Test 5

09 February 2024 6:26p

2 marks each, make proper diagram when needed.

1) Three waves due to three coherent sources meet at one point. Their amplitudes are $\sqrt{2}A_0$, $3A_0$ and $\sqrt{2}A_0$. Intensity corresponding to A_0 is I_0. Phase difference between first and second is 45°. Path difference between first and third is $\frac{\lambda}{4}$. In phase angle, first wave lags behind from the other two waves. Find resultant intensity at this point.

2) In YDSE, $D = 1.2$ m and $d = 0.25$ cm, the slits are illuminated with coherent 600 nm light. Calculate the distance y above the central maximum for which the average intensity on the screen is 75% of the maximum.

3) In a two-slit interference pattern, the maximum intensity is I_0.

(a) At a point in the pattern where the phase difference between the waves from the two slits is 60°, what is the intensity?

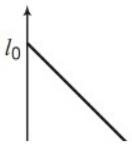
(b) What is the path difference for 480 nm light from the two slits at a point where the phase angle is 60°?

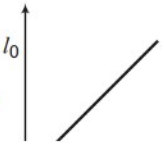
4) Differentiate between rays and wave fronts.

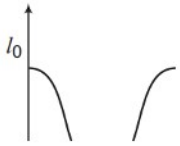
5) **Using Huygens' principle, draw a diagram showing how a plane wave gets refracted, when it is incident on the surface separating a rarer medium from a denser medium. Hence, verify Snell's laws of refraction.**

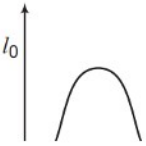
6) **What type of wave front will emerge from a**
(i)point source
(ii)distant light source?

7) In YDSE if a slab whose refractive index can be varied is placed in front of one of the slits . Then, the variation of resultant intensity at mid-point of screen with μ will be best represented by (μ is greater than or equal to 1)

(a) 

(b) 

(c) 

(d) 

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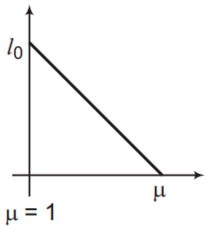
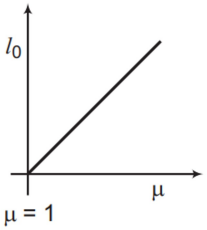
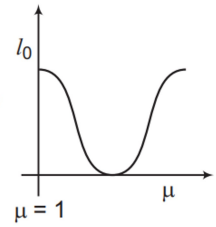
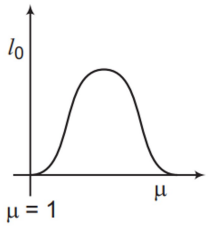
(a) 

(b) 

(c) 

(d) 

8) A)Explain two features to distinguish between the interference pattern in Young's double slit experiment with the diffraction pattern obtained due to a single slit.
(B) A monochromatic light of wavelength 500 nm is incident normally on a single slit of width 0.2 mm to produce a diffraction pattern. Find the angular width of the central maximum obtained on the screen.
Estimate the number of fringes obtained in Young's double slit experiment with fringe width 0.5 mm, which can be accommodated within the region of total angular spread of the central maximum due to single slit

9) (a) Distinguish between unpolarised light and linearly polarised light. How does one get linearly polarised light with the help of a Polaroid?
(b) A narrow beam of unpolarised light of intensity I0 is incident on a polaroid P1. The light transmitted by it is then incident on a second polaroid P2 with its pass axis making angle of 60° relative to the pass axis of P1. Find the intensity of the light transmitted by P2.

10) Young's double slit experiment is made in a liquid. The tenth bright fringe in liquid lies in screen where 6th dark fringe lies in vacuum. The refractive index of the liquid is approximately

(a) 1.8
(b) 1.54
(c) 1.67
(d) 1.2