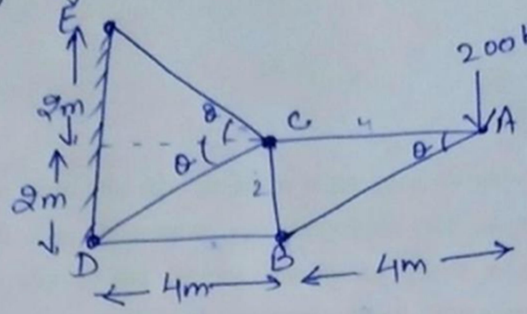
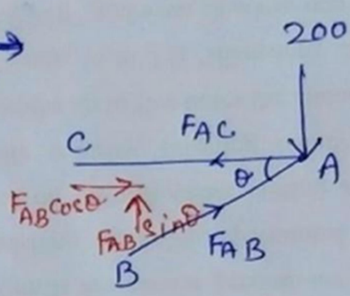
Q. Determine the support reactions and nature and magnitude of forces in the member of truss.



Sol^n ⇒ Apply joint method ⇒



At joint A

$\Sigma V = 0$

$F_{AB}\sin\theta = 200$

$F_{AB} = \frac{200}{\sin\theta}$ —(1) $\Rightarrow F_{AB} = \frac{200}{2/\sqrt{20}}$

$\boxed{F_{AB} = 447.2\,KN}$ compress

$\cos\theta = \frac{AC}{AB} = \frac{4}{\sqrt{20}}$

$\sin\theta = \frac{2}{\sqrt{20}}$

$\Sigma H = 0$

$F_{AC} = F_{AB}\cos\theta$

$F_{AC} = 447.2 \times 4/\sqrt{20}$

$\boxed{F_{AC} = 400\,KN}$ Tensile

At joint B

$\Sigma H = 0$

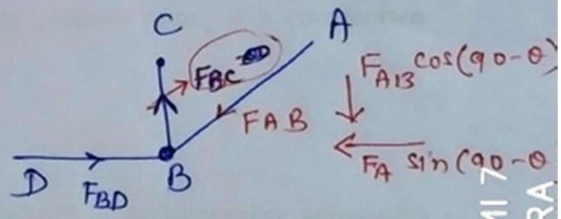
$F_{BD} = F_{AB}\sin(90-\theta)$

$= 447.2\sin(90-\theta)$

$= 447.2\cos\theta$

$= 447.2 \times 4/\sqrt{20}$

$\boxed{F_{BD} = 400\,KN}$ compress.



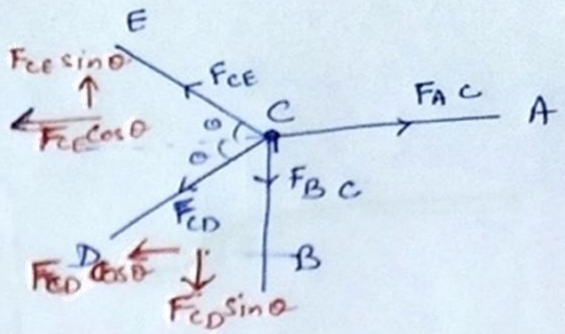
$\Sigma V = 0$

$F_{BC} = F_{AB}\cos(90-\theta)$

$F_{BC} = 447.2\sin\theta$

$\boxed{F_{BC} = 200\,KN}$ Tensile

At joint C



$\Sigma H = 0$

$F_{CE}\cos\theta + F_{CD}\cos\theta = F_{AC}$

$F_{CE} + F_{CD} = \frac{400}{\cos\theta}$ ——③

$\Sigma V = 0$

$F_{CE}\sin\theta - F_{CD}\sin\theta + F_{BC} = 0$

$F_{CE}\sin\theta - F_{CD}\sin\theta = F_{BC}$

$F_{CE} - F_{CD} = \frac{200}{\sin\theta}$ ——④

from eqn ③ & ④

$2F_{CE} = 200 \times \sqrt{20}$

$F_{CE} = 100\sqrt{20}$

$\boxed{F_{CE} = 447.2\ KN}$ Tensile

& $F_{CD} = \frac{400}{4/\sqrt{20}} - F_{CE}$

$= 100\sqrt{20} - 100\sqrt{20}$

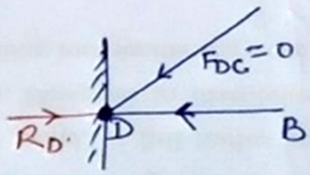
$\boxed{F_{CD} = 0}$

Now Support Reaction

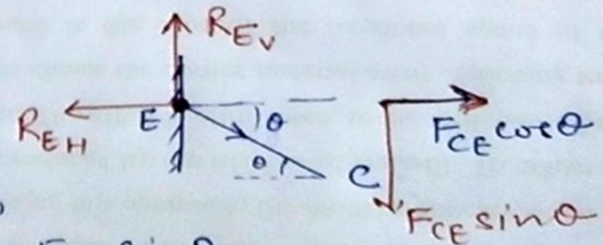
At joint D

$F_{BD} = 400\ KN$

$\therefore R_D = F_{BD} = 400\ KN$



At joint E



$\Sigma H = 0$

$R_{EH} = F_{CE}\cos\theta$

$= 100\sqrt{20} \times \frac{4}{\sqrt{20}}$

$\boxed{R_{EH} = 400\ KN}$

$\Sigma V = 0$

$R_{EV} = F_{CE}\sin\theta$

$= 100\sqrt{20} \times \frac{2}{\sqrt{20}}$

$\boxed{R_{EV} = 200\ KN}$