I B. Tech I Semester Regular/Supplementary Examinations, February - 2023
APPLIED PHYSICS
(Common to CSE, CSE-CS&T, IT , CSE-CS, CSE-IOT&CS incl BCT, CSE-CS & BS, CSE-IOT, CS, IOT)

Time: 3 hours   Max. Marks: 70

Answer any FIVE Questions ONE Question from Each Unit
All Questions Carry Equal Marks
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UNIT-I

1. a) Give the analytical treatment of interference of light.   [5M]
    b) Obtain the condition for maximum and minimum intensity of light in Newton's   [9M]
        ring experiment.

(OR)

2. a) Obtain the condition for primary and secondary maxima in Fraunhofer   [10M]
        diffraction due to a single slit.
    b) Derive and expression for width of the central maxima.   [4M]

UNIT-II

3. a) What is meant by LASER? Explain the characteristics of lasers? Write a few   [9M]
        applications of Lasers.
    b) Explain the terms absorption, spontaneous and stimulated emission.   [5M]

(OR)

4. a) Describe the construction of an optical fiber and give dimensions of various [9M]
        parts.
    b) Explain the principle behind the functioning of an optical fiber.   [5M]

UNIT-III

5. a) Derive the time dependent Schrodinger wave equation.   [9M]
    b) What are matter waves? Explain their properties.   [5M]

(OR)

6. a) Explain the quantum free electron theory of metal.   [9M]
    b) Explain salient features of quantum free electron theory.   [5M]

UNIT-IV

7. a) Describe the phenomenon of electronic polarization and obtain the expression [9M]
        for electronic polarizability.
    b) Show that the relation between dielectric constant and susceptibility is Er = 1+x   [5M]
        .

(OR)

8. a) Define the magnetic moment? Explain the origin of magnetic moment at the   [10M]
        atomic level.
    b) Define the terms susceptibility and magnetic flux density.   [4M]

UNIT-V

9. a) Derive an expression for the density of holes in the valence band of an intrinsic   [10M]
        semiconductor.
    b) Write a note on intrinsic semiconductors.   [4M]

(OR)

10. a) Describe the BCS theory of superconductors.   [10M]
    b) Write a short note on Isotopic effect and energygap in semiconductor.   [4M]

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UNIT-I

1. a) Explain the Fraunhofer diffraction due to single slit.   [9M]

    b) Derive the principle and working of interference in thin films.   [5M]

(OR)

2. a) With the help of neat diagram, explain the working of Nicol's prism in half wave   [9M]
        plate mode.
    b) Explain the phenomenon of double refraction.   [5M]

UNIT-II

3. a) Write the principle and working of He-Ne laser with the neat diagram.   [9M]

    b) Write about spontaneous and stimulated emission.   [5M]

(OR)

4. a) Classify and explain the optical fibers based on refractive index profile.   [7M]

    b) Discuss about the acceptance angle in optical fibers.   [7M]

UNIT-III

5. a) Discuss about the duel nature of matte.   [7M]

    b) Explain the Heisenberg Uncertainty principle   [7M]

(OR)

6. a) Discuss the Classical free electron theory.   [9M]

    b) Explain the density of states (3D).   [5M]

UNIT-IV

7. a) Explain different types of polarizations.   [7M]
    b) Derive the Clausius-Mossotti equation.   [7M]

(OR)

8. a) Explain different types of magnetic materials with properties   [9M]
    b) Explain hysteresis loop in magnetic materials.   [5M]

UNIT-V

9. a) Write the difference between intrinsic and extrinsic semiconductors.   [5M]

    b) Derive the equation for density of charge carriers in extrinsic semiconductors   [9M]

(OR)

10. a) What is a superconductor? Write the properties and applications of   [7M]
        superconductors.
    b) Write the Meissner effect in superconductors.   [7M]

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UNIT-I

1. a) Discuss in detail Fraunhofer diffraction due to double slit and draw the intensity distribution curve.   [10M]
    b) Discuss the theory of diffraction grating   [4M]

(OR)

2. a) Give the principle and working of Nicol's prism in quarter wave plate with neat diagram.   [10M]
    b) Give a brief note on double refraction.   [4M]

UNIT-II

3. a) Derive the relation between probabilities of spontaneous emission and stimulated emission in terms of Einstein coefficients.   [10M]
    b) Write a few applications of lasers.   [4M]

(OR)

4. a) What is meant by acceptance angle for a optical fiber? Obtain mathematical expression for acceptance angle and numerical aperture.   [10M]
    b) Explain different types of optical fibers.   [4M]

UNIT-III

5. a) Derive the time independent Schrodinger wave equation.   [10M]
    b) Explain the physical significance of wave equation.   [4M]

(OR)

6. a) Explain the concept of effective mass of an electron.   [9M]
    b) Explain the origin of energy bands in solids.   [5M]

UNIT-IV

7. a) Describe the phenomenon of ionic polarization and obtain the expression for ionic polarizability.   [10M]
    b) Briefly explain piezoelectricity.   [4M]

(OR)

8. a) Explain the Domain theory of Ferromagnetism.   [9M]
    b) Explain the soft and hard magnetic materials with properties.   [5M]

UNIT-V

9. a) Derive the expression for concentration of electrons in the valence band of an intrinsic semiconductor.   [10M]
    b) Write the difference between intrinsic and extrinsic semiconductors.   [4M]

(OR)

10. a) Explain the thermal properties of superconductors.   [8M]
    b) Write the applications of super conductors.   [6M]

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Time: 3 hours   Max. Marks: 70

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UNIT-I

1. a) Give the theory of interference and obtain the condition for constructive and destructive interference. [9M]
   b) In Newton rings experiment, the diameter of the 10th ring change from 1.40 cm to 1.27 cm when a liquid is introduced between the lens and the plate. Calculate the refractive index of the liquid. [5M]

(OR)

2. a) Explain the formation of spectra by plane diffracting grating. [9M]
   b) Derive the expression for resolving power of grating. [5M]

UNIT-II

3. a) With the help of suitable diagrams, explain the principle and working of Ruby laser. [9M]
   b) Describe the various methods of pumping lasers with examples. [5M]

(OR)

4. a) Draw the block diagram of fiber optic communication system and explain the function of each block. [9M]
   b) Write the applications of optical fibers. [5M]

UNIT-III

5. a) State and explain Heisenberg Uncertainty principle? [9M]
   b) Explain the properties of matter waves? [5M]

(OR)

6. a) Derive the expression for electrical conductivity based on classical free electron theory. [9M]
   b) Explain the terms mean free path, mean collision time and drift velocity. [5M]

UNIT-IV

7. a) Describe the phenomenon of electronic polarization and obtain an expression for electron polarizability. [9M]
   b) Briefly explain piezoelectricity. [5M]

(OR)

8. a) Explain different types of magnetic materials with properties. [9M]
   b) What are the characteristics of soft magnetic materials? [5M]

UNIT-V

9. a) Explain the intrinsic and extrinsic semiconductors with neat diagrams. [9M]
   b) Derive the relation between diffusion coefficient and mobility of charge carriers. [5M]

(OR)

10. a) Describe BCS theory of superconductors. [9M]
    b) Write a short note on SQUID's. [5M]

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