

MAR-APR-2024 SUMMER EXAMINATION**B.Tech. CBCS****Sub. Name: Engineering Physics****Sub. Code: 71811****Day and Date: MAY, 14-05-2024****Total Marks: 70****Time: 10:30 AM To 01:00 PM**

Instructions: 1. Figures to the right indicate full marks
2. Use of Scientific calculator is allowed

Special Inst.: 1) SECTION I : Que. 1 To Que.4
2) SECTION II : Que. 5 To Que.8
3) Attempt any Three questions from each Section.

Physical constants:-

i) Avogadro's Number, $N=6.023 \times 10^{26}$ / kg. atom ii) Mass of electron = 9.1×10^{-31} kg

iii) Charge of electron = 1.6×10^{-19} C iv) Speed of light, $c=3 \times 10^8$ m/s

v) Plank's constant, $h=6.63 \times 10^{-34}$ J.s

Q1) Answer the following questions. [12]

1. Give the theory of plane transmission grating for normal incidence. [6]

2. i) Explain the term optical activity & specific rotation. [6]

ii) A grating of width 2 inch is ruled with 15000 lines per inch. Find the smallest wavelength separation that can be resolved in second order at a mean wavelength of 5000 Å.

Q2) Answer the following questions. [11]

1. What is holography? Explain the construction and reconstruction of hologram. [6]

2. Explain the term: acceptance angle, acceptance cone, Numerical aperture. [5]

Q3) Answer the following questions. [11]

1. Explain basic requirements for acoustically good hall. [6]

2. The volume of a room is 1200 m³. Wall area of the room is 220 m², the floor area is 120 m² and the ceiling area is 120 m². The sound absorption coefficient for i) wall is 0.03, ii) ceiling is 0.80, iii) the floor is 0.06. Calculate the reverberation time and average sound absorption coefficient. [5]

Q4) Answer any TWO from the following questions. [12]

1. Explain construction and working of Laurent's half shade polarimeter [6]

2. What is total internal reflection? Explain structure of an optical fiber. [6]
3. Write note on factors affecting acoustics. [6]

Q5) Answer the following questions [12]

1. Explain axis of symmetry and centre of symmetry in a cubic crystal system. [6]
2. List the any three system of crystal lattices along with the relation of intercepts and interfacial angle and examples [6]

Q6) Answer the following questions [11]

1. With neat diagram explain construction and working of scanning tunneling Microscope. [6]
2. What is Top-down approach for production of nano material? Explain Ball Milling method of production of nano material. [5]

Q7) Answer the following questions. [11]

1. State de-Broglie's hypothesis of matter waves and derive an expression for wavelength of matter wave in terms of kinetic energy of particle. [6]
2. State and explain Heisenberg's uncertainty principle. [5]

Q8) Answer any TWO from the following questions. [12]

1. 1) A beam of X-ray of wavelength 0.842 \AA is incident on a crystal at a glancing angle of $8^\circ 35'$ when first order Bragg's diffraction occurs. Calculate the glancing angle for 3rd order diffraction. [6]
2) Draw crystal planes having Miller indices (210), (101), (010).
2. Why properties of material changes at nano level? State and explain different properties of nano-material. [6]
3. The X-ray photon is Compton scattered by an electron through an angle of 90° degree. Find the energy (in Kev) of the scattered X-ray photon for the incident photon of energy of 10 Kev. And hence find the energy of recoiled electron in Kev. [6]

SP - 02

Total No. of Pages : 3

Seat No.	
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F.Y. B.Tech. (All Branches) (Semester - I/II) (New) (CBCS)
Examination, December - 2023
ENGINEERING PHYSICS
Sub. Code : 71811

Day and Date : Friday, 29 - 12 - 2023
Time : 10.30 a.m. to 01.00 p.m.

Total Marks : 70

- Instructions :
- 1) Attempt any three questions from each Section.
 - 2) Figures to the right indicate full marks.
 - 3) Avogadro's Number, $N = 6.023 \times 10^{26} / \text{kg.atom}$
Mass of electron $9.1 \times 10^{-31} \text{kg}$
Charge of electron $= 1.6 \times 10^{-19} \text{C}$
Speed of light, $c = 3 \times 10^8 \text{m/s}$
Plank's constant, $h = 6.63 \times 10^{-34} \text{J.s}$

SECTION - I

Q1) Answer the following questions :

- a) What is grating? Explain the use of grating to determine wavelength of different spectral lines in mercury. [6]
- b) Explain the phenomenon of double refraction and distinguish between positive and negative crystals. [6]

Q2) Answer the following questions.

- a) Explain the following terms in brief [6]
 - i) Population inversion
 - ii) Metastable state
 - iii) Stimulated emission
- b) A Silica optical fiber with a core diameter large enough to be considered by ray theory analysis has a core refractive index of 1.5 and cladding refractive index of 1.47. Determine critical angle, numerical aperture and acceptance angle for optical fiber in air medium. [5]

P.T.O.

Q3) Answer the following questions. [6]

a) Define and explain in brief :

- i) reverberation
- ii) reverberation time
- iii) absorption Coefficient

b) A room has a volume of 1000 m^3 , the total wall area is 200 m^2 , the total floor area is 100 m^2 , and the total ceiling area is 100 m^2 . The average sound absorption coefficient for wall is 0.02, ceiling is 0.8 and floor is 0.05. Determine the average absorption coefficient and the reverberation time. [5]

Q4) Answer any two from the following questions.

- a) i) Find the minimum Number of lines in a plane diffraction grating required to just resolve the sodium doublet of wavelength 5890 \AA and 5896 \AA in the second order. [3]
- ii) Calculate the specific rotation if the plane of polarization is turned through 26.4° , when travel through 20 cm length 20% sugar solution. [3]
- b) What are advantages of optical fiber? [6]
- c) Explain various factors affecting acoustics of hall with their remedy. [6]

SECTION - II

Q5) Answer the following questions :

- a) i) Derive Bragg's Law for X- ray diffraction. [4]
- ii) The first order reflection from the plane of NaCl is obtained at an angle of 20° with the incident beam. If the interplanar spacing is 2.5 \AA , then calculate the wavelength of X- rays used. [2]
- b) i) Derive the relation between Lattice constant (a) & density (ρ) of cubic crystal. [3]
- ii) Copper has FCC structure and the atomic radius is 1.278 \AA . Calculate its density. Given-Molecular weight of copper is 63.54. [3]

Q6) Answer the following questions.

[6]

- a) Define nano material and explain top down and bottom-up approach of synthesis of nano material.
- b) Discuss the applications of nano material.

[5]

Q7) Answer the following questions.

a) What is dual nature of radiation? Derive an expression for de Broglie wavelength in terms of kinetic energy (E). [6]

b) X-rays of 1 \AA wavelength are scattered from a carbon block and the scattered radiation is viewed at an angle 90° to the incident beam. Find Compton shift $\Delta\lambda$ and kinetic energy imparted to the recoiling electron. [5]

Q8) Answer any two from the following questions.

a) Define atomic radius and find its values for SC, BCC & FCC Structure. [6]

b) What do you mean by tunneling of an electron? With neat diagram explain construction and working of scanning tunneling Microscope. [6]

c) Write note on properties of matter waves. [6]



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Summer Examination March - 2023

Subject Name: B.Tech. CBCS_71811 - Engineering Physics_03.08.2023_10.30 AM To 01.00 PM

Subject Code: 71811

Day and Date: - Thursday, 03-08-2023
Time: - 10:30 am to 01:00 pm

Total Marks: 70

Instructions.:

- 1) Figures to the right indicate full marks
- 2) Use of Scientific calculator is allowed
- 3) Assume suitable data wherever necessary and mention it boldly

Special Instruction.:

1. Section I : Question No. 1 to 4 2. Section II : Question No. 5 to 8 3. Attempt any three questions from each section. Given Data: a) Avogadro's number, $N=6.023 \times 10^{26}/\text{kg. atom}$ b) Mass of electron $=9.1 \times 10^{-31} \text{ kg}$ c) Charge on electron $=1.6 \times 10^{-19} \text{ C}$ d) Speed of light $C=3 \times 10^8 \text{ m/s}$ a) Planck's Constant, $h= 6.63 \times 10^{-34} \text{ J.S}$

- Q.1.** [12]
- a) Define Grating element and obtain the equation for maximum intensity for diffraction grating. (06)
 - b) Diffraction Grating has 6000 lines per cm. Find the angular separation of two yellow lines of wavelength 5770 AU and 5791 AU in second order. (06)
- Q.2.** [11]
- a) What is holography? Explain the construction and reconstruction of hologram. (06)
 - b) Explain the term: acceptance angle, acceptance cone, Numerical aperture. (05)
- Q.3.** [11]
- a) Explain basic requirements for acoustically good hall. (06)
 - b) The Volume of the hall is 3398.4 m³ and its total absorption equal to 92.90 O.W.U. Entry of people inside the hall raises the absorption by 185.50 O.W.U. Calculate the change in the reverberation time. (05)
- Q.4. Answer any two from the following questions.** [12]
- a) Explain construction and working of Laurent's half shade polarimeter. (06)
 - b) 1) Describe the basic principle of fiber optics. (03)
2) Determine the numerical aperture of a step index fiber, when the core refractive index is 1.5 and cladding refractive index is 1.48. (03)
 - c) 1) Explain the term reverberation. (03)
2) A hall has volume of 7500 m³. It is required to have reverberation time of 1.5 sec. what should be the total absorption in the hall (03)
- Q.5.** [12]
- a) Explain axis of symmetry and plane of symmetry in a cubic crystal system. (06)
 - b) 1) Calculate the interplanar spacing for (221) planes in simple cubic lattice, where lattice constant is 4.2 AU. (03)
2) Draw (010), (011), (111) planes of a cubic crystal system (03)
- Q.6.** [11]
- a) With neat diagram explain construction and working of scanning tunnelling Microscope. (06)
 - b) What is bottom-up approach for production of nano material? Explain colloidal method of production of nano material. (05)

Q.7.

- a) State Compton effect. With suitable diagram explain experimental arrangement used to study Compton effect. (06)
- b) 1) Calculate the de Broglie wavelength of the earth, taking the mass of the earth to be 6×10^{24} kg. Orbital velocity of the earth 3×10^4 m/s. (02)
- 2) Calculate the de Broglie wavelength associated with an electron accelerated through energy of 2 keV. (03)

[11]

Q.8. Answer any two from the following questions.

- a) Define atomic radius and find its values for SC, BCC, & FCC Structure. (06)
- b) Why properties of material changes at nano level? State and explain different properties of nano-material. (06)
- c) State and explain Heisenberg's uncertainty principle for position and momentum. (06)

[12]

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Seat No.

QP Code: 3243QP

Total No. of Pages: 2

January - February (Winter) Examination - 2023

Subject Name: B.Tech. CBCS_71811_Engineering Physics_16.03.2023_10.30 AM To 01.00 PM

Subject Code: 71811

Day and Date: Thursday, 16-03-2023
Time: 10:30 am to 01:00 pm

Total Marks: 70

Instructions.:

- 1) Figures to the right indicate full marks
- 2) Use of Scientific calculator is allowed
- 3) Assume suitable data wherever necessary and mention it boldly

Special Instruction.:

1. Section I : Question No. 1 to 4 2. Section II : Question No. 5 to 8 3. Attempt any three questions from each section. Given Data: a) Avogadro's number, $N=6.023 \times 10^{26}$ /kg. atom b) Mass of electron $=9.1 \times 10^{-31}$ kg c) Charge on electron $=1.6 \times 10^{-19}$ C d) Speed of light $C=3 \times 10^8$ m/s e) Planck's Constant, $h=6.63 \times 10^{-34}$ J.S

- Q.1.**
- a) What is grating? Explain the use of grating to determine wavelength of different spectral lines of mercury (06) [12]
 - b) Explain the phenomenon of double refraction and distinguish between positive and negative crystals (06)
- Q.2.**
- a) Explain the following terms in brief (06) [11]
1) Population inversion 2) Metastable state 3) Stimulated emission
 - b) A Silica optical fiber with a core diameter large enough to be considered by ray theory analysis has a core refractive index of 1.5 and cladding refractive index of 1.47. Determine numerical aperture and acceptance angle for optical fiber. (05)
- Q.3.**
- a) Define and explain in brief 1) reverberation 2) reverberation time 3) absorption Coefficient (06) [11]
 - b) A room has a volume of 1000 m³, the total wall area is 200 m², the total floor area is 100 m², and the total ceiling area is 100 m². The average sound absorption coefficient for wall is 0.02, ceiling is 0.8 and floor is 0.05 Determine the average absorption coefficient and the reverberation time. (05)
- Q.4. Answer any two from the following questions.** [12]
- a) 1) Find the minimum Number of lines in a plane diffraction grating required to just resolve the sodium doublet of wavelength 5890 A.U. and 5896 A.U. in the second order. (03)
 - 2) Calculate the specific rotation if the plane of polarization is turned through 26.40 deg., when travel through 20 cm length 20% sugar solution (03)
 - b) What are the advantages of optical fiber? (06)
 - c) Explain various factors affecting acoustics of hall with their remedy. (06)
- Q.5.** [12]
- a) 1) Derive Bragg's Law for X-ray diffraction. (04)
 - 2) The first order reflection from the plane of NaCl is obtained at an angle of 20 deg. with the incident beam. If the interplanar spacing is 2.5 A.U., then calculate the wavelength of X-rays used. (02)
 - b) 1) Derive the relation between Lattice constant (a) & density (ρ) of cubic crystal. (03)
 - 2) Copper has FCC structure and the atomic radius is 1.278 A.U. Calculate its density. Given- Molecular weight of copper is 63.54 (03)

- Q.6. [11]
a) Define nano material and explain with neat diagram top down and bottom-up approach of synthesis of nano material. (06)
b) Discuss the applications of nano material. (05)
- Q.7. [11]
a) What is dual nature of radiation? Derive an expression for de Broglie wavelength in terms of kinetic energy (E). (06)
b) X-rays of 1 A.U. wavelength are scattered from a carbon block and the scattered radiation is viewed at an angle 90 deg. to the incident beam. Find Compton shift $\Delta\lambda$ and kinetic energy imparted to the recoiling electron. (05)
- Q.8. [12]
Answer any two from the following questions.
a) Define atomic radius and find its values for SC, BCC, & FCC Structure. (06)
b) What do you mean by tunneling of an electron? With neat diagram explain construction and working of scanning tunneling Microscope. (06)
c) Write note on properties of matter waves. (06)