2 Fig. 2.1 shows a crane being used to lift and lower a load of mass 300 kg. The load at point B is attached to point A of the jib using a cable.

Another supporting cable attached at point C supports the far end of the jib at point A. The supporting cable makes an angle of 25° with the jib at point A.

The nearer end of the jib is connected to the cab at point D.

The mass of the jib is 2400 kg and the mass of the cab is 16000 kg. Their centres of mass are at their mid-points E and F respectively. The masses of the hook at point B and the cables are negligible.
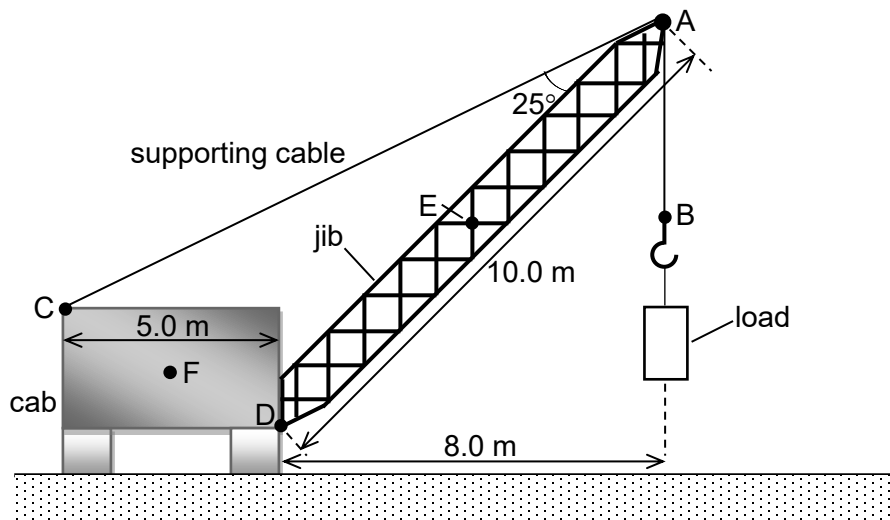

Fig. 2.1

(a) When the load is lowered with a deceleration of 1.0 m s^{-2},

   (i) show that the tension in the cable AB is 3240 N,

[1]

(ii) calculate the corresponding tension in the supporting cable AC.

tension in AC = ... N [2]

(b) For the jib in the position shown in Fig. 2.1, there is a maximum load which will just topple the crane.

(i) On Fig. 2.1, label **G**, the point about which the crane will topple.

[1]

(ii) Determine the maximum load which will just topple the crane.

maximum load = ... N   [2]

(c) The load is a rectangular slab of concrete. Fig. 2.2 shows how the slab of concrete is hooked to cable AB of the jib.
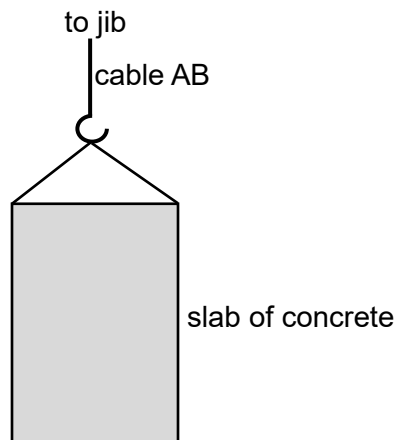
Fig. 2.2

Explain why the crane is more likely to topple on a windy day when carrying this slab of concrete.

....

....

[2]

....