

624.014.001.24

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[3],

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$$EI_{\omega} \alpha_1^{IV} - GI_t \alpha_1'' - m(x_1) + b'(x_1) = 0 \quad (1)$$

(1)

$$\alpha_1^{IV} - k^2 \alpha_1'' = \frac{m(x_1) - b'(x_1)}{EI_{\omega}}, \quad (2)$$

$$k = \sqrt{\frac{GI_t}{EI_{\omega}}} \quad (3)$$

(3)

$$\alpha = f_0(x_1) + f(x_1), \quad (4)$$

$$f_0(x_1) = A \operatorname{sh} k x_1 + B \operatorname{chk} x_1 + C x_1 + D$$

(2), $f(x_1)$ (2),

A, B, C, D

u_1 ó

$Y_1; w_1$ ó

v_1 ó

$Z_1; \alpha_1$ ó

$Y_1; \gamma_1$ ó

β_1 ó

$Z_1; u$ ó

$Y; w$ ó

v ó

$Z; \alpha$ ó

$Y; \gamma$ ó

β ó

$Z; \delta$

ó

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Y_1, Z_1

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[1, 2, 4]

[1, 2].

$Y_1; I_z$; I_y
 $Z_1; GI_t$

; EI_{ω}

	α_1	δ_1	α_1	δ_1
α_1	$\frac{\lambda EI_{\omega}}{l^3}$	$\frac{\alpha EI_{\omega}}{l^2}$	$-\frac{\lambda EI_{\omega}}{l^3}$	$\frac{\alpha EI_{\omega}}{l^2}$
δ_1	$\frac{\alpha EI_{\omega}}{l^2}$	$\frac{\mu EI_{\omega}}{l}$	$-\frac{\alpha EI_{\omega}}{l^2}$	$\frac{\gamma EI_{\omega}}{l}$
α_1	$-\frac{\lambda EI_{\omega}}{l^3}$	$-\frac{\alpha EI_{\omega}}{l^2}$	$\frac{\lambda EI_{\omega}}{l^3}$	$-\frac{\alpha EI_{\omega}}{l^2}$
δ_1	$\frac{\alpha EI_{\omega}}{l^2}$	$\frac{\gamma EI_{\omega}}{l}$	$-\frac{\alpha EI_{\omega}}{l^2}$	$\frac{\mu EI_{\omega}}{l}$

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	U_1	V_1	W_1	α_1	β_1	γ_1	δ_1	U_1	V_1	W_1	α_1	β_1	γ_1	δ_1
U_1	$R_{1,1}$							$R_{1,8}$						
V_1		$R_{2,2}$				$R_{2,6}$			$R_{2,9}$				$R_{2,13}$	
W_1			$R_{3,3}$		$R_{3,5}$					$R_{3,10}$		$R_{3,12}$		
α_1				$R_{4,4}$			$R_{4,7}$				$R_{4,11}$			$R_{4,14}$
β_1			$R_{5,3}$		$R_{5,5}$					$R_{5,10}$		$R_{5,12}$		
γ_1		$R_{6,2}$				$R_{6,6}$			$R_{6,9}$				$R_{6,13}$	
δ_1				$R_{7,4}$			$R_{7,7}$				$R_{7,11}$			$R_{7,14}$
U_1	$R_{8,1}$							$R_{8,8}$						
V_1		$R_{9,2}$				$R_{9,6}$			$R_{9,9}$				$R_{9,13}$	
W_1			$R_{10,3}$		$R_{10,4}$					$R_{10,10}$		$R_{10,12}$		
α_1				$R_{11,4}$			$R_{11,7}$				$R_{11,11}$			$R_{11,14}$
β_1			$R_{12,3}$		$R_{12,5}$					$R_{12,10}$		$R_{12,12}$		
γ_1		$R_{13,2}$				$R_{13,6}$			$R_{13,9}$				$R_{13,13}$	
δ_1				$R_{14,4}$			$R_{14,7}$				$R_{14,11}$			$R_{14,14}$

$$\alpha = \frac{k^2 l^2 (ch(kl) - 1)}{kl sh(kl) - 2ch(kl) + 2}, \quad (6)$$

$$\gamma = \frac{kl (sh(kl) - kl)}{kl sh(kl) - 2ch(kl) + 2}, \quad (7)$$

$$\lambda = \frac{k^3 l^3 sh(kl)}{kl sh(kl) - 2ch(kl) + 2}, \quad (8)$$

$$\mu = \frac{kl (kl ch(kl) - sh(kl))}{kl sh(kl) - 2ch(kl) + 2}. \quad (9)$$

$R \acute{o}$
 $, r \acute{o}$
 $(\dots 1), \acute{o}$
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$$= \begin{vmatrix} 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & d & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & d \end{vmatrix} \quad (11),$$

$$= \begin{vmatrix} 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & d & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & d \end{vmatrix} \quad (12),$$

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$$r_{1,1} = r_{8,8} = \frac{EA}{l}, \quad r_{1,8} = r_{8,1} = -\frac{EA}{l}, \quad r_{2,2} = r_{9,9} = \frac{12EI_z}{l^3},$$

$$r_{2,6} = r_{2,13} = r_{6,2} = r_{13,2} = \frac{6EI_z}{l^2}, \quad r_{2,9} = r_{9,2} = -\frac{12EI_z}{l^3},$$

$$r_{9,13} = r_{13,9} = -\frac{6EI_z}{l^2}, \quad r_{3,3} = r_{10,10} = \frac{12EI_y}{l^3},$$

$$r_{3,5} = r_{5,3} = r_{3,12} = r_{12,3} = -\frac{6EI_y}{l^2}, \quad r_{3,10} = r_{10,3} = -\frac{12EI_y}{l^3},$$

$$r_{10,12} = r_{12,10} = \frac{6EI_y}{l^2}, \quad r_{4,4} = r_{11,11} = \frac{\lambda EI_\omega}{l^3},$$

$$r_{4,7} = r_{4,14} = r_{7,4} = r_{14,4} = \frac{\alpha EI_\omega}{l^2}, \quad r_{4,11} = r_{11,4} = -\frac{\lambda EI_\omega}{l^3},$$

$$r_{11,14} = r_{14,11} = -\frac{\alpha EI_\omega}{l^2}, \quad r_{5,5} = r_{12,12} = \frac{4EI_y}{l},$$

$$r_{5,10} = r_{10,5} = \frac{6EI_y}{l^2}, \quad r_{5,12} = r_{12,5} = \frac{2EI_y}{l}, \quad r_{6,6} = r_{13,13} = \frac{4EI_z}{l},$$

$$r_{6,9} = r_{9,6} = -\frac{6EI_z}{l^2}, \quad r_{6,13} = r_{13,6} = \frac{2EI_z}{l}, \quad r_{7,7} = r_{14,14} = \frac{\mu EI_\omega}{l},$$

$$r_{7,11} = r_{11,7} = -\frac{\alpha EI_\omega}{l^2}, \quad r_{7,14} = r_{14,7} = \frac{\gamma EI_\omega}{l}.$$

$$R = T \cdot r \cdot T, \quad (10)$$

$$= \begin{vmatrix} l_1 & m_1 & n_1 \\ l_2 & m_2 & n_2 \\ l_3 & m_3 & n_3 \end{vmatrix} \quad (13)$$

$$= \begin{vmatrix} l_1 & l_2 & l_3 \\ m_1 & m_2 & m_3 \\ n_1 & n_2 & n_3 \end{vmatrix} \quad (14)$$

$l_1, m_1, n_1 \acute{o}$
 $Z_1, d \quad d \acute{o}$
 $Y_1, l_3, m_3, n_3 \acute{o}$
 $l_2, m_2, n_2 \acute{o}$

1.	-	3.	-	256, 1940.
2.	-	4.	-, 1948. 198 .	-

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[1].

38,9%.

(17 ; 18-45 ; 45),

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(48,3%)
(41,2%).

(56,4%)

(49,1%).

(47,2%).

49% 65,9%.

(60,9%).

(48,7%).

(66,7%).

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[2],

- ó 72,1%,
- ó 70,5%,
- ó 66,7%,
- ó 49,2%,
- ó 48,3%,
- ó 80,3%,
- ó 62,1%,
- ó 48,8%,

ó

ó 78,9%.