Chapter 1

Normal/Allowable Stress ---> $\underset{\text{MPA}}{\sigma_{allowable}} = \dfrac{P}{A}\ \begin{matrix}\text{N}\\ \text{mm}^2\end{matrix}$

if there was change in diameter, make section and take ΣF "P"
**Remember : if Tension Remove Area of Bolts from A*
if Compression ignore bolt area and consider it with rectangle

Single Shear ---> $\underset{\text{MPA}}{\tau} = \dfrac{P}{A}\ \begin{matrix}\text{N}\\ \text{mm}^2\end{matrix}$

**When design :-*
Take Bigger diameter, Smaller Force

Double Shear ---> $\underset{\text{MPA}}{\tau} = \dfrac{P}{2A}\ \begin{matrix}\text{N}\\ \text{mm}^2\end{matrix}$

Punch Shear ---> $\underset{\text{MPA}}{\tau} = \dfrac{P}{2\pi r^{*}(\text{thickness})}\ \begin{matrix}\text{N}\\ \text{mm}^2\end{matrix}$

Bearing Stress ---> $\underset{\text{MPA}}{\sigma_{bearing}} = \dfrac{P}{A_{bearing}}\ \begin{matrix}\text{N}\\ \text{mm}^2\end{matrix}$

Two wooden members with clearance ---> $\underset{\text{MPA}}{\tau_{allowable}} = \dfrac{\tau_{ultimate}}{F.S}\ \text{MPA}$

$$---> \underset{\text{MPA}}{\tau} = \frac{P}{2\text{width}[(L\text{-clearance})/2]}\ \begin{matrix}\text{N}\\ \text{mm}^2\end{matrix}$$

Double Shear with bolts ---> $\underset{\text{MPA}}{\tau} = \dfrac{P}{2(\text{number of bolts})A_{bolt}}\ \begin{matrix}\text{N}\\ \text{mm}^2\end{matrix}$

Ultimate Stress ---> $\underset{\text{MPA}}{\sigma_{Ultimate}} = \dfrac{P_{Ultimate}}{A}\ \begin{matrix}\text{N}\\ \text{mm}^2\end{matrix}$

$$\underset{\text{MPA}}{\tau_{Ultimate}} = \frac{P_{Ultimate}}{A}\ \begin{matrix}\text{N}\\ \text{mm}^2\end{matrix}$$

Factor of Safety ---> $F.S = \dfrac{P_{Ultimate}}{P_{Allowable}}\ \begin{matrix}\text{N}\\ \text{N}\end{matrix}$

$$F.S = \frac{\sigma_{Ultimate}}{\sigma_{Allowable}}\ \begin{matrix}\text{MPA}\\ \text{MPA}\end{matrix}$$

Required Area to Resist shear caused by axial load ---> $\ell = \dfrac{P}{\tau_{allowable}\pi d}\ \text{N}$

Chapter 2

Strain ---> $\varepsilon = \dfrac{\ell}{L}\ \begin{matrix}\text{mm}\\ \text{mm}\end{matrix}$

Tension ---> ε (+)

Compression ---> ε (-)

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Stress ---> $\underset{\text{MPA}}{\sigma} = \overset{\text{GPA*1000}}{E}\,\varepsilon$

elongation ---> $\ell = \dfrac{\overset{\text{N mm}}{PL}}{\underset{\text{GPA*1000}}{E}\,A_{\text{mm}^2}}$

$\ell = \alpha(\overset{\text{C}^{\text{o}}}{\Delta T})\overset{\text{mm}}{L}$

Poisson's ratio ---> $V = -\dfrac{\varepsilon_y}{\varepsilon_x} = -\dfrac{\varepsilon_z}{\varepsilon_x}$

Hooke's Law in Shear ---> $\underset{\text{MPA}}{\tau} = \overset{\text{GPA}}{G}\underset{\text{Rad}}{\gamma}$

Modulus of rigidity ---> $\underset{\text{GPA}}{G} = \dfrac{E^{\text{ GPA}}}{2(1+v)}$

$K = \dfrac{\overset{\text{MPA}}{\sigma_{max}}}{\underset{\text{MPA}}{\sigma_{ave}}}$

Hooke's Law

$$\epsilon_x = +\frac{\sigma_x}{E} - \frac{\nu\sigma_y}{E} - \frac{\nu\sigma_z}{E}$$

$$\epsilon_y = -\frac{\nu\sigma_x}{E} + \frac{\sigma_y}{E} - \frac{\nu\sigma_z}{E}$$

$$\epsilon_z = -\frac{\nu\sigma_x}{E} - \frac{\nu\sigma_y}{E} + \frac{\sigma_z}{E}$$

Chapter 3

Shear strain ---> $\gamma_{max} = \dfrac{r_2\Phi}{L}$, $\gamma_{min} = \dfrac{r_1\Phi}{L}$, $\gamma = \dfrac{p\Phi}{L}$

* r --> radius of cylinder, L --> length of cylinder, Φ --> angel of twist

$\underset{\text{MPA}}{\tau} = G\gamma$

Stress ---> $\underset{\text{MPA}}{\tau} = \dfrac{T*p}{J}$

Stress ---> $\underset{\text{MPA}}{\tau_{max}} = \dfrac{T*r}{J}$

$\underset{\text{Rad}}{\Phi} = \dfrac{\overset{\text{N.mm}}{T}\ L^{\text{ mm}^2}}{\underset{\text{GPA*1000}}{G}\ J_{\text{ mm}^4}}$

Polar MOI ---> $J = \dfrac{\pi\,(r_o^4 - r_i^4)}{2}$ _* For Hollow Shaft_

$J = \dfrac{\pi\, r^4}{2}$ _* For Cylinder_

* Solid Cylinderical Shaft

$\pi\, r^2 = \pi(r_o^2 - r_i^2)$

* Rad to Degree = <u>Φ*180/π</u>

* Degree to Rad = <u>Φ*π/ 180</u>

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Chapter 4

Flexural Stress ---> $\underset{MPA}{\sigma_x} = \dfrac{-My}{I_z}$ $\begin{matrix} N.mm \\ mm^4 \end{matrix}$

***y --> distance between $\overline{Y}$ for whole shape and point of moment “up + , down -”**
***The tail of moment always Tension, and the head always Compression**

Centroid ---> $\underset{mm}{\overline{y}} = \dfrac{\overset{mm}{\Sigma y_i A_i}}{\Sigma A_i \ mm}$ ---> $\dfrac{(A_{shape1} * Centroid_{shape1}) + (A_{shape2} * Centroid_{shape2})}{A_{shape1} + A_{shape2}}$

if Symmetrical ---> $\underset{mm^4}{I} = \dfrac{\overset{mm}{bh^3}}{12}$ ***if NOT-Symmetrical --->*** $\underset{mm^4}{I} = \underset{mm^4}{\Sigma I} + \Sigma A \overset{mm}{D} y^2$

$I = \Sigma I + \Sigma A D y^2$ ---> $\left[\underset{\text{Shape 1}}{\dfrac{bh^3}{12}} + \underset{\text{Shape 2}}{\dfrac{bh^3}{12}} \right]$ + $[A_{shape1} * (Centroid_{main} - Centroid_{shape1})^2]$ + $[A_{shape2} * (Centroid_{main} - Centroid_{shape2})^2]$

Strain ---> $\varepsilon = \dfrac{y}{\rho}$

$\dfrac{1}{\rho} = \dfrac{M}{EI}$

Section Modulus ---> For Rectangle $\underset{mm^3}{S} = \dfrac{bh^2}{6}$, For Circular $\underset{mm^3}{S} = \dfrac{\pi d^3}{32}$, $\underset{MPA}{\sigma_{max}} = \dfrac{M}{S}$ $\begin{matrix} N.mm \\ mm^3 \end{matrix}$

Design of Beam For Bendeing Stresses ---> $\underset{mm^3}{S} = \dfrac{M_{max}}{\sigma_{allow}}$ $\begin{matrix} N.mm \\ MPA \end{matrix}$

Modular Ratio ---> $n = \dfrac{E_2}{E_1}$, $\sigma_{shape1} = \dfrac{-My}{I_z}$, $\sigma_{shape2} = n \dfrac{My}{I_z}$

ReInforced concreat ---> $(bh') \dfrac{h'}{2} = nA_s(d - h')$

***d --> distance between top of conc and center of steel**
***b --> shape base**
***h' --> distance between top of conc and new top of steel**

$\underset{MPA}{\sigma} = \pm \dfrac{\overset{N}{P}}{\underset{mm^2}{A}} \pm \dfrac{My}{I_z}$ $\begin{matrix} N.mm \\ mm^4 \end{matrix}$

***The plus or minus depends if it's Tension Or Compression**

Chapter 5

Max Compression Stress ---> $\underset{MPA}{\sigma_C} = \dfrac{M_{max} y_{pC}}{I}$ $\begin{matrix} N.mm \\ mm^4 \end{matrix}$

Max Tension Stress ---> $\underset{MPA}{\sigma_T} = \dfrac{M_{max} y_{pT}}{I}$ $\begin{matrix} N.mm \\ mm^4 \end{matrix}$

$\underset{MPA}{\sigma_{max}} = \dfrac{M_{max}}{S}$ $\begin{matrix} N.mm \\ mm^3 \end{matrix}$

***Most of CH5 is Same as CH4**

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Chapter 6

Shear Stress in Rectangular Section ---> $\underset{\text{MPA}}{\tau} = \dfrac{\overset{\text{N}}{V}Q_{\ \text{mm}^3}}{\underset{\text{mm}}{b}I_{\ \text{mm}^4}}$

****Q --> A*Y "area of needed section*distance between Y for whole shape centriod of needed section" .. b --> Base of section****

$\underset{\text{MPA}}{\tau_{ave}} = 1.5\,\dfrac{V_{\ \text{N}}}{A_{\ \text{mm}^2}}$ ****Use it when Rectangular Section and centroid in the middle****

Shear Stress in Circular C-S ---> $\tau_{max} = 1.33\,\tau_{ave} = \dfrac{4V}{3A}$

Shear flow ---> $f = \dfrac{\overset{\text{N}}{V}Q_{\ \text{mm}^3}}{I_{\ \text{mm}^4}}$

Nail Spacing ---> $S = \dfrac{nF}{f}$ — nF: Number or nails rows / Strength of each nail; f: Shear Flow

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Chapter 7

Stress with angel "x" ---> $\underset{MPA}{\sigma_{x1}} = \frac{\overset{MPA}{\sigma_x} + \overset{MPA}{\sigma_y}}{2} + \frac{\overset{MPA}{\sigma_x} - \overset{MPA}{\sigma_y}}{2}\cos 2\Phi + \overset{MPA}{\tau_{xy}}\sin 2\Phi$

Stress with angel "y" ---> $\underset{MPA}{\sigma_{y1}} = \frac{\overset{MPA}{\sigma_x} + \overset{MPA}{\sigma_y}}{2} - \frac{\overset{MPA}{\sigma_x} - \overset{MPA}{\sigma_y}}{2}\cos 2\Phi - \overset{MPA}{\tau_{xy}}\sin 2\Phi$

$\underset{MPA}{\tau_{x1y1}} = -\frac{(\overset{MPA}{\sigma_x} - \overset{MPA}{\sigma_y})}{2}\sin 2\Phi + \overset{MPA}{\tau_{xy}}\cos 2\Phi$

**the direction of stress does matter, T+ or C-*

Principal Stress ---> $\underset{MPA}{\sigma_{1,2}} = \frac{\overset{MPA}{\sigma_x} + \overset{MPA}{\sigma_y}}{2} \pm \sqrt{\left(\frac{\overset{MPA}{\sigma_x} - \overset{MPA}{\sigma_y}}{2}\right)^2 + \overset{MPA}{\tau_{xy}}{}^2}$

**For $\sigma 1$ use +, For $\sigma 2$ use - then check if T+ or C-*

Principal Angel ---> $\tan 2\Phi_p = \frac{2\overset{MPA}{\tau_{xy}}}{\underset{MPA}{\sigma_x} - \underset{MPA}{\sigma_y}}$, $\underset{\Phi_{p1}}{\Phi_p}$, $\underset{\Phi_{p2}}{\Phi_p + 90}$

Corresponding normal stress

**Use $\Phi p1$ for example in Stress with angel to check which stress goes with which angel*

Orientation
Max Shear ---> $\overset{MPA}{\tau_{max}} = \sqrt{\left(\frac{\overset{MPA}{\sigma_x} - \overset{MPA}{\sigma_y}}{2}\right)^2 + \overset{MPA}{\tau_{xy}}{}^2}$, $\underset{MPA}{\sigma_s} = \frac{\overset{MPA}{\sigma_x} + \overset{MPA}{\sigma_y}}{2}$, $\Phi_s = \Phi_p \pm 45$

Mohr's Circle :-

$\overset{MPA}{\sigma_{\substack{max\\min}}} = \frac{\overset{MPA}{\sigma_x} + \overset{MPA}{\sigma_y}}{2} \pm R$

$R = \tau_{max}$

$\tan 2\Phi_p = \frac{2\overset{MPA}{\tau_{xy}}}{\underset{MPA}{\sigma_x} - \underset{MPA}{\sigma_y}}$

Chapter 8

$$\underset{\text{MPA}}{\sigma_x} = \pm \frac{\overset{\text{N}}{P}}{\underset{\text{mm}^2}{A}} \quad , \quad \underset{\text{MPA}}{\sigma_x} = \frac{\overset{\text{N.mm}}{-My}}{I \ \text{mm}^4} \quad , \quad \underset{\text{MPA}}{\tau_{xy}} = \frac{\overset{\text{N.mm}}{T^*r}}{J \ \text{mm}^4} \quad , \quad \underset{\text{MPA}}{\tau_{xy}} = \frac{\overset{\text{N}}{V}Q \ \text{mm}^3}{\underset{\text{mm}}{b}I \ \text{mm}^4}$$

*For Hollow Shaft

$$I = \frac{\pi (r_o^4 - r_i^4)}{4}$$

*For Cylinder

$$I = \frac{\pi r^4}{4}$$

*For Hollow Shaft

$$Q = 2/3 \, (r_o^3 - r_i^3)$$

*For Cylinder

$$\tau = \frac{4V}{3A}$$

*For Hollow Shaft

$$J = \frac{\pi (r_o^4 - r_i^4)}{2}$$

*For Cylinder

$$J = \frac{\pi r^4}{2}$$

Chapter 9

$$EI \frac{d^2 v}{dx^2} = M$$

X=0 & X=L

*intergrate 2 times to get C1x + C2 ... then use boundry conditions at V=0 & V=max

$EI\Phi$ = equation from table"shapes"

Chapter 10

*Le --> distance between zero moments

Critical Load ---> $\underset{\text{N}}{P_{crt}} = \frac{\overset{\text{GPA*1000}}{\pi^2 E} I \ \text{mm}^4}{Le^2 \ \text{mm}}$ *always take smaller I

Slenderness ratio ---> $\lambda = \frac{Le}{r}$ *r --> least radius of gyration

radius of gyration ---> $r = \sqrt{\frac{I_{min} \ \text{mm}^4}{A \ \text{mm}^2}}$

Factor of Safety ---> $F.S = \frac{P_{crt} \ \text{N}}{P \ \text{N}}$ *always take smaller F.S

Short Column $\lambda<32$
Med Column $32<\lambda>120$
Long Column $\lambda>120$

Critical Stress ---> $\underset{\text{MPA}}{\sigma_{crt}} = \frac{P_{crt} \ \text{N}}{A \ \text{mm}^2}$

*Check

$\sigma_{crt} < \sigma_{yield} \xrightarrow{\text{*if true}} P_{crt} = P_{crt}$

*if false, try to find less area, less P, you can get it from question

Critical Load ---> $\underset{\text{MPA}}{\sigma_{crt}} = \frac{\overset{\text{GPA*1000}}{\pi^2 E}}{(Le/r)^2 \ \text{mm}} \Rightarrow \frac{\overset{\text{GPA*1000}}{\pi^2 E}}{\lambda^2}$

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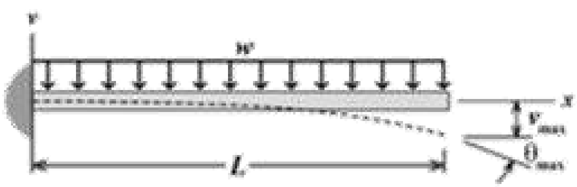
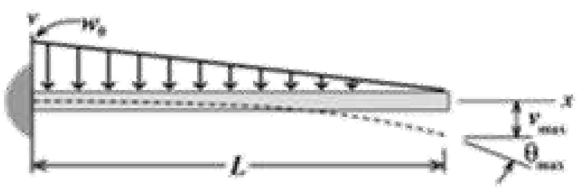
CANTILEVER BEAMS

Beam	Slope	Deflection	Elastic Curve
	$\theta_{max} = -\dfrac{PL^2}{2EI}$	$v_{max} = -\dfrac{PL^3}{3EI}$	$v = -\dfrac{Px^2}{6EI}(3L - x)$
	$\theta_{max} = -\dfrac{ML}{EI}$	$v_{max} = -\dfrac{ML^2}{2EI}$	$v = -\dfrac{Mx^2}{2EI}$
	$\theta_{max} = -\dfrac{wL^3}{6EI}$	$v_{max} = -\dfrac{wL^4}{8EI}$	$v = -\dfrac{wx^2}{24EI}(6L^2 - 4Lx + x^2)$
	$\theta_{max} = -\dfrac{w_0 L^3}{24EI}$	$v_{max} = -\dfrac{w_0 L^4}{30EI}$	$v = -\dfrac{w_0 x^2}{120LEI}(10L^3 - 10L^2x + 5Lx^2 - x^3)$

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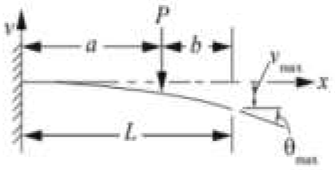
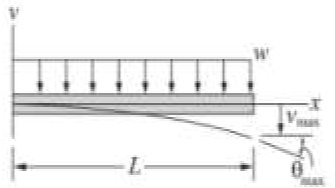
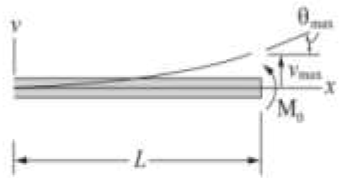
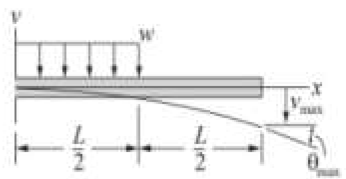
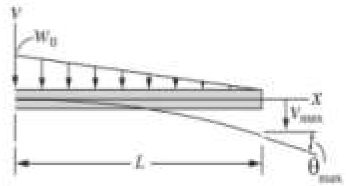
Cantilevered Beam Slopes and Deflections

BEAM	SLOPE	DEFLECTION	ELASTIC CURVE	MAXIMUM MOMENT
	$\theta_{max} = \dfrac{-Pa^2}{2EI}$	$v_{max} = \dfrac{-Pa^2}{6EI}(3L - a)$	$v = \dfrac{-Pa^2}{6EI}(3x - a)$, for $x > a$ $v = \dfrac{-Px^2}{6EI}(-x + 3a)$, for $x \le a$	M_{max} (at $x = 0$) $= Pa$
	$\theta_{max} = \dfrac{-wL^3}{6EI}$	$v_{max} = \dfrac{-wL^4}{8EI}$	$v = \dfrac{-wx^2}{24EI}(x^2 - 4Lx + 6L^2)$	M_{max} (at $x = 0$) $= \dfrac{wL^2}{2}$
	$\theta_{max} = \dfrac{M_0 L}{EI}$	$v_{max} = \dfrac{M_0 L^2}{2EI}$	$v = \dfrac{M_0 x^2}{2EI}$	M_{max} (at all x) $= M_0$
	$\theta_{max} = \dfrac{-wL^3}{48EI}$	$v_{max} = \dfrac{-7wL^4}{384EI}$	$v = \dfrac{-wx^2}{24EI}\left(x^2 - 2Lx + \dfrac{3}{2}L^2\right)$ $0 \le x \le L/2$ $v = \dfrac{-wL^3}{192EI}(4x - L/2)$ $L/2 \le x \le L$	M_{max} (at $x = 0$) $= \dfrac{wL^2}{8}$
	$\theta_{max} = \dfrac{-w_0 L^3}{24EI}$	$v_{max} = \dfrac{-w_0 L^4}{30EI}$	$v = \dfrac{-w_0 x^2}{120EIL}(10L^3 - 10L^2 x + 5Lx^2 - x^3)$	M_{max} (at $x = 0$) $= \dfrac{w_0 L^2}{6}$

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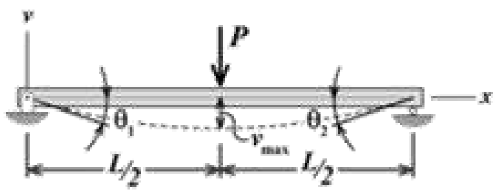
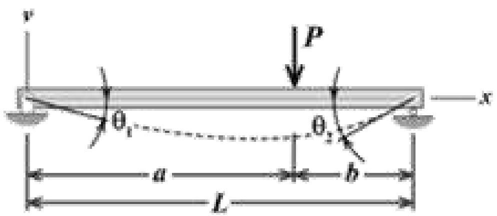
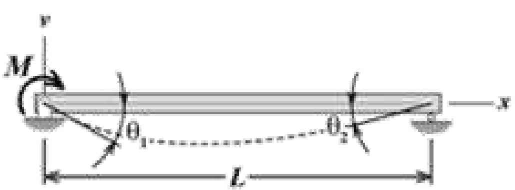
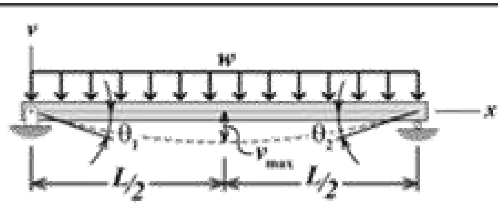
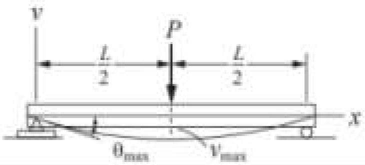
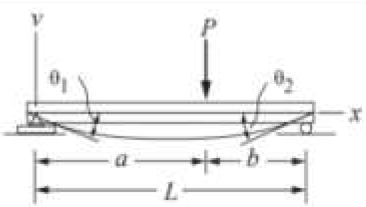
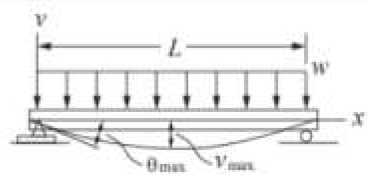
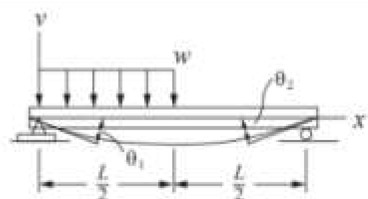
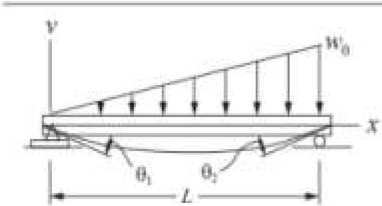
Simply Supported Beams			
Beam	**Slope**	**Deflection**	**Elastic Curve**
	$\theta_1 = -\theta_2 = -\dfrac{PL^2}{16EI}$	$v_{max} = -\dfrac{PL^3}{48EI}$	$v = -\dfrac{Px}{48EI}(3L^2 - 4x^2)$ $for\ 0 \le x \le L/2$
	$\theta_1 = -\dfrac{Pb(L^2 - b^2)}{6LEI}$ $\theta_2 = +\dfrac{Pa(L^2 - a^2)}{6LEI}$	$v\big\|_{x=a} = -\dfrac{Pba}{6LEI}(L^2 - b^2 - a^2)$	$v = -\dfrac{Pbx}{6LEI}(L^2 - b^2 - x^2)$ $for\ 0 \le x \le a$
	$\theta_1 = -\dfrac{ML}{3EI}$ $\theta_2 = +\dfrac{ML}{6EI}$	$v_{max} = -\dfrac{ML^2}{9\sqrt{3}EI}$ $@\ x = L\left(1 - \dfrac{\sqrt{3}}{3}\right)$	$v = -\dfrac{Mx}{6LEI}(2L^2 - 3Lx + x^2)$
	$\theta_1 = -\theta_2 = -\dfrac{wL^3}{24EI}$	$v_{max} = -\dfrac{5wL^4}{384EI}$	$v = -\dfrac{wx}{24EI}(L^3 - 2Lx^2 + x^3)$

Simply Supported Beam Slopes and Deflections

BEAM	SLOPE	DEFLECTION	ELASTIC CURVE	MAXIMUM MOMENT
	$\theta_{max} = \dfrac{-PL^2}{16EI}$	$v_{max} = \dfrac{-PL^3}{48EI}$	$v = \dfrac{-Px}{48EI}(3L^2 - 4x^2)$ $0 \le x \le L/2$	M_{max} (at center) $= \dfrac{PL}{4}$
	$\theta_1 = \dfrac{-Pab(L+b)}{6EIL}$ $\theta_2 = \dfrac{Pab(L+a)}{6EIL}$	$v\big\vert_{x=a} = \dfrac{-Pba}{6EIL}(L^2 - b^2 - a^2)$	$v = \dfrac{-Pbx}{6EIL}(L^2 - b^2 - x^2)$ $0 \le x \le a$	M_{max} (at point of load) $= \dfrac{Pab}{L}$
	$\theta_1 = \dfrac{-M_0L}{3EI}$ $\theta_2 = \dfrac{M_0L}{6EI}$	$v_{max} = \dfrac{-M_0L^2}{\sqrt{243}EI}$	$v = \dfrac{-M_0x}{6EIL}(x^2 - 3Lx + 2L^2)$	M_{max} (at $x = 0$) $= M_0$
	$\theta_{max} = \dfrac{-wL^3}{24EI}$	$v_{max} = \dfrac{-5wL^4}{384EI}$	$v = \dfrac{-wx}{24EI}(x^3 - 2Lx^2 + L^3)$	M_{max} (at center) $= \dfrac{wL^2}{8}$
	$\theta_1 = \dfrac{-3wL^3}{128EI}$ $\theta_2 = \dfrac{7wL^3}{384EI}$	$v\big\vert_{x=L/2} = \dfrac{-5wL^4}{768EI}$ $v_{max} = -0.006563\dfrac{wL^4}{EI}$ at $x = 0.4598L$	$v = \dfrac{-wx}{384EI}(16x^3 - 24Lx^2 + 9L^3)$ $0 \le x \le L/2$ $v = \dfrac{-wL}{384EI}(8x^3 - 24Lx^2 + 17L^2x - L^3)$ $L/2 \le x < L$	$M_{max}\left(\text{at } x = \dfrac{3}{8}l\right) = \dfrac{9}{128}wL^2$
	$\theta_1 = \dfrac{-7w_0L^3}{360EI}$ $\theta_2 = \dfrac{w_0L^3}{45EI}$	$v_{max} = -0.00652\dfrac{w_0L^4}{EI}$ at $x = 0.5193L$	$v = \dfrac{-w_0x}{360EIL}(3x^4 - 10L^2x^2 + 7L^4)$	$M_{max}\left(\text{at } x = \dfrac{L}{\sqrt{3}}\right) = \dfrac{w_0L^2}{9\sqrt{3}}$

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$$1.\Delta = \int_0^L m \frac{M}{EI} dx$$

$$1_{(KN.m)}.\theta = \int_0^L \frac{m_\theta M}{EI} dx$$

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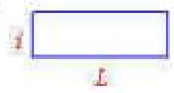
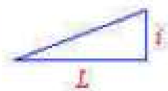
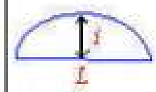
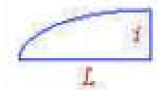
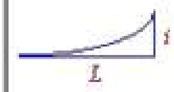
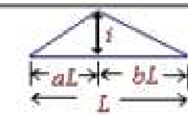
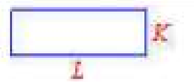
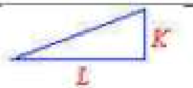
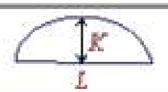
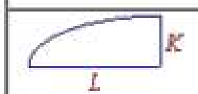
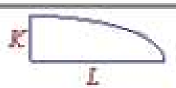
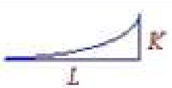
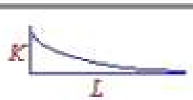
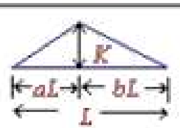
M_u \ M_p							
	KiL	1/2 KiL	1/2 K $(i_1 + i_2)$ L	2/3 KiL	2/3 KiL	1/3 KiL	1/2 KiL
	1/2 KiL	1/3 KiL	1/6 K $(i_1 + 2i_2)$ L	1/3 KiL	5/12 KiL	1/4 KiL	1/6(1 + a) KiL
	1/2 KiL	1/6 KiL	1/6 K $(2i_1 + i_2)$ L	1/3 KiL	1/4 KiL	1/12 KiL	1/6(1 + b) KiL
	1/2 $(K_1 + K_2)$ iL	1/6 $(K_1 + 2K_2)$ iL	1/6 $(2K_1i_1 + K_1i_2 + K_2i_1 + 2K_2i_2)$ L	1/3 $(K_1 + K_2)$ iL	1/12 $(3K_1 + 3K_2)$ iL	1/12 $(K_1 + 3K_2)$ iL	1/6((1 + b) K_1 + (1 + a) K_2)iL
	2/3 KiL	1/3 KiL	1/3 K $(i_1 + i_2)$ L	8/15 KiL	7/15 KiL	1/5 KiL	1/3(1 + ab) KiL
	2/3 KiL	5/12 KiL	1/12 K $(3i_1 + 5i_2)$ L	7/15 KiL	8/15 KiL	3/10 KiL	1/12(5 - b - b^2) KiL
	2/3 KiL	1/4 KiL	1/12 K $(5i_1 + 3i_2)$ L	7/15 KiL	11/30 KiL	2/15 KiL	1/12(5 - a - a^2) KiL
	1/3 KiL	1/[redacted]4 KiL	1/12 K $(i_1 + 3i_2)$ L	1/5 KiL	3/10 KiL	1/5 KiL	1/12(1 + a + a^2) KiL
	1/3 KiL	1/12 KiL	1/12 K $(3i_1 + i_2)$ L	1/5 KiL	2/15 KiL	1/30 KiL	1/12(1 + b + b^2) KiL
	1/2 KiL	1/6(1+ a) KiL	1/6 KL ((1 + b) i_1 + (1 + a) i_2)	1/3(1 + ab) KiL	1/12(5 - b - b^2) KiL	1/12(1 + a + a^2) KiL	1/3 KiL