Rev. Ex 5 Q

** 21 (a) What is the physical meaning of the term 'centre of gravity'? (1 mark)

(b) State the conditions for an object to be in equilibrium. (2 marks)

(c) After a typhoon, a pole is about to collapse. A man ties a rope to the pole as an emergency measure (Fig s on p.204). The rope makes an angle of 20° to the horizontal. The contact point between the pole and the ground is X. The weight of the pole is 400 N and its centre of gravity is 0.9 m from X. The pole is in equilibrium. Assume that the pole can rotate freely about X.

5 Moment of a Force

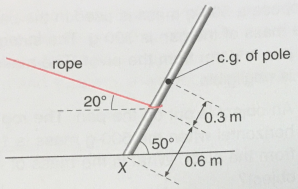


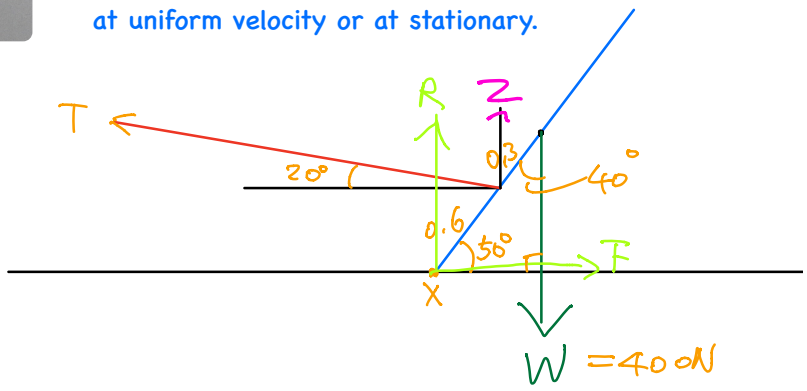
Fig s

(i) Find the magnitude of the tension in the rope. (2 marks)

(ii) Find the magnitude and direction of the force acting on the pole by the ground. (4 marks)

(a) Center of gravity is a point where all small components of the body can combine, and weight can be treated as acting on center of gravity only.

(b) In equilibrium, there is no net force acting on the body. The body could be moving at uniform velocity or at stationary.

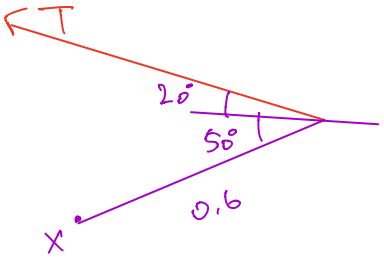


(ci) Take moment about X.

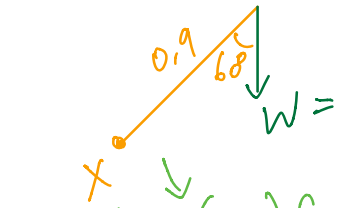
Clockwise moment = Anti-clockwise moment,

$(400)(0.9)(\sin 60^\circ) = T(0.6)(\sin 70^\circ)$

$T = 410\text{N}$



moment $= (T)(0.6)(\sin 70^\circ)$



moment $= (W)(0.9)(\sin 60^\circ)$

(cii) Balance horizontal forces,

$F = T \cos 20^{\circ}$

$F = 386N$

Balance vertical forces,

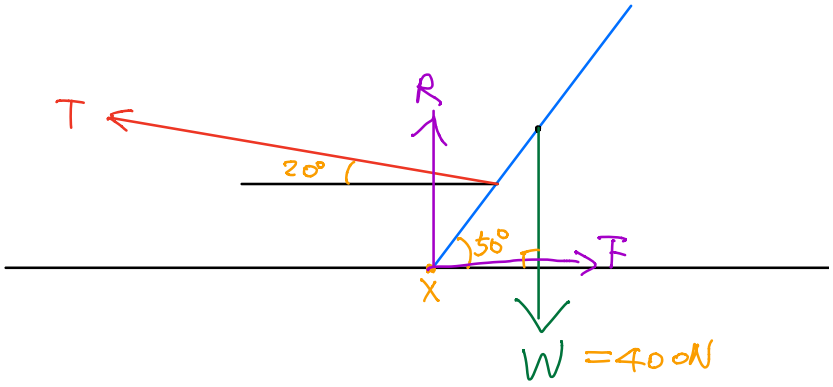
$W = R + T \sin 20^{\circ}$

$400 = R + 410 \sin 20^{\circ}$

$R = 260N$

The resultant force $= \sqrt{F^2 + R^2}$

$= 465N$



$\tan\theta = \frac{260}{386}$

$\theta = 34.03^{\circ}$