Started on	Wednesday, 9 February 2022, 3:13 PM
State	Finished
Completed on	Wednesday, 9 February 2022, 3:58 PM
Time taken	45 mins
Grade	

Question **1**

Correct

Mark 2.00 out of 2.00

Consider a sinusoidal plane wave

$$a(\vec{r},t) = A\,\cos[\omega t - \vec{k}\cdot\vec{r}]$$

with $\omega = 2\pi \times 10^2\ \mathrm{s}^{-1}$ and $\vec{k} = (3\hat{i} + 4\hat{j}) \times 2\pi\,\mathrm{m}^{-1}$. Calculate $|\Delta\phi|$ the magnitude of the phase difference between the points $(x_1, y_1, z_1) = (2, 2, 2)\,\mathrm{m}$ and $(x_2, y_2, z_2) = (7, 7.6, 7.3)\,\mathrm{m}$. Express your answer as $|\Delta\phi| = N \times \pi$, and give the value of N to at least one percent accuracy.

Answer: 74.8 ✔

The correct answer is: 74.80

Question **2**

Mark out of 2.00

A wave travelling along the z axis has the phase velocity

$$v_p = c\sqrt{1 + (k_0/k_z)^2}$$

where c is the speed of light in vacuum, k_z is the wave number and $k_0 = 2\pi \times 10\,\mathrm{m}^{-1}$ is a constant. Calculate the value of the group velocity for $k_z = 11.8 \times 2\pi\,\mathrm{m}^{-1}$. Give your answer in units of c to at least one percent accuracy.

Answer:

The correct answer is: 0.76

Question **3**

Mark out of 2.00

In Young's Double slit experiment, the separation between the two slits is d=(0.01*4) mm. If a (100*4) nm light is incident on the slits to produce interference, then how many maxima will be there in the angular range $-30^0 < 0 < 30^0$

Answer:

The correct answer is: 101

Question **4**

Mark out of 2.00

In a Newton's ring experiment using light of wavelength $\lambda = 6.4\times10^{-5}$ cm, the point of contact between the glass plate and the plano-convex lens (of radius of curvature R=100 cm) is perfect. Now the lens is slowly raised vertically upwards, the rings collapse at the center. If the lens is raised by a distance $y = 5\lambda$, then compute the radius of the m=24th order dark ring. Write your answer in the unit of mm up to 2 decimals with at least 1% accuracy.

Answer:

The correct answer is: 2.99

Question **5**

Mark out of 2.00

In a Michelson Interferometer experiment, the field of view is 20^0 (the direction θ of the outermost ring). If the wavelength of light used is $\lambda = 4\times10^{-5}$ cm and the mirror spacing is $d = 7\times10^{-3}$ cm, then calculate the number of bright fringes visible in the field of view. Write your answer truncated to nearest integer.

Answer:

The correct answer is: 21

Question **6**

Cc

Mark out of 2.00

A parallel beam of light ($\lambda = 5 \times 10^{-5}$ cm) is incident normally on a narrow slit of width 0.2 mm. The Fraunhofer diffraction pattern is observed on a screen which is placed at the focal point of convex lens whose focal length is 1.8 cm. The distance (in cms) between the first and the second maxima on the right side of the central maxima is:

Answer:

The correct answer is: 0.00

Question **7**

Mar ut of 2.00

In a double slit setup, slits of width ***a***=0.2 mm are separated by ***d***=1.8 mm. If the slits are illuminated by a light of wavelength λ=600 nm, how many bright fringes are observed within the central peak of the diffraction pattern?

Answer:

The correct answer is: 17

Question **8**

Marked of 2.00

A grating has 12250 lines/inch. Determine the maximum orders of primary maxima that is possible to see when a light of wavelength 508 nm is normally incident on the grating?

Answer:

The correct answer is: 4

◄ Test 2

Jump to...

Test 4 ►