7 Fig 7.1 shows two microwave transmitters **A** and **B** 0.20 m apart. The transmitters emit microwaves of frequency 10 GHz, of equal amplitude and in phase. A microwave detector is placed at **O** at a distance of 4.0 m from **AB**.

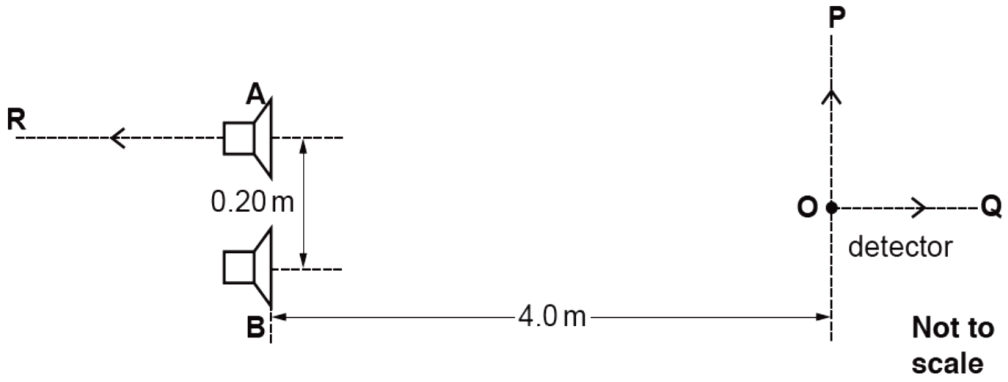

Fig. 7.1

Interference of the waves from the two transmitters is detected only when the transmitters are coherent.

(a) Explain the meaning of the term interference.

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..... [1]

(b) The length of the detector aerial is half a wavelength. Calculate the length of the aerial.

aerial length = ... m [2]

(c) **(i)** **1.** Explain why the amplitude of the detected signal changes when the detector is moved in the direction **OP**.

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..... [3]

2. Calculate the distance between adjacent maximum and minimum signals.

distance = ... m [2]

(ii). Explain why the amplitude of the detected signal changes when the detector is moved in the direction of **OQ**.

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..... [2]

(iii) **1.** Explain why the amplitude of the detected signal decreases to a minimum before increasing again as transmitter **A** is moved a small distance in the direcxtion **AR** with the detector fixed at **O**.

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..... [1]

2. Calculate the distance **A** is moved to cause this minimum signal at **O**.

distance = ... m [2]

(d) State, with a reason, the effect on the intensity of the signal detected at O when each of the following changes is made:

(i) The amplitude of the waves emitted from **A** and **B** are doubled.

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..... [2]

(ii) The two microwave transmitters **A** and **B** emits waves that are anti-phase to each other.

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..... [2]

(iii) The detector **O** is rotated 90^{o} about the axis through **OQ**.

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[3]