5 **(a)** State the *Principle of Superposition*.

……

……

(b) A Young's double slit experiment is set up as shown in Fig 5.1. Monochromatic light of wavelength 650 nm is incident on slit S_0. Light emerging from slits S_1 and S_2 are in phase and the distance between the slits is 1.65 mm. A screen is placed 6.5 m away from the slits.

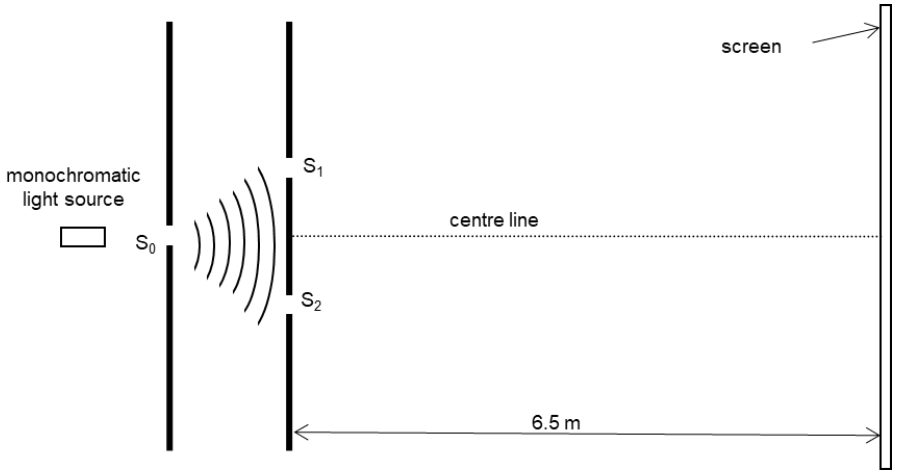

Fig 5.1

(i) Determine the separation of the bright fringes when they are formed on the screen.

separation = …… m [2]

(ii) Suggest changes to the appearance of the fringes when a darken film is now placed in front of slit S_1.

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(iii) The screen is removed and a man stands directly in front of the two slits during day time. The diameter of the pupil of the eyes can be taken to be 3.5 mm.

Determine the maximum distance the man can stand away from the two slits before he can no longer resolve them.

(iv) As the diameter of the pupil of the eyes increases during night time, explain if the man is still able to resolve the two slits if he is to stand at the same location as determined in **(b)(iii)**.

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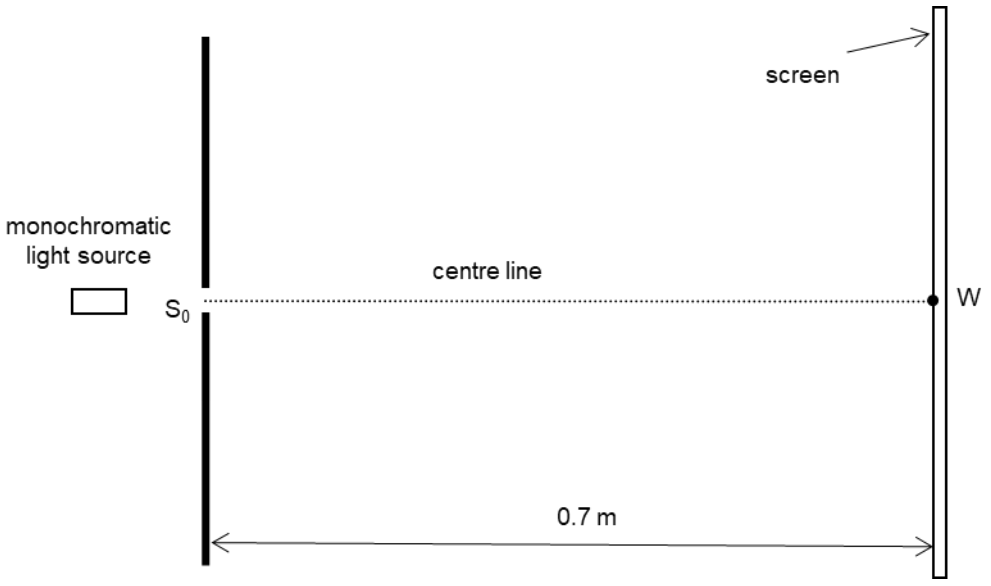
(c) The setup is modified as shown in Fig 5.2 to demonstrate single slit diffraction. Monochromatic light of wavelength 550 nm is incident on slit S_0 with slit width of 2.20 μm. A screen is placed 0.7 m away from the slit and the centre of the interference pattern formed on the screen is at W.



(i) Determine the width of the centre bright fringe formed on the screen.

(ii) On Fig 5.3, sketch the variation with distance *x* from point W of the intensity of the light on the screen.

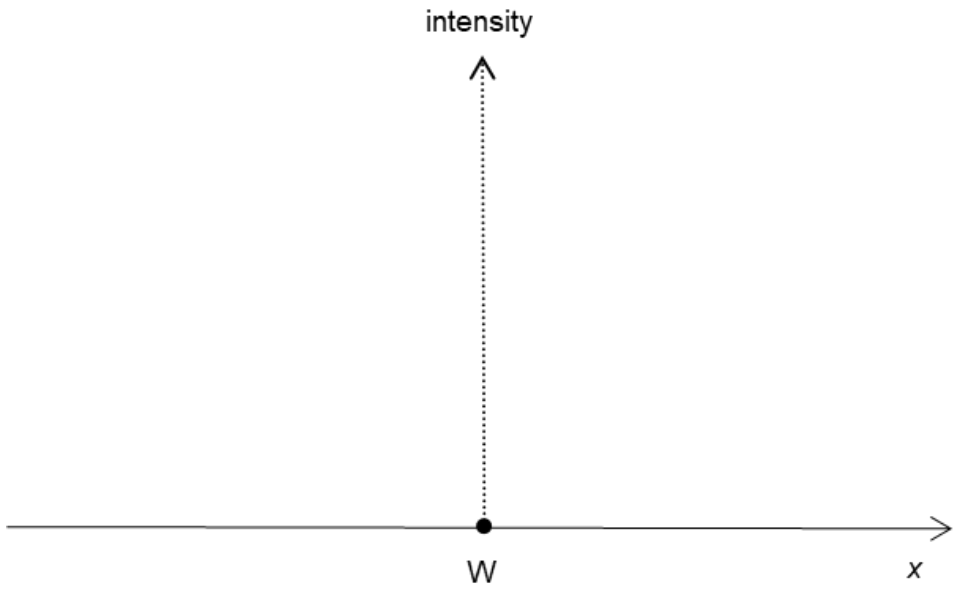


Fig 5.3

(iii) The amplitude of the light at a point 0.8 m away from S_0 is measured to be A_0. The screen is now moved to a new position such that the point is now 1.1 m away from S_0.

Assuming that the light from S_0 acts like a point source, determine in terms of A_0, the amplitude of the light at the new position.

amplitude = …… A_0 [2]

Section B

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