NITDGP/BTECH/Reg/Even/2021-22

NATIONAL INSTITUTE OF TECHNOLOGY DURGAPUR

Even Semester Mid-term Examination, 2021-22

Course Code: PHC01 | Full Marks: 25

Course Name: ENGINEERING PHYSICS | Time: 90 Minutes

Question Paper No.: NITDGP/ PHC01/1 | Date of Exam: 02/06/22

Group A

Instructions: Answer any FIVE questions **5x2=10**

Question No.	Body of the Question	Marks	Mapped CO
1	Two tuning forks A and B of nearly equal frequencies are used in an experiment to produce Lissajous figures. On slightly loading fork A, it is observed that the cycle of change of figure slows down from 10 to 20 seconds. If the frequency of fork B is 256 Hz, determine the frequency of fork A before and after loading.	2	CO1
2	A damped oscillator has initial energy E_0 = 100 J. If the energy decay time of the oscillator is 0.1s, calculate its damping coefficient.	2	CO2
3	The amplitude of a forced oscillator at frequencies $\omega_1 = 400/s$ and $\omega_2 = 600/s$ are equal. Find its resonant frequency.	2	CO1
4	In Newton's ring experiment if the incident light consists of two wavelengths 4000 A^O and 4002 A^o calculate the distance (from the point of contact) at which the ring will disappear. Assume that the radius of curvature of the curved surface is 400 cm.	2	CO3
5	An equiconvex lens is placed on another equiconvex lens. The radii of curvature of the two surfaces of the upper lens are 50 cm and those of the lower lens are 100 cm. The waves are reflected from the upper and lower surfaces of the air film, interfere to produce Newton's rings. Calculate the radius of the 9th dark ring. Assume λ = 600 nm.	2	CO3
6	In a typical biprism arrangement b/a =20 (where b is the distance between the prism and the screen and a is the distance between the slit and the prism), and for sodium light (λ = 5893 A^o) one obtained a fringe width of 0.1 cm, calculate the angle α of the prism.	2	CO3

Course Outcomes

CO1: To realize and apply the fundamental concepts of physics such as superposition principle, simple harmonic motion to real world problems. CO2: Learn about the quantum phenomenon of subatomic particles and its applications to the practical field. CO3: Gain an integrative overview and applications of fundamental optical phenomena such as interference, diffraction and polarization. CO4: Acquire basic knowledge related to the working mechanism of lasers and signal propagation through optical fibers.

Group B

Instructions: Answer any THREE questions **3x5=15**

Question No.	Body of the Question	Marks	Mapped CO
7	What are Lissajous figures? Find out the Lissajous figure traced out by a particle subjected to two perpendicular SHMs of unequal amplitudes, time periods in the ratio of 3:1 and phase differing by (a) zero and (b) $\pi/2$.	5	CO1
8	Derive the differential equation of damped harmonic oscillator and give its general solution. What type of motion do you get when the damping is small? Draw the time-displacement curve for it.	5	CO2
9	What are the conditions of interference? In case of Young's double slit experiment prove that, $\frac{I_{max}-I_{min}}{I_{max}+I_{min}} = \frac{2\sqrt{k}}{k+1}$, where k is the ratio of two intensities.	2+3	CO3
10	Differentiate between division of wavefront and division of amplitude. Draw a schematic diagram for experimental set-up of Fresnel's Biprism and explain the nature of coherent sources produced here.	2+3	CO3
11	Write down the conditions of maxima and minima in Newton's ring experiment. In a Newton's ring set up, diameter of 20th dark ring is found to be 7.25mm. The space between spherical surface and the flat slab is then filled with water (μ= 1.33). Calculate the diameter of the 16th dark ring in the new set up.	2+3	CO3

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