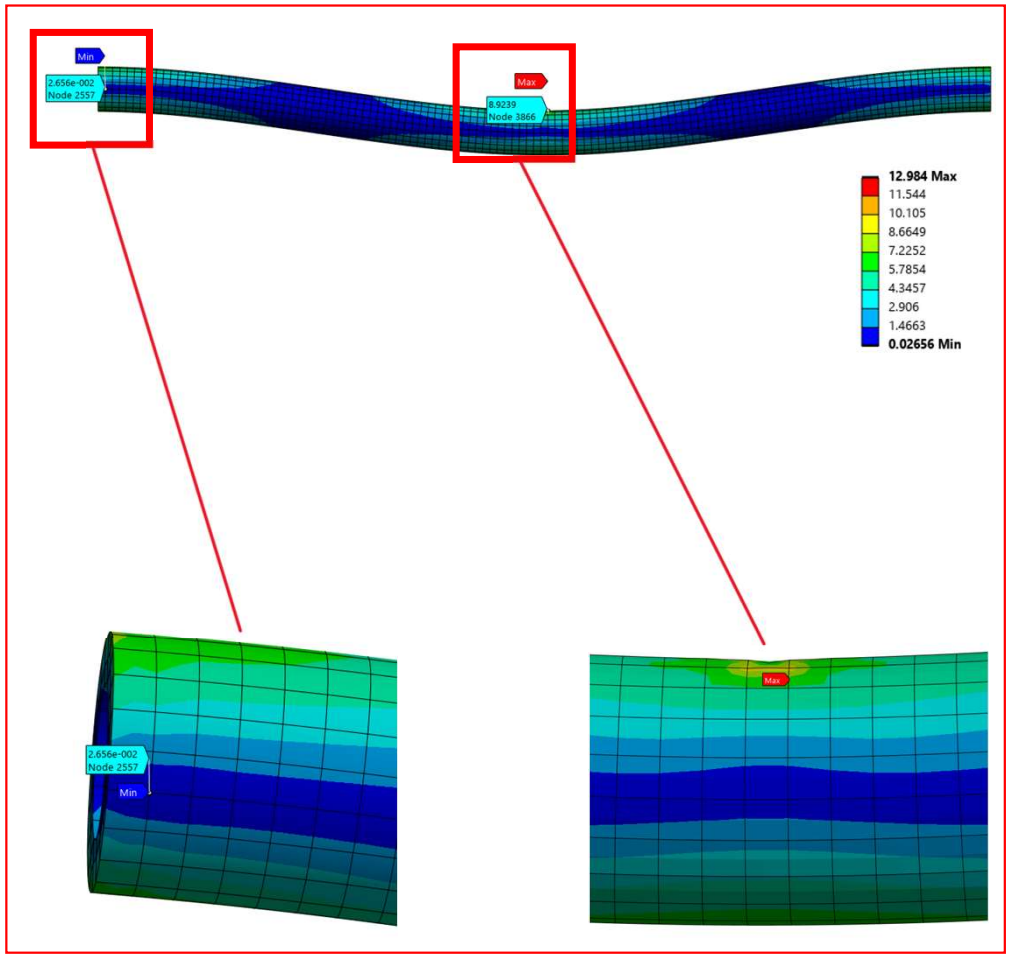


Fill in the blank. (refer to the 2, 3 and 4 page)
Solve the maximum deflection (δ_{max}) at the center of the beam. Unit is mm.

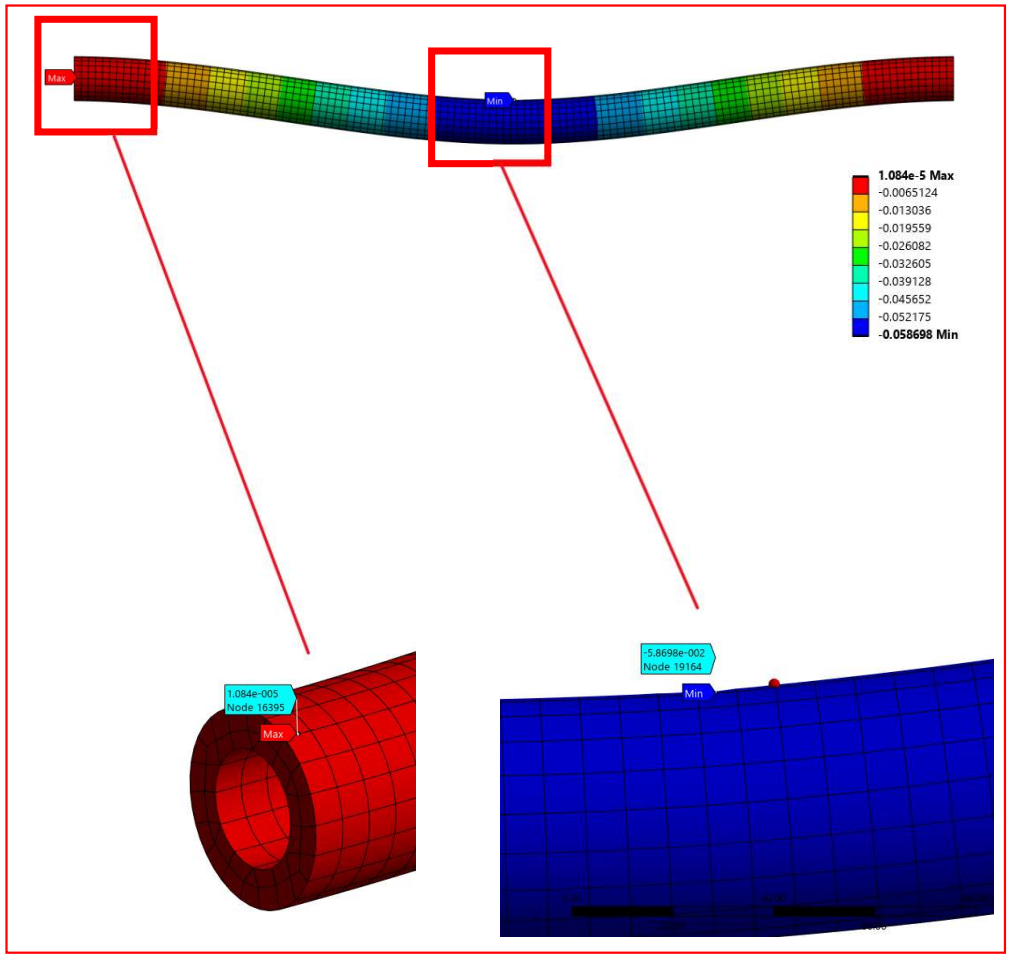
Type	I_x (m^4)	W (N)	L(m)	E (N/m^2)	δ_{max} (mm)		
					Calculation (이론값)	Simulation (해석값)	Error(%) (오차)
A	2.6704e-7	600	1	2.1e11	0.05573	0.058698	5.3

숙제 결과

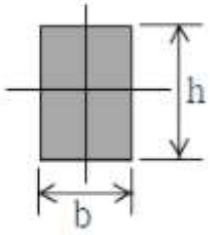
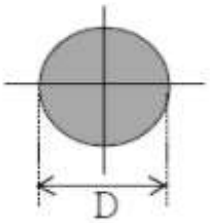
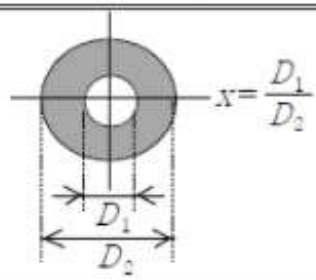
등가응력=유효응력(Equivalent Stress=von Mises Stress)



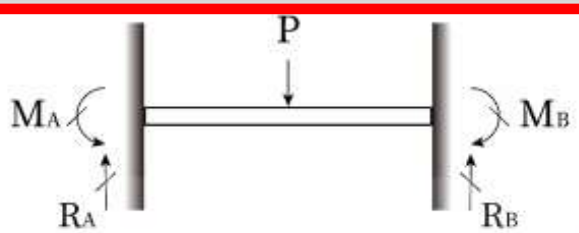
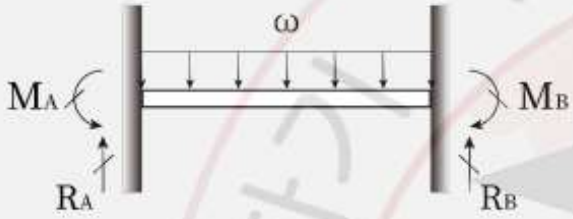
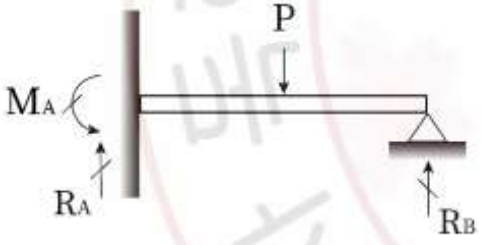
Y축 변형량(Y-direction Deformation)



참고자료

구분	수학적 표현	공식활용	사각형	중실축	중공축
단면1차 모멘트 Q_x, Q_y	$Q_x = \int y dA$ $Q_y = \int x dA$	$Q_x = \bar{y}A$ $Q_y = \bar{x}A$			
단면2차 모멘트 I_x, I_y	$I_x = \int y^2 dA$	$I_x = K_y^2 A$ $I_y = K_x^2 A$	$I_x = \frac{bh^3}{12}$ $I_y = \frac{hb^3}{12}$	$I_x = I_y = \frac{\pi D^4}{64}$	$I_x = I_y = \frac{\pi D_2^4}{64}(1-x^4)$
극단면2차 모멘트 I_p	$I_p = \int r^2 dA$	$I_p = I_x + I_y$	$I_p = \frac{bh}{12}(b^2 + h^2)$	$I_p = \frac{\pi D^4}{32}$	$I_p = \frac{\pi D_2^4}{32}(1-x^4)$
단면계수 Z	$Z_x = \frac{I_x}{e_x}$ $Z_y = \frac{I_y}{e_y}$	$Z = \frac{M}{\sigma_b}$	$Z_x = \frac{bh^2}{6}$ $Z_y = \frac{hb^2}{6}$	$Z_x = Z_y = \frac{\pi D^3}{32}$	$Z_x = Z_y = \frac{\pi D_2^3}{32}(1-x^4)$
극단면 계수 Z_p	$Z_p = \frac{I_p}{e}$	$Z_p = \frac{T}{\tau}$		$Z_p = \frac{\pi D^3}{16}$	$Z_p = \frac{\pi D_2^3}{16}(1-x^4)$

참고자료

부정정보	반력 & 모멘트	처짐각 & 최대처짐
 양단 고정보 - 집중하중	$R_A = \frac{P}{2}$, $R_B = \frac{P}{2}$ $M_A =$, $M_B =$ $M_{max} = \frac{PL}{8}$	$\delta_{max} = \frac{PL^3}{192\,EI}$ $\delta_C = \delta_{max}$
 양단 고정보 - 분포하중	$R_A =$, $R_B =$ $M_A = \frac{\omega L^2}{12}$, $M_B = \frac{\omega L^2}{12}$ $M_{max} =$	$\delta_{max} =$ $\delta_C = \delta_{max}$
	$R_A = \frac{11}{16}P$, $R_B = \frac{15}{16}P$ $M_A =$ $M_{max} =$	$\delta_{max} =$ $\delta_C = \frac{7\,PL^3}{768\,EI}$