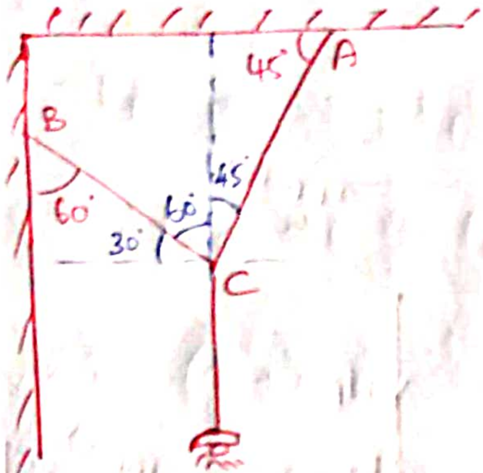
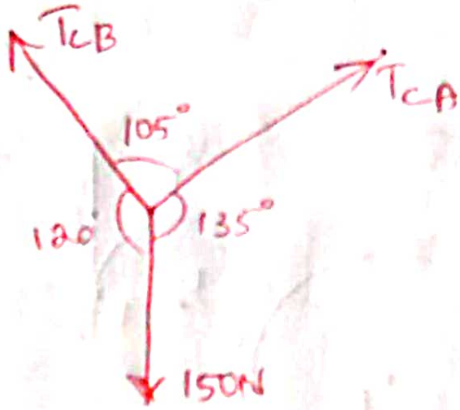
(14) An electric light fixture weighing 150 N hangs from a point C by two strings AC & BC as shown in fig. Determine the forces in the strings AC & BC





Soln: TCA and TCB are the tensions in the strings CB and CA

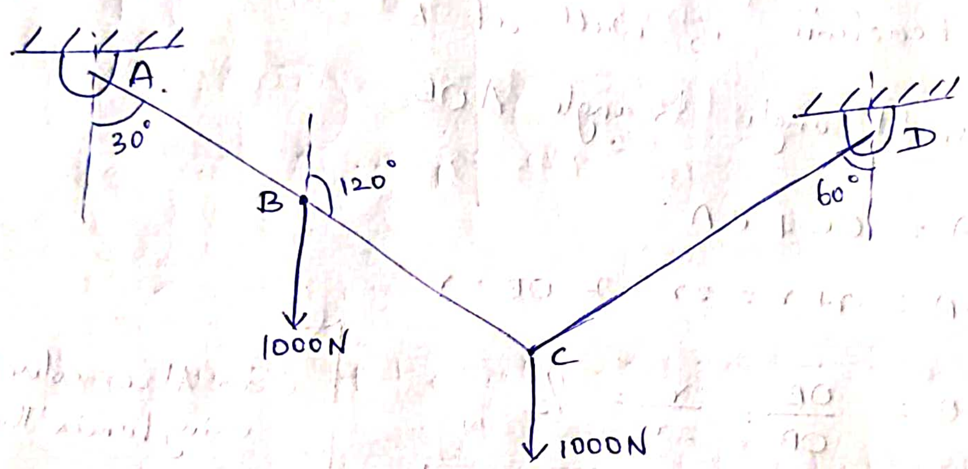
Applying Lami's Eqn $\dfrac{T_{CB}}{\sin 135^\circ} = \dfrac{T_{CA}}{\sin 120^\circ} = \dfrac{150}{\sin 105^\circ}$

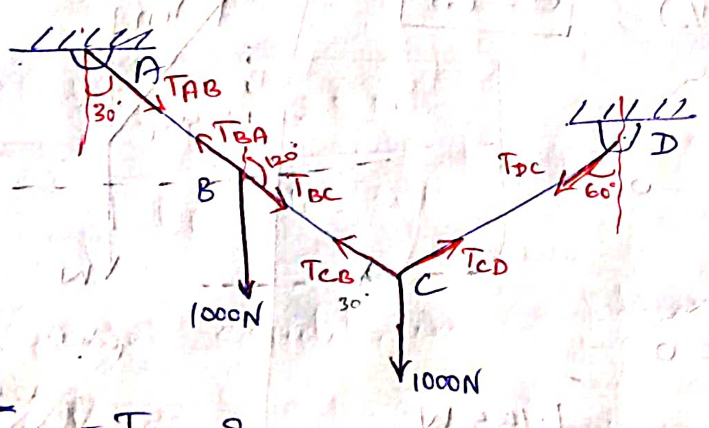
$$T_{CB} = \frac{150 \times \sin 135^\circ}{\sin 105^\circ} = \underline{109.8N}$$

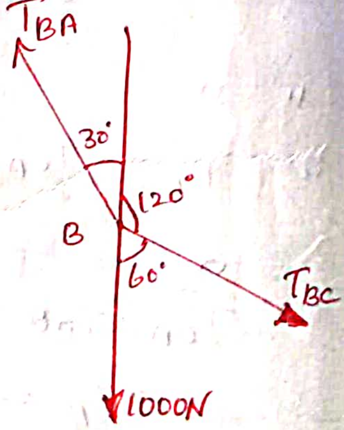
$$T_{CA} = \frac{150 \sin 120^\circ}{\sin 105^\circ} = \underline{134.49N}$$

(18) A string ABCD attached to two fixed points A & D has two equal weights of 1000N attached to it at B & C. The weights rests with the portions AB & CD inclined at 30° & 60° respectively to the vertical as shown in fig.

Find the tensions in the portion AB & BC CD of the string. If the inclination of the portion BC with the vertical is 120°







$T_{BC} = T_{CB}$ &

$T_{CD} = T_{DC}$.

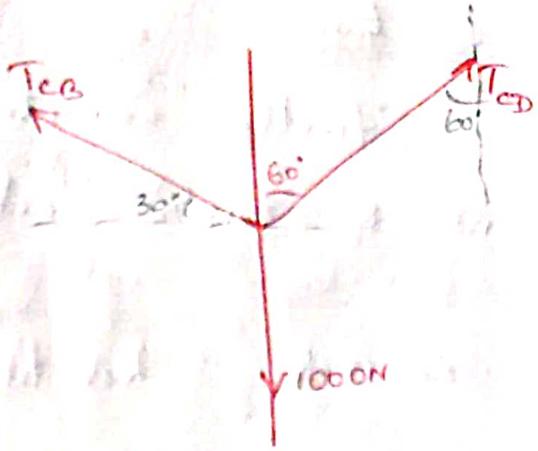
Applying Lamis theorem: at B

$$\frac{T_{BA}}{\sin 60^\circ} = \frac{T_{BC}}{\sin 150^\circ} = \frac{1000}{\sin 150^\circ}$$

$\boxed{T_{BA} = 1732\,N}$

$\boxed{T_{BC} = 1000\,N}$

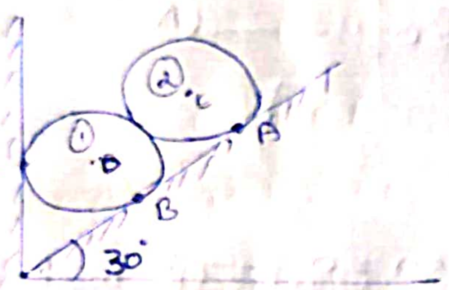
Applying Lamis theorem at C

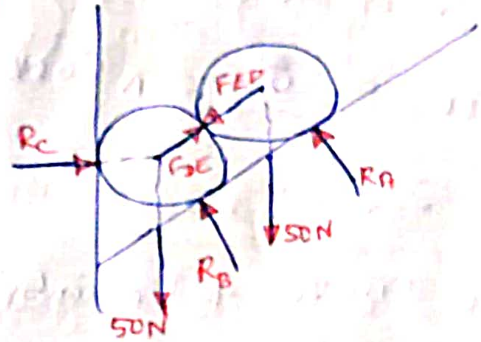


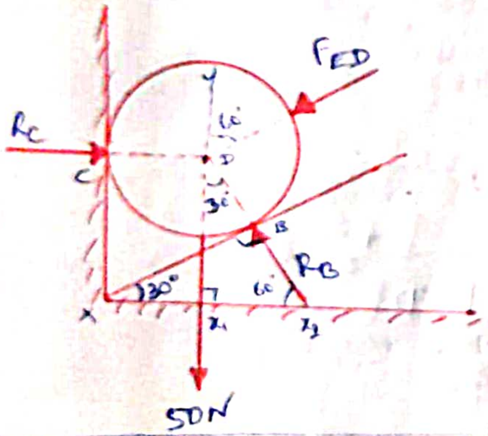
$$\frac{T_{CB}}{\sin 120^\circ} = \frac{T_{CD}}{\sin 120^\circ} = \frac{1000}{\sin 120^\circ}$$

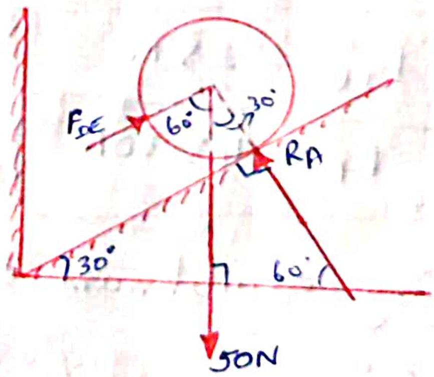
$$\boxed{T_{CD} = 1000\ N}$$

(19) Two identical rollers each of weight 50N, are supported by an inclined plane and a vertical wall as shown in fig. Find the reaction at the point of support A, B & C. Assume all surface to be smooth.









$\Delta\ x B x_2$

$\theta = 60^\circ$

$\Delta\ D x_1 x_2$

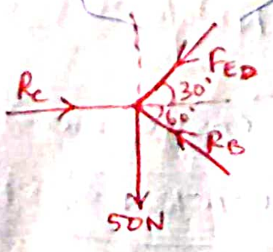
$\theta = 30^\circ$

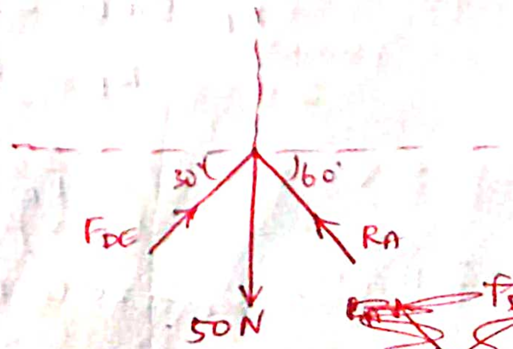
(Understanding part)

$\angle F_{DE} D B = 90^\circ$

$\angle x_1 D B = 30^\circ$

$\therefore \angle Y D F_{ED} = 180 - 120$
$= 60^\circ$





Solution:

Firstly consider roller ② that has minimum no. of forces acting.

Let R_c = Reaction at (roller 1) C

R_B = Reaction at B (Roller 1)

R_A = Reaction at A (Roller 2)

Applying equilibrium conditions at E

$\Sigma H = 0$

$F_{DE} \cos 30^\circ - R_A \cos 60^\circ = 0$ —— ①

$\Sigma V = 0$

$F_{DE} \sin 30^\circ + R_A \sin 60^\circ - 50 = 0$ —— ②

Solving equations ① & ② for 2 unknowns.

$$\boxed{F_{DE} = 25\,N}$$

$$\boxed{R_A = 43.30\,N}$$

Applying equilibrium conditions at D

$\Sigma V = 0$

$R_B \sin 60^\circ - 25 \sin 30^\circ - 50 = 0$

$$R_B = \frac{25 \sin 30^\circ + 50}{\sin 60^\circ} = 62.5$$

$$\boxed{R_B = 62.5\,N}$$

$\Sigma H = 0$; $R_c - 25 \cos 30^\circ - R_B \cos 60^\circ = 0$

Sub R_B; we get $\boxed{R_c = 57.73\,N}$