

- 2 (a) Define *moment of a force*.

.....  
..... [1]

- (b) An arrangement for lifting heavy loads is shown in Fig. 2.1.

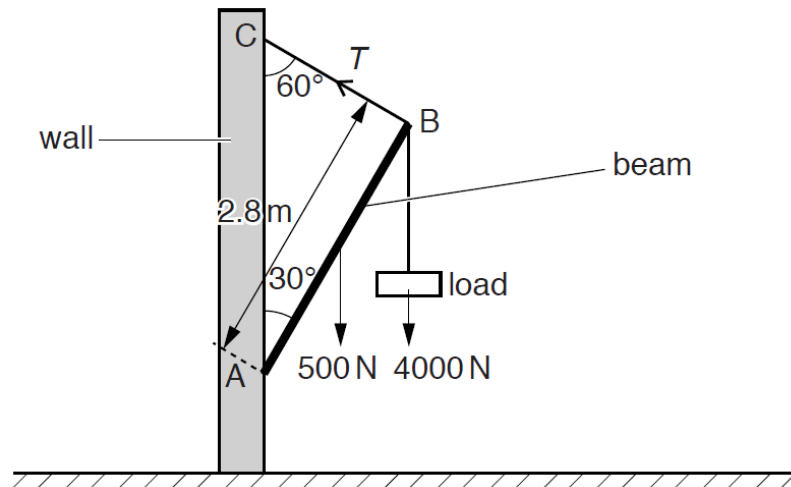


Fig. 2.1

A uniform metal beam AB is pivoted on a vertical wall at A. The beam is supported by a wire joining end B to the wall at C. The beam makes an angle of  $30^\circ$  with the wall and the wire makes an angle of  $60^\circ$  with the wall.

The beam has length 2.8 m and weight of 500 N. A load of 4000 N is supported from B. The tension in the wire is  $T$ . The beam is in equilibrium.

- (i) By taking moments about an appropriate point, show that  $T$  is 2.1 kN.

[1]

- (ii) Calculate the vertical component  $T_v$  of the tension  $T$ .

$T_v = \dots\dots\dots$  N [1]

- (iii) Explain why  $T_v$  does not equal the sum of the load and the weight of the beam although the beam is in equilibrium.

.....  
.....  
..... [1]

- (iv) Determine the magnitude and direction of the reaction force on the beam at A.

force magnitude = ..... N

direction = ..... [4]

[Total: 8]

