

**Section B**

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

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

.....  
.....  
.....  
.....  
..... [2]

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

1.

.....  
.....  
.....

2.

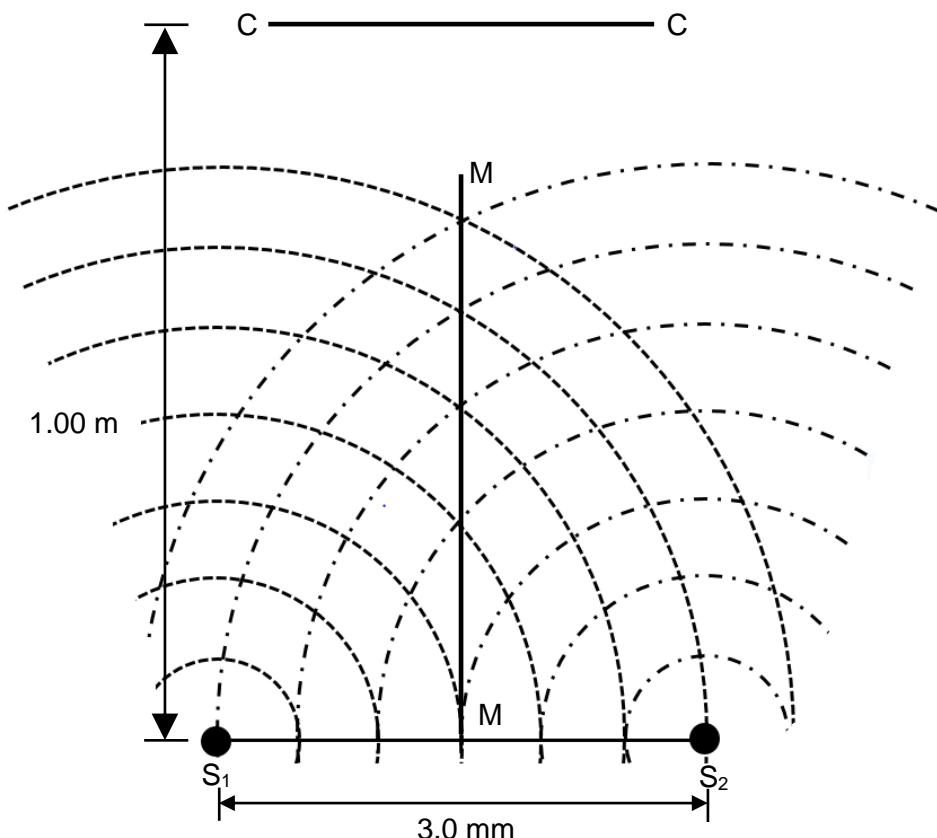
.....  
.....  
.....

3.

.....  
.....  
.....

[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  $S_2$ .

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

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

1.  $2\lambda$ . Label this line EE. [1]

2.  $0.5\lambda$ . 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<sub>1</sub>S<sub>2</sub>.

..... [1]

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

[1]

- (vi) Along line S<sub>1</sub>S<sub>2</sub>, determine the number of minima (locations where the resultant wave has the smallest amplitude) detected between the two sources. Ignore what is detected at the sources.

number of minima = ..... [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: .....

.....  
.....

$S_1S_2$ : .....

.....  
.....

[2]

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

CC: .....

.....  
.....

$S_1S_2$ : .....

.....  
.....

[2]

[Total: 20]