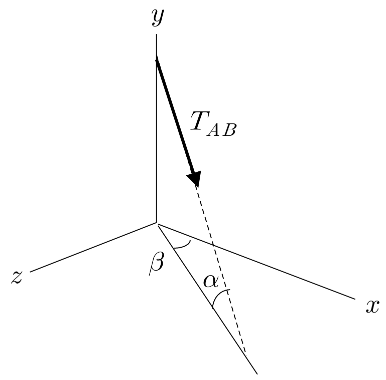
<2.12~2.14절>

2.75 T_{AB} = 4.2 kN, α = 40°, β = 40°



(a) $F_y = -T_{AB}\sin\alpha$

= -(4.2 kN) sin40° = -2.6997 kN

$F_x = (T_{AB}\cos\alpha)\cos\beta$

= (4.2 kN) cos40° cos40°

= 2.4647 kN

$F_z = (T_{AB}\cos\alpha)\sin\beta$

= (4.2 kN) cos40° sin40°

= 2.0681 kN

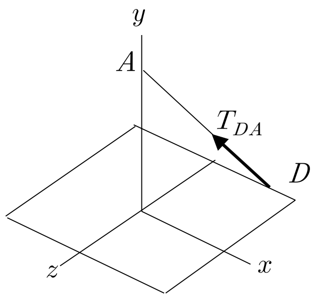
⇒ F_x = 2.46 kN, F_y = -2.70 kN, F_z = 2.07 kN

(b) $\cos\theta_x = \frac{F_x}{T_{AB}} = \frac{2.4647}{4.2}$ = 0.58683 ⇒ $\theta_x = \cos^{-1}0.58683$ = 54.1°

$\cos\theta_y = \frac{F_y}{T_{AB}} = \frac{-2.6997}{4.2}$ = -0.64279 ⇒ $\theta_y = \cos^{-1}(-0.67279)$ = 130.0°

$\cos\theta_z = \frac{F_z}{T_{AB}} = \frac{2.0681}{4.2}$ = 0.49240 ⇒ $\theta_x = \cos^{-1}0.49240$ = 60.5°

2.90



T_{DA} = 870 N

d = (-0.6 m)**i** + (1.2 m)**j** + (0.9 m)**k**

$d = \sqrt{(-0.6\,\mathrm{m})^2 + (1.2\,\mathrm{m})^2 + (0.9\,\mathrm{m})^2}$ = 1.6155 m

$\boldsymbol{\lambda} = \frac{\mathbf{d}}{d} = \frac{1}{1.6155\,\mathrm{m}}$[(-0.6 m)**i** + (1.2 m)**j** + (0.9 m)**k**]

= -0.3714 **i** +0.74278 **j** + 0.5571 **k**

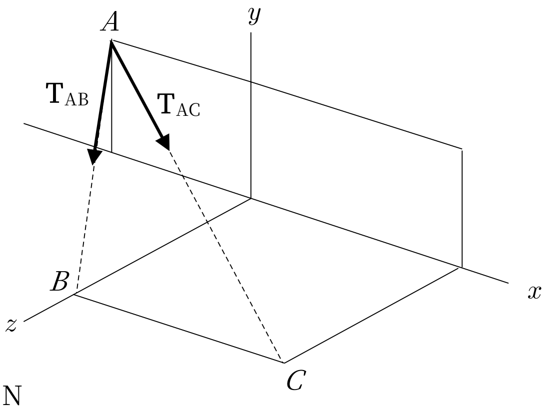
$\mathbf{F}_{DA} = T_{DA}\,\boldsymbol{\lambda}$

= (870 N) (-0.3714 **i** +0.74278 **j** + 0.5571 **k**)

= (-323.1 N) **i** +(646.2 N) **j** + (484.7 N) **k**

⇒ $\mathbf{F}_x$ = (-323 N) **i**, $\mathbf{F}_y$ = (646 N) **j**, $\mathbf{F}_z$ = (485 N) **k**

2.95



T_{AB} = 850 N

$\mathbf{d}_{AB}$ = (0.40 m)**i** + (-0.45 m)**j** + (0.60 m)**k**

$d_{AB} = \sqrt{(0.40\text{ m})^2 + (-0.45\text{ m})^2 + (0.60\text{ m})^2} = 0.850\text{ m}$

$\boldsymbol{\lambda}_{AB} = \frac{\mathbf{d}_{AB}}{d_{AB}} = \frac{1}{0.850\text{ m}}[(0.40\text{ m})\mathbf{i} + (-0.45\text{ m})\mathbf{j} + (0.60\text{ m})\mathbf{k}]$

= 0.4706 **i** - 0.5294 **j** + 0.7059 **k**

$\mathbf{T}_{AB} = T_{AB}\,\boldsymbol{\lambda}_{AB}$

= (850 N) (0.4706 **i** - 0.5294 **j** + 0.7059 **k**)

= (400 N) **i** + (-450 N) **j** + (600 N) **k**

T_{AC} = 1020 N

$\mathbf{d}_{AC}$ = (1.00 m)**i** + (-0.45 m)**j** + (0.60 m)**k**

$d_{AC} = \sqrt{(1.00\text{ m})^2 + (-0.45\text{ m})^2 + (0.60\text{ m})^2} = 1.250\text{ m}$

$\boldsymbol{\lambda}_{AC} = \frac{\mathbf{d}_{AC}}{d_{AC}} = \frac{1}{1.250\text{ m}}[(1.00\text{ m})\mathbf{i} + (-0.45\text{ m})\mathbf{j} + (0.60\text{ m})\mathbf{k}]$

= 0.800 **i** - 0.360 **j** + 0.480 **k**

$\mathbf{T}_{AC} = T_{AC}\,\boldsymbol{\lambda}_{AC}$

= (1020 N) (0.800 **i** - 0.360 **j** + 0.480 **k**)

= (816.0 N) **i** + (-367.2 N) **j** + (489.6 N) **k**

$\mathbf{R} = \mathbf{T}_{AB} + \mathbf{T}_{AC}$

= [(400 N) **i** + (-450 N) **j** + (600 N) **k**]

+ [(816.0 N) **i** + (-367.2 N) **j** + (489.6 N) **k**]

= (1216.0 N) **i** + (-817.2 N) **j** + (1089.6 N) **k**

$R = \sqrt{R_x^2 + R_y^2 + R_z^2} = \sqrt{(1216.0\text{ N})^2 + (-817.2\text{ N})^2 + (1089.6\text{ N})^2} = 1825.8\text{ N}$

⇒ 합력의 크기 R = 1826 N

$\cos\theta_x = \frac{R_x}{R} = \frac{1216.0}{1825.8} = 0.66601$ ⇒ $\theta_x = \cos^{-1}0.66601 = 48.2°$

$\cos\theta_y = \frac{R_y}{R} = \frac{-817.2}{1825.8} = -0.44758$ ⇒ $\theta_y = \cos^{-1}(-0.44758) = 116.6°$

$\cos\theta_z = \frac{R_z}{R} = \frac{1089.6}{1825.8} = 0.59678$ ⇒ $\theta_z = \cos^{-1}0.59678 = 53.4°$