Sdutions: 21-5-3.4-MK-01.pg

$M = 13\,kg$

$a = (0, 0, 4)$

$b = (3, 4, 4)$

$c = (-6, -3, 6)$

$d = (4, -3, 4)$

$\vec{AB} = (3, 4, 0)$

$\vec{AC} = (-6, -3, 2)$

$\vec{AD} = (4, -3, 0)$

$|\vec{AB}| = \sqrt{3^2 + 4^2 + 0^2} = 5$

$|\vec{AC}| = \sqrt{(-6)^2 + (-3)^2 + 2^2} = 7$

$|\vec{AD}| = \sqrt{4^2 + (-3)^2 + 0^2} = 5$

$\vec{u}_{AB} = \frac{3}{5}\hat{i} + \frac{4}{5}\hat{j} + 0\hat{k}$

$\vec{u}_{AC} = \frac{-6}{7}\hat{i} - \frac{3}{7}\hat{j} + \frac{2}{7}\hat{k}$

$\vec{u}_{AD} = \frac{4}{5}\hat{i} - \frac{3}{5}\hat{j} + 0\hat{k}$

$\Sigma F_x = \frac{3}{5}F_{AB} - \frac{6}{7}F_{AC} + \frac{4}{5}F_{AD} = 0$

$\Sigma F_y = \frac{4}{5}F_{AB} - \frac{3}{7}F_{AC} - \frac{3}{5}F_{AD} = 0$

$\Sigma F_z = 0F_{AD} + \frac{2}{7}F_{AC} + 0\hat{k} = (9.81\,m/s^2)(13\,kg) = 127.53\,N$

use ΣF_z eq

$F_{AC} = \frac{127.53 \times 7}{2} = 446.4\,N$

use system solver to find F_{AB} & F_{AD}

$F_{AB} = 382.59 \text{ N}$

$F_{AC} = 446.36 \text{ N}$

$F_{AD} = 191.30 \text{ N}$