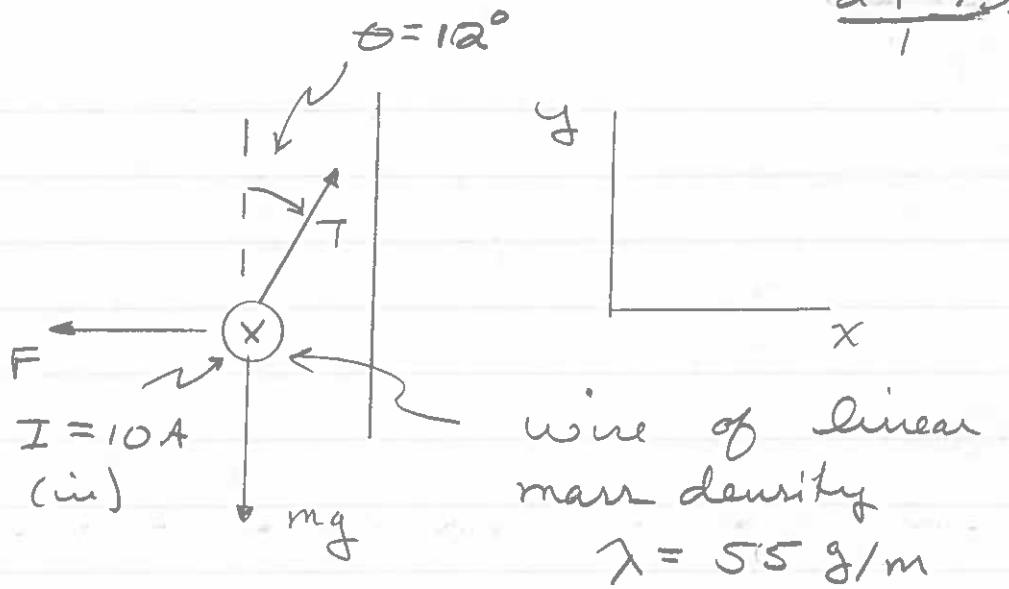
a.)

FBD:



$\lambda = 55\ g/m$
$= 0.055\ kg/m$

Now: $\Sigma F_y = T\cos\theta - mg = 0$ (1)

$\Sigma F_x = T\sin\theta - F = 0$ (2)

So, divide (2)/(1):

$$\tan\theta = \frac{F}{mg}$$

Now:

$$m = \lambda L$$

and

$$\vec{F} = \vec{F}_{mag} = I\vec{L}\times\vec{B}$$
$$= ILB, \text{ left}$$

For $\vec{F}$ to the left, $\vec{B}$ is down.

$\therefore$ $\tan\theta = \frac{ILB}{\lambda Lg} \Rightarrow$ $\boxed{B = \frac{\lambda g \tan\theta}{I}}$

b.)

$\vec{B} = 0.00955\ T$, down

i.e. in $-y$ direction by RHR.