

11N502

Roll No. _____

Total No. of Pages: **3**

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B. Tech. I - Sem. (New Scheme) (Main) Exam., May - 2023

All Branch

1FY1 - 02 Engineering Physics

Common to all Branches

Time: 3 Hours

Maximum Marks: 70

Instructions to Candidates: ersahilkagyan.com

Part - A: Short answer questions (up to 25 words) 10×2 marks = 20 marks.
All ten questions are compulsory.

Part - B: Analytical/Problem solving questions 5×4 marks = 20 marks.
Candidates have to answer five questions out of seven.

Part - C: Descriptive/Analytical/Problem Solving/Design questions 3×10 marks = 30 marks. Candidates have to answer three questions out of five.

Schematic diagrams must be shown wherever necessary. Any data you feel missing may suitably be assumed and stated clearly. Units of quantities used/calculated must be stated clearly.

Use of following supporting material is permitted during examination.
(Mentioned in form No. 205)

1. NIL

2. NIL

PART - A

- Q.1 State the essential difference between interference and diffraction of light. [2]
- Q.2 What is physical significance of wave function? [2]
- Q.3 The uncertainty principle imposes no restriction on the measurements related to macroscopic objects. Comment. [2]
- Q.4 Explain how X-ray diffraction can be used to characterize nano particles? [2]

- Q.5 / Sketch a neat diagram of Fraunhofer diffraction at a single slit. [2]
- Q.6 / State the Maxwell's equations in their differential form. [2]
- Q.7 Explain the terms - [2]
- (i) Basis
 - (ii) Space lattice
 - (iii) Unit cell
 - (iv) Space group
- Q.8 Write a short note on Davisson Germer's experiment. [2]
- Q.9 / Write two examples of type-I and type-II superconductors. [2]
- Q.10 / What is meant by numerical aperture for an optical fibre? [2]

PART - B

- Q.1 Explain how you can distinguish between linearly, circularly and elliptically polarized light. [4]
- Q.2 / Explain how Newton's rings experiment can be used to find the wavelength of the light source used. [4]
- Q.3 What is de Broglie's hypothesis? Calculate the de-Broglie wavelength associated with electrons, which are accelerated by a voltage of 50 kV. [4]
- Q.4 Explain top down and bottom up approach for the synthesis of nano materials. [4]
- Q.5 Calculate the Zero-point energy for a particle in an infinite potential well for an electron confined to a 1 nm atom. [4]
- Q.6 / Explain the principle and working of a He-Ne laser by clearly drawing the energy level diagrams. [4]
- Q.7 / What is Hall effect and its importance in semiconductor industry? [4]

PART - C

- Q.1 What are orthogonal wave functions? Write the Schrodinger equation for particle in a box and solve it to obtain energy Eigen values and Eigen functions. [10]
- Q.2 (a) Explain what is population inversion and pumping in lasers? [4]
(b) With neat diagrams, describe the principle, construction and working of semiconductor laser. Also, discuss the application of lasers. [6]
- Q.3 (a) What is diffraction grating? Describe how the wavelength of the monochromatic light is determined using it. [5]
(b) Find the number of orders visible if the wavelength of the incident radiation is 5000 \AA and number of lines on the grating are 1000 in one centimeter. [5]
- Q.4 (a) How would you produce polarized light by reflection? What is Brewster's Law? Calculate the angular position of the sun above the horizon so that light reflected from a calm lake is completely polarized. The refractive index of water is 1.33. [5]
(b) How would you ascertain the correct state of polarization (i.e. circularly, elliptically, plane, unpolarized, partial polarized etc.) of an unknown incoming beam of light with the help of a rotating Nicol prism and a quarter wave plate? [5]
- Q.5 (a) Why semiconductors are doped? Giving suitable energy level diagram explain how doping by donors improve conductivity of a semiconductor. [7]
(b) Explain Meissner's effect. [3]
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