

Section B

Answer **one** question from this Section in the space provided.

- 8 (a) (i) State the *principle of superposition*.

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..... [2]

- (ii) When two waves superpose, state three conditions necessary for a stable and observable interference pattern.

1.

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2.

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3.

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[3]

- (b) Two coherent transverse wave sources produce wavefronts as shown in Fig. 8.1. The sources S_1 and S_2 are 3.0 mm apart. The line CC is parallel to the line joining S_1 and S_2 and it is 1.00 m away from the sources. Fig. 8.1 is not drawn to scale.

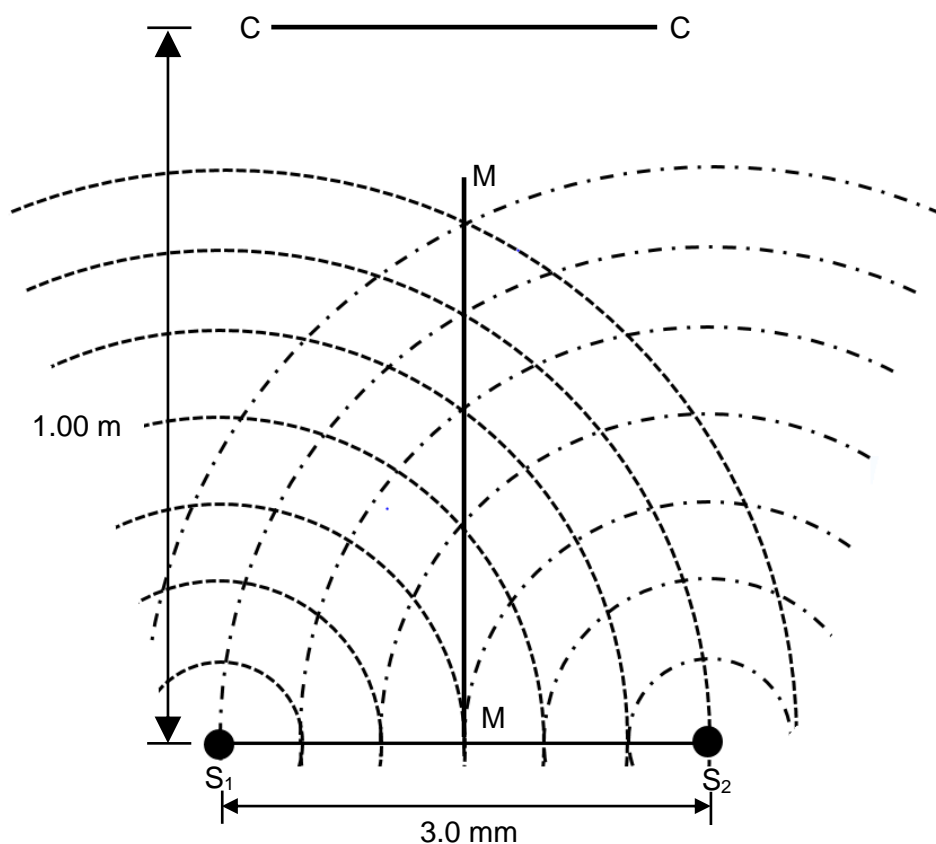


Fig. 8.1 (not to scale)

Lines where the amplitude of the resultant wave is minimum is known as a nodal line. Lines where the amplitude of the resultant wave is a maximum is known as an antinodal line.

- (i) Line MM is a nodal line.

Hence, deduce the phase difference (in degrees) between the sources S_1 and S_2 .

phase difference = $^{\circ}$ [1]

- (ii) On Fig. 8.1, draw a line where the path difference in terms of wavelength λ of the waves from the two sources is

1. 2λ . Label this line EE. [1]

2. 0.5λ . Label this line FF. [1]

- (iii) State whether the line FF is a nodal or antinodal line.

Line FF: [1]

- (iv) Identify the particular interference pattern detected along line S_1S_2 .

..... [1]

- (v) Show that the wavelength of the waves generated by the two sources is 0.5 mm.

[1]

- (vi) Along line S_1S_2 , determine the number of minimas (locations where the resultant wave has the smallest amplitude) detected between the two sources. Ignore what is detected at the sources.

number of minimas = [3]

- (vii) Determine the distance between each maxima that can be detected along line CC.

distance between each maxima = m [2]

(viii) Describe how the new interference pattern detected along lines CC and S_1S_2 compares with the old pattern when the following changes are made separately.

1. The distance between S_1 and S_2 is increased.

CC:

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S_1S_2 :

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[2]

2. The amplitude of waves from S_1 is smaller than the waves from S_2 .

CC:

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S_1S_2 :

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[2]

[Total: 20]