Resolución a 1.

$Q = 5.354\, D^2 \sqrt{H}$

Sistema inglés

$$U_{5.354} = \frac{ft^3}{s \cdot ft}$$

$$\therefore \quad U_{5.354} = \frac{ft^2}{s}$$

$Q = k\, D^2 \sqrt{H}$

Sistema Internacional

$$U_k = \frac{m^3}{m \cdot s}$$

$$U_k = \frac{m^2}{s}$$

$$5.354 \frac{ft^2}{s} = k \frac{m^2}{s} \quad ; \qquad k = 5.354 \frac{ft^2}{s} \cdot \frac{s}{m^2}$$

$$k = 5.354 \frac{ft^2}{m^2} \qquad ; \qquad k = 5.354 \frac{(0.3048)^2\ m^2}{m^2}$$

$k = 0.4974$

La expresión resulta: $Q = 0.4974\, D^2 \sqrt{H}$

Resolución a 2.

$$\overline{R_1} = \overline{F_1} + \overline{F_2} + \overline{F_3}$$

$F_1 = 650i - 260j$
$F_2 = 240i + 320j$
$F_3 = F_{3_x} i + F_{3_y} j$ $\qquad F_{3_x} = -710 \quad [N]$
$\overline{R_1} = 180i - 60j$ $\qquad F_{3_y} = -120 \quad [N]$

$\overline{F_3} = -710i - 120j \quad [N]$

$\overline{M}_o^{\overline{R}} = 5i \times (180i - 60j) = -900k \quad [N \cdot m]$

$\overline{M}_o^{\overline{F_1}} = 3i \times (650i - 260j) = -1950k \quad [N \cdot m]$

$\overline{M}_o^{\overline{F_2}} = \qquad 0 \qquad = 0 \quad [N \cdot m]$

$\overline{M}_o^{\overline{F_3}} = xi + y\,j \times (-710i - 120j) = (-120x + 710y)k \quad [N \cdot m]$

$1050 = -120x + 710y$

$x = 0$ $\qquad y = 0$
$y = 1.478 \quad [m]$ $\qquad y = -8.75 \quad [m]$

Resolución a 3.

a)

$\bar{F}_{5000} = 0\,i - 5000\,j + 0\,k \qquad [N]$

$\bar{F}_{3000} = 0\,i + 3000\,j + 0\,k \qquad [N]$

$\bar{F}_{4000} = 0\,i - 4000\,j + 0\,k \qquad [N]$

$F_{1000} = 0\,i + 1000\,j + 0\,k \qquad [N]$

$\bar{R} = 0\,i - 5000\,j + 0\,k \qquad [N]$

$\bar{M}_H^{\bar{F}_M} = 0\,i - 0\,j + 25000\,k \qquad [N \cdot m]$

$\bar{M}_H^{\bar{F}_D} = 0\,i - 0\,j - 9000\,k \qquad [N \cdot m]$

$\bar{M}_H^{\bar{F}_J} = 0\,i - 0\,j + 8000\,k \qquad [N \cdot m]$

$\bar{M}_H^{\bar{F}_G} = 0\,i - 0\,j - 1000\,k \qquad [N \cdot m]$

$\bar{M}_H = 0\,i - 0\,j + 23000\,k \qquad [N \cdot m]$

b)

$\bar{R} \cdot \bar{M}_o = 0$

Se reduce a una fuerza que no pasa por el origen

$(x\,i + y\,j + z\,k) \times (-5000\,j) \;=\; 23000\,k$

$P = (-4.6\,,\,0\,,\,0) \;\; [m]$ (es decir 4.6 m medidos hacia la izquierda desde H)

La línea de acción pasa por las barras $\overline{ML}$, $\overline{MC}$ y $\overline{BC}$

c)

$\sum F_y = 0 \;\; ; \qquad R_A + R_H - 5000 = 0$

$\sum M_H = 0\,; \qquad 23000 - 6\,\mathrm{R_A} = 0\,; \qquad R_A = 3{,}833.33 \;\; [N]$

$R_H = 1166.67 \;\; [N]$

Resolución a 4.

$$(60h)(30) - (2827.43)(34.535) = (30h)(20)$$

$$1800h - 97654.29 = (30h)(20)$$

$$1800h - 97654.29 = 600h$$

$$h = 81.37$$