4 **(a)** State what is meant by *stationary waves*.

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.....

..... [2]

(b) A loudspeaker producing sound of constant frequency is placed near the open end of the pipe, as seen in Fig. 4.1.

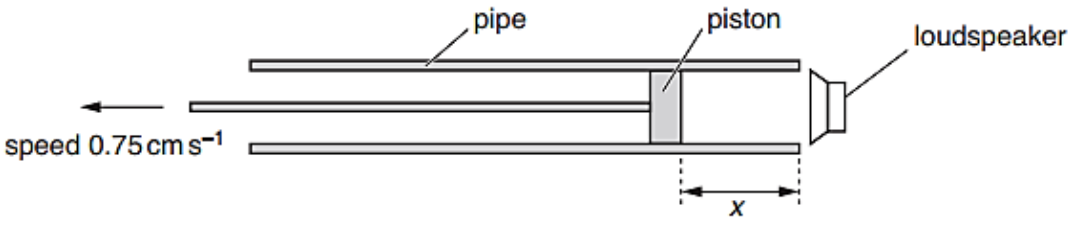

Fig. 4.1

A movable piston is at a distance x from the open end of the pipe. Distance x is increased from $x = 0$ by moving the piston to the left with a constant speed of 0.75 cm s^{-1}.

The speed of the sound in the pipe is 330 m s^{-1}.

(i) Explain how a stationary wave can be formed in the pipe.

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.....

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..... [2]

(ii) A much louder sound is first heard when $x = 6.0$ cm. Determine the frequency of the sound in the pipe.

frequency = ... Hz [3]

(iii) After a time interval, a second much louder sound is heard. Calculate the time interval between the first and second louder sound.

time = ... s [2]

(iv) The actual time interval measured is different from that calculated in **(b)(iii)**, despite no experimental errors. Suggest why this is so.

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..... [1]