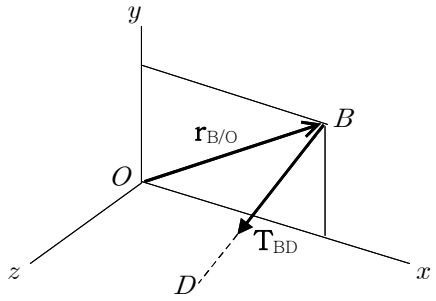
[3.1절]

3.26　T_{BD} = 900 N

S; known　T_{BD},　unknown 점 O에 관한 모멘트 $\mathbf{M}_O$　　M; 자유물체도(F.B.D.)

⇒　위치벡터와 힘벡터의 벡터곱



A; ① 위치벡터

$\mathbf{r}_{B/O} = l_x\,\mathbf{i} + l_y\,\mathbf{j} + l_z\,\mathbf{k}$

$= (2.5\text{ m})\,\mathbf{i} + (2\text{ m})\,\mathbf{j}$

② 힘벡터

$d_x = -1\text{ m},\quad d_y = -2\text{ m},\quad d_z = 2\text{ m}$

$d = \sqrt{d_x^2 + d_y^2 + d_z^2} = \sqrt{(-1)^2 + (-2)^2 + 2^2}\text{ m} = 3.00\text{ m}$

$\boldsymbol{\lambda}_{BD} = \dfrac{1}{3.00}[(-1)\,\mathbf{i} + (-2)\,\mathbf{j} + 2\,\mathbf{k}] = -0.3333\,\mathbf{i} - 0.6667\,\mathbf{j} + 0.6667\,\mathbf{k}$

$\mathbf{T}_{BD} = T_{BD}\,\boldsymbol{\lambda}_{BD} = (900\text{ N})\,\dfrac{1}{3.00}[(-1)\,\mathbf{i} + (-2)\,\mathbf{j} + 2\,\mathbf{k}]$

$= -300\,\mathbf{i} - 600\,\mathbf{j} + 600\,\mathbf{k}\text{ (N)}$

③ 벡터곱

$\mathbf{M}_O = \mathbf{r}_{B/O} \times \mathbf{T}_{BD}$

$= [2.5\,\mathbf{i} + 2\,\mathbf{j}\text{ (m)}] \times [300\,\mathbf{i} - 600\,\mathbf{j} + 600\,\mathbf{k}\text{ (N)}]$

$= [(2)(600) - 0]\,\mathbf{i} + [0 - (2.5)(600)]\,\mathbf{j}$

$+ [(2.5)(-600) - (2)(-300)]\,\mathbf{k}\quad (\text{N}\cdot\text{m})$

$= 1200\,\mathbf{i} - 1500\,\mathbf{j} - 900\,\mathbf{k}\quad (\text{N}\cdot\text{m})$

R(과정의 타당성) : 서술

(가령 $T_x<0$, $T_y<0$, $T_z>0$, 힘의 각 직각성분의 방향)

T(결과의 의미) : 서술

(가령, $M_x>0$, $M_y<0$, $M_z<0$, 각 좌표축에 관한 모멘트의 방향)