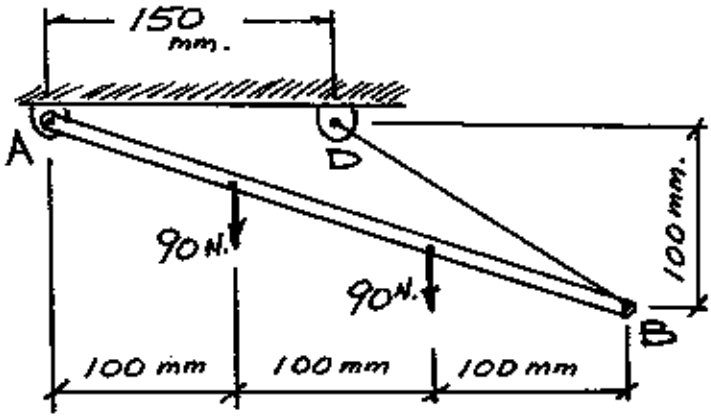
MILANO

MECH 234 + 235

PROB. 4-26

P. 170



ROD $\overline{AB}$

ATTACHED TO CABLE $\overline{BD}$

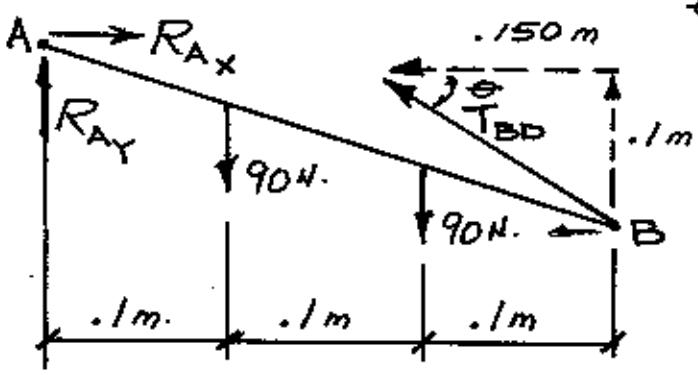
FIND: T_{BD} , R_A

(+) sign convention

NOTE: ① 90 N. loads are vertical
② T_{BD} pulls at both pt. B and pt. D with same tension

SELECT MEMBER AB FOR ANALYSIS.

F.B.D.



$\theta = \tan^{-1}\left(\frac{.1}{.15}\right) = 33.69°$

$T_{BD_X} = -T_{BD} \cos 33.7°$
$= -.83\,T_{BD}$

$T_{BD_Y} = +T_{BD} \sin 33.7°$
$= .55\,T_{BD}$

$\Sigma F_X = 0 = R_{AX} - T_{BD_X} \quad \therefore R_{AX} = .83\,T_{BD}$

$\Sigma F_Y = 0 = R_{AY} - 90^{N.} - 90^{N} + T_{BD_Y}$

Since you know the direction of T_{BD}, solve for moments about pt. A.

$\Sigma M_A = 0 = (90^{N.})(.1m) + (90^{N})(.2m) - (T_{BD_Y})(.3m) + (T_{BD_X})(.1m)$

(from pt. B to pt. A)

$27\,N\text{-}m = (.55\,T_{BD})(.3m) - (.83\,T_{BD})(.1m)$

$27 = 0.082\,T_{BD} \quad \therefore \boxed{T_{BD} = 329.3\ N.}$

Therefore $R_{AX} = .83(329.3^{N.}) = 273.3\ N. \rightarrow$

$R_{AY} = 180^{N} - .55(329.3^{N.}) = -1.12^{N}$ OPP. DIR. ↓

$R_A = \sqrt{(273.3)^2 + (1.12)^2} = 273.3^{N.}$

$\theta = \tan^{-1}\frac{-1.12}{273.3} = -0.2°$ IGNORE

$\boxed{R_A = 273.3^{N.} \rightarrow}$