

BANGLADESH UNIVERSITY OF BUSINESS AND TECHNOLOGY (BUBT)
Faculty of Engineering and Applied Sciences
Department of Computer Science and Engineering
Program: B.Sc. in CSE
PHY 101: Physics I
(Section: 1 & 2; Shift: Day; Intake: 47)

Final

Spring 2021

Total Marks : 40

Time: 6 Hours

Course Instructor: Shahjahan Miah

Instructions:

- Answer all the questions. Q1 includes 5 (five) short questions in total with 1 (one) mark each.
- The marks on the right-hand side in square brackets indicate marks for that question only.
- Please attach your answer script in PDF format in Google Classroom.
- Please do not forget to name the PDF file as: **ID_Name.pdf**
- (Example: 15162108019_Mehedi Hasan.pdf)
- Upload the answer script in right position / orientation.

CO1: Understand crystal, interference, diffraction and polarization

1. a) A double-slit experiment is performed with yellow light of wavelength **XYZ** nm. Calculate the slit separation of the double-slit arrangement that will produce bright interference fringe 200 cm away from the narrow slit. [2]
- b) Calculate the d-spacing d_{111} of a cubic crystal whose lattice constant is **XY** Å (Angstrom). [2]
- c) Draw the plane for the Miller indices of (100). [2]
- d) The refractive index for plastic is **XY**°. Calculate the angle of refraction for a ray of light incident at polarizing angle. [2]
- e) What is the name of the system of unit cell where the unit cell characteristics, $a = b = 5.8 \text{ Å}$, $c = 8.7 \text{ Å}$ and $\alpha = \beta = \gamma = 90^\circ$. [2]

[Where **X**, **XY** and **XYZ** are indicates the last one, last two and last three digits of your student ID respectively.]

CO3: Solved problems in the area of the Solid State Physics

2. a) Consider Copper has the FCC crystal structure. Answer the following: [5]
- (i) How many atoms are there per unit cell?
 - (ii) If R is the radius of the Cu atom, show that the lattice parameter a is given by $a = 2\sqrt{2} R$;
 - (iii) Calculate the atomic packing Fraction;
- b) Calculate the d-spacing of (123) plane of a tetragonal crystal whose lattice constants are $a=b= 3.8$ Angstrom and $c= XY$ Å (Angstrom). [3]
- c) Calculate the lattice constant of a cubic crystal whose d-spacing $d_{110} = XY$ Å. [2]

[Where XY is indicates the last two digit of your student ID].

CO3: Solve problems in the area of interference

3. a) Two coherent sources are 0.18 mm apart and the fringes are observed on a screen XY cm away. It is found that with a certain monochromatic source of light, the fourth bright fringe is situated at a distance of 13 mm from the central fringe. Calculate the wavelength of light. [5]
- b) Green light of wavelength 5700 Å from a narrow slit is incident on a double slit. If the overall separation of 10 fringes on a screen 100 cm away is XY cm, find the slit separation. [3]

[Where XY is indicates the last two digit of your student ID].

CO3: Solve problems in the area of diffraction and Polarization

4. a) When yellow light in vacuum is incident at the polarizing angle on a certain glass slab, the angle of refraction XY° . What will be [5]
- (i) The polarizing angle?; and
 - (ii) The refractive index of the glass?
- b) Plane polarized light of wavelength 8000 Å is incident on a thin quartz plate cut with faces parallel to the optic axis. Calculate
- (i) The ratio of the intensities of the ordinary and extra ordinary lights if the plane of vibration of the incident light makes an angle of XY° with the optic axis.
 - (ii) The minimum thickness of the plate which introduces a phase difference of 50° between the O- and E-rays.
 - (iii) The minimum thickness of the plate for which the O- and E-rays will combine to produce plane polarized light. [7]
- Given, $\mu_o = 1.544$ and $\mu_e = 1.533$.

[Where XY is indicates the last two digit of your student ID].