{3.2절}

3.47 d = 25 m, T_{AB} = 4 kN

    S; 좌표축에 관한 모멘트,   M; 자유물체도(F.B.D.)
        좌표축 단위벡터와 위치벡터와 힘벡터의 삼중곱
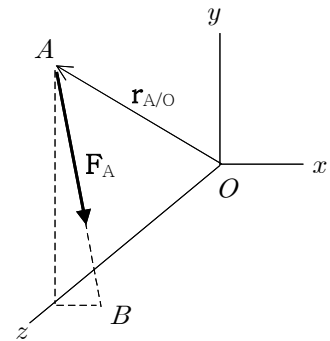
    A; ① 위치벡터

d_x = 0, d_y = 15 m

$d_z = \sqrt{d^2 - d_y^2} = \sqrt{(25\,\text{m})^2 - (15\,\text{m})^2}$ = 20 m

$\mathbf{r}_{A/O}$ = 0 $\mathbf{i}$ + (15 m) $\mathbf{j}$ + (20 m) $\mathbf{k}$

      = 15 $\mathbf{j}$ + 20 $\mathbf{k}$ (m)

② 힘벡터

$(d_{AB})x$ = 2.5 m, $(d_{AB})y$ = −15 m, $(d_{AB})z$ = 0

$d_{AB} = \sqrt{(2.5\,\text{m})^2 + (-15\,\text{m})^2 + 0}$ = 15.207 m

$\boldsymbol{\lambda}_{AB} = \dfrac{1}{15.207}$ (2.5 $\mathbf{i}$ − 15 $\mathbf{j}$) = 0.1644 $\mathbf{i}$ − 0.9864 $\mathbf{j}$

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

    = (4 kN) (0.1644 $\mathbf{i}$ − 0.9864 $\mathbf{j}$)

    = 0.6576 $\mathbf{i}$ − 3.946 $\mathbf{j}$ (kN)

③ 벡터곱

$\mathbf{M}_O = \mathbf{r}_{A/O} \times \mathbf{F}_A$

    = [15 $\mathbf{j}$ + 20 $\mathbf{k}$ (m)] × [0.6576 $\mathbf{i}$ − 3.946 $\mathbf{j}$ (kN)]

    = [−(20)(−3.946)] $\mathbf{i}$ + [(20)(0.6576)] $\mathbf{j}$ + [−(15)(0.6576)] $\mathbf{k}$ (kN·m)

    = (78.92) $\mathbf{i}$ + (13.152) $\mathbf{j}$ + (−9.864) $\mathbf{k}$ (kN·m)

④ 삼중곱

⇒ $M_x = \mathbf{M}_O \cdot \mathbf{i}$ = [(78.92) $\mathbf{i}$ + (13.152) $\mathbf{j}$ + (−9.864) $\mathbf{k}$ (kN·m)] · $\mathbf{i}$ = 78.9 kN·m

      $M_y = \mathbf{M}_O \cdot \mathbf{j}$ = [(78.92) $\mathbf{i}$ + (13.152) $\mathbf{j}$ + (−9.864) $\mathbf{k}$ (kN·m)] · $\mathbf{j}$ = 13.15 kN·m

      $M_z = \mathbf{M}_O \cdot \mathbf{k}$ = [(78.92) $\mathbf{i}$ + (13.152) $\mathbf{j}$ + (−9.864) $\mathbf{k}$ (kN·m)] · $\mathbf{k}$ = −9.86 kN·m

    R; (과정의 타당성 검토)

    T; (결과의 의미 검토)