11N502

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11N502

B. Tech. I - Sem. (New Scheme) Main Exam., July – 2022

1FY1 – 02 Engineering Physics

Common to all Branches

Time: 2 Hours **Maximum Marks: 70**

Min. Passing Marks:

Instructions to Candidates:

Part – A: Short answer questions (up to 25 words) 5×3 marks = 15 marks. Candidates have to answer 5 questions out of 10.

Part – B: Analytical/Problem Solving questions 3×5 marks = 15 marks. Candidates have to answer 3 questions out of 7.

Part – C: Descriptive/Analytical/Problem Solving questions 2×20 marks = 40 marks. Candidates have to answer 2 questions out of 5.

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 If the uncertainty in the location of particle is equal to de-Broglie wavelength, then calculate the uncertainty in its velocity.

Q.2 What is meant by acceptance angle for an optical fibre?

Q.3 Write down the applications of lasers in medical science.

Q.4 Why good conductors are bad superconductors?

Q.5 The first order Bragg's reflections of X-rays with wavelength 0.58Å are obtained at an angle of 9.15° with the set of parallel planes of a crystal. Calculate the inter-planar spacing of the crystal.

Q.6 What is the difference between direct and indirect band semiconductors?

Q.7 Name the material characterization technique which is based on the concept of the quantum mechanical tunneling.

Q.8 Define poynting vector in an electromagnetic field.

Q.9 What is the energy of a photon whose momentum is the same as that of a proton whose kinetic energy is 10 MeV? Rest mass of the proton is 1000 MeV / c^2.

Q.10 Explain the terms: (i) Spontaneous emission (ii) Stimulated emission

PART– B

Q.1 State and explain Lorentz force and Faraday's law of electromagnetic induction.

Q.2 Mobilities of electrons and holes in a sample of intrinsic germanium at 300 K are 0.36 $m^2V^{-1}s^{-1}$ and 0.17 $m^2V^{-1}s^{-1}$. If the conductivity of the specimen is 2.12 $\Omega^{-1}m^{-1}$, estimate the intrinsic carrier density.

Q.3 Explain spatial and temporal coherence.

Q.4 What do you understand by the term 'wave function'? Define Eigen value and Eigen function.

Q.5 What are nano materials? Give some applications of nano materials.

Q.6 An electron is put in a cubical box each of side 2 Å. Find the value of its momentum and energy for the ground state and first excited sate.

Q.7 What do you understand by electromagnetic waves? Define interference, diffraction, refraction and polarization of the electromagnetic radiation.

PART–C

Q.1 Establish time dependent Schrodinger wave equation and further deduce the time independent equation from it.

Q.2 (a) Explain Fresnel diffraction.

(b) Briefly explain Fraunhofer diffraction in single slit experiment.

(c) Examine if two spectral lines of wavelengths 5890 Å and 5893 Å can be clearly resolved in the (i) First order and (ii) Second order by a diffraction grating 2 cm wide and having 425 lines/cm.

Q.3 (a) Write the Maxwell's equations in their differential form and use them to deduce the integral form of the equation. Briefly explain the physical importance of the Maxwell's equations.

(b) What is displacement current density $\overrightarrow{J_D}$? Explain how Maxwell used the continuity equation to introduce the term $\overrightarrow{J_D}$ in order to modify Ampere's law, also explain how did the introduction of the term $\overrightarrow{J_D}$ revolutionize physics?

Q.4 (a) Explain the principle of propagation of light through an optical fiber.

(b) What is attenuation in fibers? Discuss the attenuation of signals in optical fibers.

(c) Explain the variation of attenuation of signals in a fibre as a function of wavelength.

Q.5 (a) What is diffraction grating? Describe, how the wavelength of monochromatic light is determined using it?

(b) Find the number of orders visible if the wavelength of the incident radiation is 5000Å and number of lines on the grating are 1000 in one centimeter.
