

JAYPEE UNIVERSITY OF INFORMATION TECHNOLOGY, WAKNAGHAT

TEST -2 EXAMINATION- 2023

BTech-1 Semester (CSE/IT/ECE/CE)

COURSE CODE (CREDITS): 18B11PH111 (4)

MAX. MARKS: 25

COURSE NAME: Engineering Physics-1

COURSE INSTRUCTORS: PBB, SKK, VSA, SKT, HAZ, SBA, HSR,

MAX. TIME: 1.5 H

Note: (a) All questions are compulsory.

(b) Marks are indicated against each question in square brackets.

(c) The candidate is allowed to make suitable numeric assumptions wherever required for solving problems

Q1. (a) Obtain the differential form of Gauss law.

[2-marks] [CO-1]

(b) Prove that $\vec{\nabla}\left(\frac{1}{r^n}\right) = \left(\frac{-n}{r^{n+2}}\right)\vec{r}$

[3-marks] [CO-1]

Q2. (a) Derive the conditions of maxima and minima in Young's Double Slit Experiment. [2-marks] [CO-3]

(b) Distance between two slits is 0.1 mm and the width of the fringes formed on the screen is 5 mm. If the distance between the screen and the slit is one meter what would be the wavelength of light used?

[2-marks] [CO-4]

Q3. (a) A Young's double slit experiment is carried out with monochromatic light in air. What will be the change in wavelength and fringe width when the apparatus is immersed in water or the medium is replaced by an optically denser medium?

[2.5-marks] [CO-2]

(b) Using an optical method how would you determine the thickness of a piece of transparent cello tape? Explain your answer.

[2-marks] [CO-4]

Q4. (a) Calculate the separation between two virtual sources in Fresnel biprism using lens displacement method.

[2.5-marks] [CO-3]

(b) In a biprism arrangement, the reading of the micrometer scale for the zeroth order fringe and 8th order fringe are 0.325 mm and 1.255 mm respectively. If a mica ($\mu=1.6$) sheet is used to cover the upper half of the biprism, then the central maximum shifts to the position of 10th fringe. Given that the slits are separated by 2 mm and the distance of the monochromatic sources from the screen is 1 m, calculate the thickness of the mica sheet.

[2-marks] [CO-4]

Q5. (a) Obtain the condition for maxima and minima for thin film interference in reflected pattern.

[2.5-marks] [CO-2]

(b) Calculate the thickness of a soap film ($\mu=1.463$) that will result in constructive interference in the reflected light, if the film is illuminated normally with light whose wavelength in free space is 6000Å. [2-marks] [CO-4]

Q6. Two coherent sources of intensity ratio α interfere. Show that in the interference pattern

$$\frac{I_{\max} - I_{\min}}{I_{\max} + I_{\min}} = \frac{2\sqrt{\alpha}}{(1 + \alpha)}$$

[2.5-marks] [CO-3]