We will start with Equilib eqn $\Sigma \vec{M} = \vec{0}$ first. ②

Use point A as Reference (Why? because many (3) force components pass through it so simplifies problem)

for each force write down <u>force vector</u> <u>and</u> vector from A to a point on line of action of force.

for weight: $\vec{W} = -W\hat{j}$ (note sign) $= -490.5\hat{j}$ N (I)

$\vec{W}$ goes thru point G

$$\vec{AG} = (\tfrac{1}{2})a\sin(50°)\hat{i} - \tfrac{1}{2}a\cos(50°)\hat{j} - \tfrac{1}{2}b\hat{k}$$
$$= (\tfrac{1}{2})(0.8)(0.766)\hat{i} - \tfrac{1}{2}(0.8)(0.643)\hat{j} - \tfrac{1}{2}(1.2)\hat{k}$$
$$= 0.306\hat{i} - 0.257\hat{j} - 0.6\hat{k}$$

Hinge B $\vec{B} = B_x\hat{i} + B_y\hat{j}$ (II)

$\vec{B}$ goes thru point B

$$\vec{AB} = -b\hat{k} = -1.2\hat{k}$$

Hinge A $\vec{A} = A_x\hat{i} + A_y\hat{j} + A_z\hat{k}$ (III)

$\vec{A}$ passes thru pt. A

$$\vec{AA} = \vec{0}$$

Prop CD $\vec{F}_{CD} = \|F_{CD}\|(0.828\hat{i} + 0.386\hat{j} + 0.405\hat{k})$ (IV)

F_{CD} passes thru pt. D

$$\vec{AD} = a\sin(50°)\hat{i} - a\cos(50°)\hat{j}$$
$$= (0.8)(0.766)\hat{i} - (0.8)(0.643)\hat{j}$$
$$= 0.613\hat{i} - 0.514\hat{j}$$

NOW WE ARE READY TO CALCULATE MOMENTS $\vec{M} = \vec{r} \times \vec{F}$

(I)
$$\begin{Vmatrix} \hat{i} & \hat{j} & \hat{k} \\ 0.306 & -0.257 & -0.6 \\ 0 & -490.5 & 0 \end{Vmatrix} = -(0.6)(490.5)\hat{i} + 0\hat{j} - (0.306)(490.5)\hat{k}$$
$$= -294.3\hat{i} - 150.1\hat{k} \quad \text{Nm}$$

(II)
$$\begin{Vmatrix} \hat{i} & \hat{j} & \hat{k} \\ 0 & 0 & -1.2 \\ B_x & B_y & 0 \end{Vmatrix} = +(1.2)B_y\hat{i} - (1.2)B_x\hat{j}$$

(III)
$$\begin{Vmatrix} \hat{i} & \hat{j} & \hat{k} \\ 0 & 0 & 0 \\ A_x & A_y & A_z \end{Vmatrix} = \vec{0} \quad \text{(naturally)}$$

(this was obvious, but is included for completeness INDEED, we use pt. A as a ref so as to produce this result)