11502/21502

Roll No. _____ Total No. of Pages: 3

# 11502/21502

**B. Tech. I - Sem. Main/Back & II–Sem. Back Exam., March – 2021**

**BSC**

**1FY2-02/2FY2-02 Engineering Physics**

**Time: 3 Hours** **Maximum Marks: 160**

**Min. Passing Marks:**

***Instructions to Candidates:***

***Part – A:*** *Short answer questions (up to 25 words) 10 × 3 marks = 30 marks. All **ten** questions are compulsory.*

***Part – B:*** *Analytical/Problem solving questions 5 × 10 marks = 50 marks. Candidates have to answer **five** questions out of **seven**.*

***Part – C:*** *Descriptive/Analytical/Problem Solving questions 4 ×20 marks = 80 marks. Candidates have to answer **four** questions out of **five**.*

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

1. NIL 2. NIL





## PART – A

Q.1 Mention the difference between Fresnel and Fraunhofer class of diffraction. [3]

Q.2 Explain Rayleigh criterion of Resolution. [3]

Q.3 Write important application of Hall Effect. [3]

Q.4 Explain the reason for high intensity of a laser. [3]

Q.5 What is the physical meaning of maximum angle of acceptance for an optical fiber? [3]

Q.6 Explain the advantage of using broad source of light in NR experiment instead of a point source of light. [3]

Q.7 Write the characteristics of wave function. [3]

Q.8 What are matter waves? How they are experimentally verified? [3]

Q.9 What is the difference between Spontaneous and Stimulated emission? [3]

Q.10 Give Poisson' and Laplace's equations. [3]

## PART – B

Q.1 Draw labelled diagram of a Michelson's Interferometer. How shall we use it to measure wavelength of a monochromatic source of light? [10]

Q.2 What is meant by resolving power of a grating? Derive an expression for resolving power of grating & on what factor does it depend? [10]

Q.3 Describe nature and origin of various forces existing between atoms of solid crystals. Explain the formation of covalent, ionic and metallic bonding in solids. [10]

Q.4 Give the formulation of time-dependent Schrodinger's equation for a free particle. Discuss the probability density and normalization of the wave function. [10]

Q.5 What is coherence? Explain temporal and spatial coherence. [10]

Q.6 A laser beam having a wavelength of 8000 Å and aperture 0.5 cm is set to moon. If distance of moon from earth is $4 \times 10^8$ m, then calculate (a) Half angular spread of the beam and (b) Areal spread of the beam when it reaches the moon. [10]

Q.7 If $\vec{A} = xz^3\hat{i} - 2x^2yz\hat{j} + 2yz^4\hat{k}$, find curl at point (1, - 1, 1). [10]

## PART – C

Q.1 (a) What is X-ray diffraction? Deduce Bragg's Law for the diffraction of X-ray in a crystal, how Bragg's spectrometer is used to determine the wavelength of monochromatic X-rays? [14]

(b) Assuming that there are $5\times10^{28}$ atoms/$m^3$ in copper, find the Hall coefficient. [6]

Q.2 Write down the Schrödinger's time independent wave equation for a free particle confined in a one dimensional box of size 'a'. Obtain Eigen values and normalized wave function for this particle. [20]

Q.3 What is an optical fiber? What do you mean by numerical aperture of an optical fiber? Find an expression for the Numerical aperture of a step index optical fiber. Write the advantages of optical fiber also. [20]

Q.4 What is meant by population inversion? Give the essential requirements of any laser system. Explain how these requirements are achieved. Explain the working of semiconductor laser with necessary theory. Write down the applications of semiconductor laser. [20]

Q.5 What are Maxwell's Equations? Derive Maxwell's Equations in an Isotropic medium and in free space. [20]