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Daffodil International University
Department of Software Engineering
Faculty of Science & Information Technology
Final Examination, Spring 2025
Course Code: PHY 101 ; Course Title: Physics-I: General Mechanics, Waves and Oscillations, Optics and Atomic and Modern Physics
Sections & Teachers: A-D(SH), (E-H,Q)(MRI), I-L(MOR), M-P(JB)
Time: 2 Hrs Marks: 40

Answer ALL Questions
[The figures in the right margin indicate the full marks and corresponding course outcomes. All portions of each question must be answered sequentially.]

1. a. Describe the following terms: 4+3+3 CLO-1
   a. Coherent light source and types of light interference
   b. Satellite positioning and Einstein's two theories of relativity
   c. Refractive index and critical angle.

2. a. Using the example of light from a point source (like a bulb), **elaborate** the concept of a wavefront using Huygen's principle. **Explain** how it is formed and represent it with a suitable labeled diagram. 5 CLO-2

   b. When sunlight passes through two tiny holes or gaps, we see light and dark lines on the wall. **Estimate** the intensity of the bright and dark fringes formed, and **compute** how changing the distance between the slits affects the spacing between the fringes in Young's double-slit experiment 5

   c. *Describe* with supporting diagram how Brewster's angle, Malus's law, and specific rotation relate to light behavior, and compare how their applications differ from the light control mechanisms used in polaroid sunglasses. 5

3. a. The distance between the centers of two consecutive bright fringes in Young's experiment is 0.75 mm. The distance of the screen from the slit is 68 cm. The frequency of the light is $1.2\times10^{10}$ Hz. 5 CLO-3
   i. **Find** out the separation between the slit.
   ii. **Calculate** the width of dark fringes.
   iii. **What** is the distance of 5th bright and dark fringes respectively from the central bright fringe?

   b. A light beam of $3.2\times10^{-7}$ m wavelength is incident on a metallic plate of Nickel. The value of stopping potential found 3.6 V. 5
   i. **Calculate** the maximum velocity of photo electron.
   ii. **Find** the energy of incident light in keV.
   iii. **Calculate** the value of work function and threshold frequency.

   c. A spaceship is 20 m long and has a rest mass of 800 kg. It moves at $\frac{1}{2}\times10^{8}$ m/s and takes 180 Earth days to reach a planet. 5
   i. **Find** the length seen from the planet.
   ii. If speed becomes $\frac{2}{3}\times10^{8}$ m/s, **calculate mass change**.
   iii. **How much time** passes inside the spaceship?