1 A boom can be used to assist a person to move heavy loads. A typical arrangement is shown below.
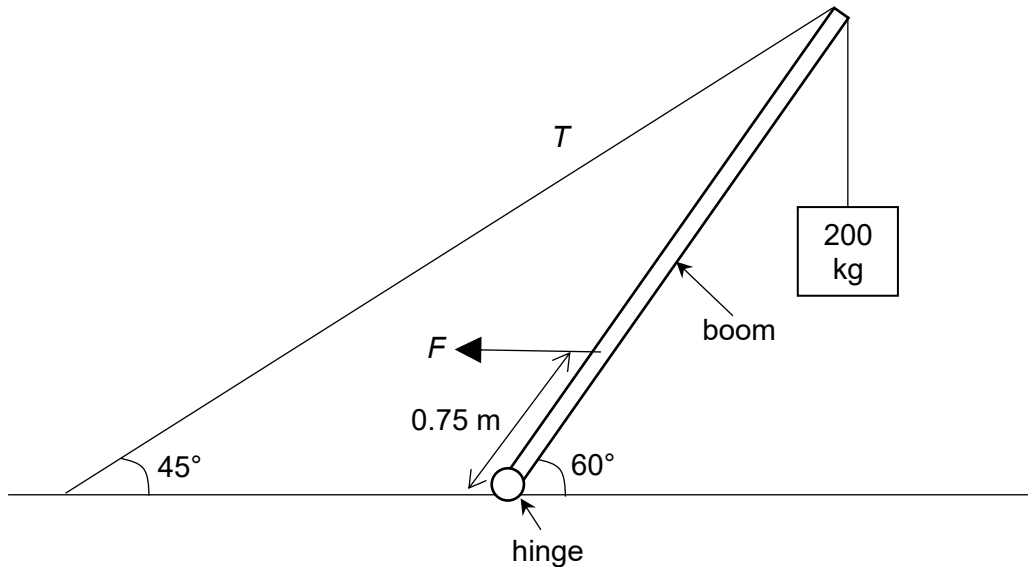

Fig. 1.1

The boom is angled at 60° to the horizontal, and a steel cable is attached to the top of the boom and the floor such that the cable makes an angle of 45° to the horizontal, as shown. The uniform boom has a mass of 45 kg and length 3 m.

A human operator exerts a force F = 120 N horizontally at a distance 0.75 m away from the hinge as measured along the boom. The system is in equilibrium.

(a) State the conditions for a body to be in static equilibrium.

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(b) Show that the tension T in the cable connecting from the top of the boom to the floor is 4.1 kN.

.……………[3]

(c) Determine the magnitude and direction of the force exerted by the hinge on the boom.

magnitude of force = ………………………….. N

direction of the force = ………………………………………………………… [4]