4 After a gust of strong wind, a building with a height of 160 m starts to sway. Fig. 4.1 shows the variation with x of the force experienced by the top floor of the building F, where x is the distance to the adjacent building.

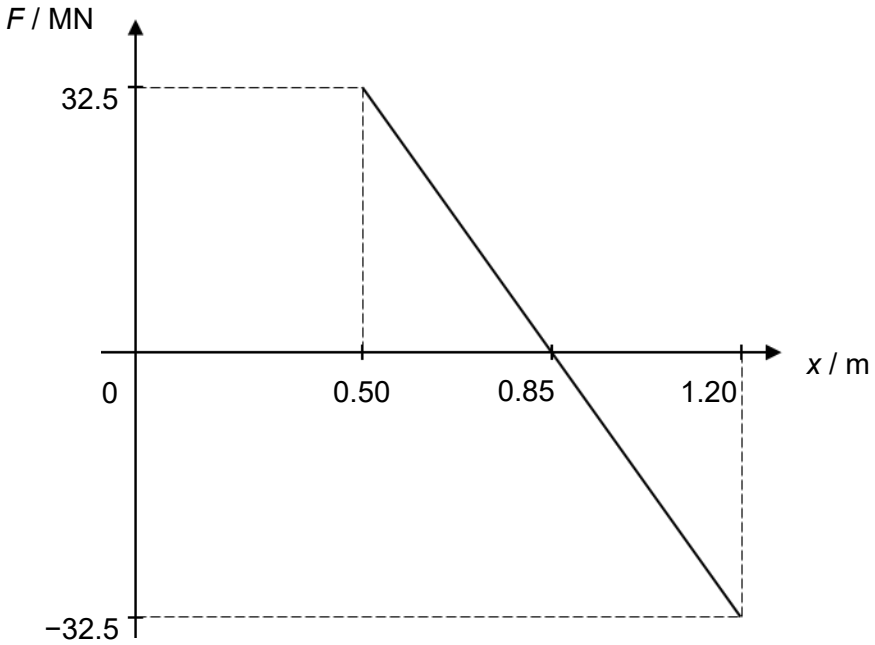

Fig. 4.1

(a) (i) Use Fig. 4.1 to explain how it can be deduced that the top floor of the building oscillates in simple harmonic motion.

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……..... [3]

(ii) The top floor of the building experiences a maximum acceleration of 3.42 m s^{-2}.

1. Determine the amplitude of the oscillation.

amplitude = ……. m [1]

2. Determine the frequency at which the wind is blowing at the building.

Explain your answer

……..…..….....

……..…..... [3]

(iii) On the same axes, sketch the variation with *x* of

1. the potential energy of the oscillation. Label this line P.

2. the kinetic energy of the oscillation. Label this line K.

Numerical values for energy are not required.

[2]

(iv) Determine x when $\frac{\text{kinetic energy}}{\text{potential energy}} = \frac{1}{2}$.

x = ... m [2]

(b) After an earthquake hit the city, it was found that some buildings swayed more and suffered more damage than others.

Suggest why.

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