1E2402

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B. Tech. II - Sem. (Main / Back) Exam., March – 2021
BSC
2FY2-02 Engineering Physics

Time: 2 Hours

[To be converted as per scheme]
Max. Marks: 110
Min. Marks: 39

Instructions to Candidates:

Attempt all five questions from Part A, four questions out of seven questions from Part B and two questions out of five from Part C.

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

(Answer should be given up to 25 words only)   [10×3=30]

All questions are compulsory

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Q.1 What is interference of light?

Q.2 Explain Bragg's law.

Q.3 Explain temporal and spatial coherence.

Q.4 Explain normalized and orthogonal wave functions.

Q.5 Write the basic postulates of wave function.

Q.6 Explain the meaning of resolving power.

Q.7 What is X-ray diffraction?

Q.8 Explain Bio-Savart law.

Q.9 Why are Newton's rings circular in shape?

Q.10 What is the meaning of acceptance angle?

PART – B

(Analytical/Problem solving questions) [4×10=40]
Attempt any four questions

Q.1 What are Newton's rings? Explain the formation of Newton's ring in reflected light. Prove that in reflected light the diameters of the dark rings are proportional to the square root of the natural numbers.

Q.2 A diffraction grating has 5000 lines per cm and the total ruled width is 5 cm. Calculate dispersion for a wavelength of 5000 Å in the second order.

Q.3 Find the lowest energy of an electron confined to move in a one dimensional potential box of width 1 Å. https://www.rtuonline.com

Q.4 A particle is in cubical box of length 'a' in its ground state. Find the probability that a particle will be found in a volume defined by –

$$0 \le x \le \frac{a}{2}, 0 \le y \le \frac{a}{2}, 0 \le z \le \frac{a}{2}$$

Q.5 Calculate the coherence time and coherence length of white light of wavelength range from 3500 Å to 6500 Å.

Q.6 Distinguish between spontaneous and induced emissions. How does induced emission dominate in He – Ne laser?

Q.7 Write short notes on the following –

   (a) Divergence and Curl of static magnetic field

   (b) Covalent and Metallic bonding

PART – C

Q.1 (a) Describe the construction and working of Michelson's interferometer.

(b) Find the difference between Newton's rings and Michelson's interferometer.

Q.2 Write Schrodinger's equation for a particle of mass 'm' trapped in one dimensional box of size 'a'. Write an expression for its energy eigen values. How would solutions get modified if the particles were in a three-dimensional cubical box of side 'a'?

Q.3 What is an optical fibre? Describe the construction and working of an optical fibre. Find an expression for the numerical aperture of a step index optical fibre.

Q.4 (a) Draw a neat labelled diagram of semiconductor laser and explain its working.

(b) Explain the reasons for the following properties of laser –

(i) High directionality

(ii) High intensity

Q.5 (a) Derive Maxwell equation in differential form.

(b) Write a short note on Poynting vector.

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