

Total No. of Questions : 6]

PE12173

[6581]-2404

EE.

SEAT No. :

[Total No. of Pages : 8

BSC-102-BES : ENGINEERING PHYSICS
(2024 Pattern) (Credit System) (Semester - I/II)

Time : 2½ Hours]

[Max. Marks : 60

Instructions to the candidates:

- 1) Q.1 is compulsory. Attempt any one of the remaining questions.
- 2) Figures to the right indicate full marks.
- 3) Neat diagrams must be drawn wherever necessary.
- 4) Use of non-programmable electronic pocket calculators is allowed.
- 5) Assume suitable data, if necessary.

Physical Constants:

- Plank's constant, $h = 6.63 \times 10^{-34} \text{ J.s}$
- Mass of electron, $m_e = 9.1 \times 10^{-31} \text{ Kg}$
- Charge on electron, $e = 1.6 \times 10^{-19} \text{ C}$

Q1) Write the correct option with answers for the following questions (1 mark each). **[10]**

- a) The propagation of light in an optical fiber is based on the principle of:
 - i) Total Internal Refraction
 - ii) Total Intervened Reflection
 - iii) Total Internal Reflection
 - iv) Through Internal Refraction
- b) The process of raising the atoms from a lower energy state to a higher one to create population inversion is called:
 - i) Pumping
 - ii) Stimulated emission
 - iii) Spontaneous emission
 - iv) Absorption
- c) The De-Broglie's wavelength of an electron is _____ to square root of accelerating potential:
 - i) Equal
 - ii) Inversely proportional
 - iii) Directly proportional
 - iv) Independent

P.T.O.

- d) The full form of STM is:
- Scientific technical microscope
 - Scanning tunneling microscope
 - Super tensile microscope
 - None of the above
- e) In positive crystal the velocity of the O-ray, except optic axis is:
- Half of the velocity of the E-ray
 - Less than the velocity of the E-ray
 - Greater than the velocity of the E-ray
 - None of the above
- f) If a thin film appears dark in reflected light, it will appear _____ in transmitted light as:
- Dark
 - Bright
 - Partially dark
 - Invisible
- g) In intrinsic semiconductors Fermi level lies _____
- Close to Valance Band
 - Close to Conduction Band
 - Exactly at center between valance band and conduction band
 - None of the above
- h) In Hall effect, the Hall voltage develops is _____ to both Transverse Magnetic field and Current.
- Incline
 - Parallel
 - Equal
 - Perpendicular
- i) The minimum magnetic field required to destroy superconductivity is called:
- Critical magnetic field
 - Applied magnetic field
 - External magnetic field
 - None
- j) Physical Vapor Deposition (PVD) method is known as:
- Top-down method
 - Chemical etching method
 - Lithography method
 - Bottom-up method

Q2) a) Solve any one.

i) With a neat labeled diagram Explain construction and working of CO_2 laser. [5]

ii) Define: [5]

- 1) Stimulated emission
- 2) Population inversion
- 3) Resonant cavity
- 4) Metastable state
- 5) Pumping

b) Solve any one.

i) Differentiate between step index and graded index optic fibers. (Any five points). [5]

ii) Define: [5]

- 1) Numerical Aperture,
- 2) Angle of acceptance, Calculate the acceptance angle and numerical aperture for an optical fiber whose core R.I. is 1.55 and cladding R.I. is 1.48.

Q3) a) Solve any one.

i) Derive Schrodinger's time Independent wave equation. [5]

ii) State properties of Matter waves. (any 3) [5]

Calculate the de-Broglie wavelength of an electron when accelerated with the P.D. of 10 KV

b) Solve any one.

i) Obtain relation for De-Broglie's Wavelength in terms of Kinetic Energy. Find lowest energy of an electron which is confined in a Rigid box of length $1 \text{ \AA}$. [5]

ii) With a neat diagram explain working of Scanning Tunneling Microscope. [5]

Q4) a) Solve any one.

i) Derive the equation of path difference between reflected rays when monochromatic light of wavelength ' λ ' falls with angle of incidence ' i ' on the uniform thickness film of refractive index μ . [5]

ii) Explain applications of interference: Anti-reflection coating. [5]
Fringes of equal thickness are obtained in a thin glass wedge of Refractive Index 1.52. The fringe spacing is 1 mm and wavelength of light is $5893 \text{ \AA}$. Calculate the angle of wedge in seconds of an Arc.

b) Solve any one.

i) Explain the Huygens's Wave Theory of Double Refraction. [5]

ii) Explain the classification of the solids into conductors, semiconductors and insulators on the basis of band theory of solids with neat Diagrams. [5]

Q5) a) Solve any one.

i) Draw neat labelled Energy Band diagram in following modes for PN junction diode. [5]

1) Reverse biased mode

2) Forward biased mode

ii) Explain production of ultrasonic waves by piezoelectric method. [5]

b) Solve any one.

i) What are Ultrasonics? Give any two the properties of Ultrasonic waves. An ultrasonic pulse is sent through a block of copper. The echo pulse is recorded after $5\mu\text{s}$. If the velocity of ultrasonic in copper is 5500 m/s , calculate the thickness of the copper block. [5]

ii) Explain the following properties of Nano Particles. [5]

1) Mechanical Property

2) Electrical Property

Q6) a) Solve any one.

i) Explain the applications of Nano technology in. [5]

1) Targeted Drug delivery and

2) Automobile field

ii) Distinguish between types of superconductors. (Minimum 5 points) [5]

b) Solve any one.

i) Explain electrical and optical properties of nanoparticles. [5]

ii) Explain what is Meissner effect? [5]

The critical temp. For lead is 7.2 K . However at 5 K it loses its superconductivity when subjected to a magnetic field of $3.3 \times 10^4\text{ A/m}$. Find the maximum value of critical magnetic field which will allow to retain its superconductivity at 0 K .

❖❖❖❖