

Branch :- First Year Common to All Branches
Subject : Engineering Physics (1A2)

Semester :- I & II

List of Constants:

- **Charge of electron, $e = 1.602 \times 10^{-19} \text{ C}$**
- **Mass of electron, $m = 9.1 \times 10^{-31} \text{ Kg}$**
- **Boltzmann Constant, $k = 1.38 \times 10^{-23} \text{ J/K}$**
- **Velocity of light, $c = 3 \times 10^8 \text{ m/s}$**
- **Plank's constant, $h = 6.625 \times 10^{-34} \text{ Js}$**
- **Acceleration due to gravity, $g = 9.8 \text{ m/s}^2$**

UNIT I

- 1) Explain classification of conductor, semiconductor and insulator on the basis of energy band gap.
- 2) What are two types of semiconductors. Define impurity levels in extrinsic semiconductor.
- 3) Draw energy band diagrams of N type and P type semiconductor showing the Fermi levels and Impurity levels at 0K and 100K.
- 4) State Law of Mass Action.
- 5) Explain Zener mechanism and Avalanche mechanism along with effect of temperature on Breakdown Voltage?
- 6) Define band gap energy. Give the classification of solids on the basis of band theory of solids
- 7) Show that in intrinsic semiconductor Fermi level lies midway of forbidden gap i.e. $E_f = E_g/2$.
- 8) Explain working of p-n junction diode in forward bias and reverse bias condition.
- 9) Write down the conductivity equations for intrinsic, p-type & n-type semiconductor specifying the terms used in it.
- 10) Explain formation of depletion region in pn junction diode.
- 11) Explain VI characteristics of pn junction diode.
- 12) What is Hall Effect? Derive the expression for Hall Coefficient and Hall Voltage

- 13) Enlist the materials used for LED. Define striking potential in LED.
- 14) What are the applications of Zener diode.
- 15) Write the applications of pn junction diode.
- 16) Explain the Avalanche and Zener breakdown mechanisms of junction breakdown.
- 17) Write any five applications of LED.

UNIT II

- 1) What is Planck's Photon Hypothesis?
- 2) What are properties of Photons?
- 3) Show that de Broglie's wavelength of an electron accelerated by voltage V is given by $\lambda = 12.27/\sqrt{V} \text{ \AA}$.
- 4) Derive the equation for DeBroglie's wavelength.
- 5) State DeBroglie's hypothesis.
- 6) Explain: a) Absorption,
b) Spontaneous Emission of Radiation
c) stimulated Emission of Radiation
- 7) Derive the equation for Compton shift in case of Compton effect and show that Compton shift is independent of the wavelength of incident radiation.
- 8) Explain experimental setup of Compton effect.
- 9) What are matter waves? Give the properties of matter waves.
- 10) Explain the characteristics of Compton scattering.
- 11) State Compton Effect?
- 12) Explain the concept of binding energy of an electron in an atom on the basis of uncertainty principle.
- 13) Show that electron does not exist in the nucleus.

- 14) State Heisenberg's Uncertainty Principal.
- 15) Why Compton shift is not observed in heavy elements.
- 16) Explain the presence of unmodified line in scattered radiation.
- 17) Derive an expression for Compton shift.

UNIT III

- 1) Explain the motion of electron in transverse electric field and obtain expression for deflection " δ ".
- 2) Show that electron describe parabolic path in the region of transverse electric field.
- 3) Show that deflection of an electron in a uniform transverse magnetic field Confined to a small region is

$$\delta = D'l\left(\frac{e}{m}\right)\frac{B}{V}$$

- 4) Explain the motion of electron in crossed electric and magnetic field.
- 5) Derive the equation for deflection of electron moving in uniform transverse magnetic field when it is extended over a wide region.
- 6) An electron moving uniform magnetic field of 25×10^{-4} wb /m² follows a circular path. If the orbital velocity is 4.367×10^7 m/s, Calculate the radius of the orbit.
- 7) Explain the production of positive rays.
- 8) State four important properties of positive rays.
- 9) Discribe construction and working of brainbridge mass spectrograph. Derive necessary formula & Prove that mass scale is linear
- 10) Derive necessary formula & Prove that mass scale is linear.
 - (i) Time base generator
 - (ii) Trigger circuit
- 11) Draw the well labeled diagram of Cathode Ray Tube.
- 12) Draw the block diagram of CRO and mention it's various parts.

13) Derive the equation for Radius of path traced by an electron in perpendicular magnetic field applied over wide region.

14) What are the applications of CRO.

15) Explain the function of

(i) Vertical amplifier (ii) Horizontal amplifier

16) Explain the motion of electron in transverse uniform magnetic field. Derive an expression for frequency of revolution of electron in the magnetic field.

17) An electron starts from rest and moves freely in an electric field of intensity 2400 v/m.

Determine (1) The force on the electron (2) Acceleration (3) K.E acquired and velocity attained if electron moves through a potential difference of 90V.

UNIT IV

1) What is interference? Explain two types of interference

2) Explain the method of determination of wavelength of monochromatic light by Newton's ring experiment. Derive necessary formula

3) For plane diffraction grating with 5000 lines/inch used to normal incidence, find the longest wavelength of light for which spectrum can be observed

4) What is Dispersive power of grating?

5) What is thin film? Derive conditions for path difference for Interference in parallel thin film due to reflected light

6) Describe the theory of single slit diffraction. Write the conditions for minima and secondary maxima. Draw the figure showing intensity distribution.

7) What is diffraction? Distinguish between Fresnel's and Fraunhofer diffraction.

8) Why central spot of Newton's ring is always dark.

9) State the conditions necessary for obtaining sustainable interference pattern.

10) Explain how refractive index of liquid can be determined by Newton's ring

- 11) Derive an expression for the wavelength of monochromatic light in Newton's ring Experiment.
- 12) In Newton's ring experiment show that radius of dark ring is directly proportional to the square root of the number of rings.
- 13) Explain the experimental arrangement of Newton's ring.
- 14) What is plane diffraction grating?
- 15) How is laboratory grating prepared?
- 16) Define grating element.
- 17) Derive the Grating equation

UNIT V

- 1) Enlist the applications of optical fibers.
- 2) Differentiate between Laser light and conventional light.
- 3) Explain the construction of Fiber optics.
- 4) What is Fiber optics? Explain the Principle of Fiber optics.
- 5) Define the following terms:
 - a) Fractional refractive index changes
 - b) Numerical aperture
 - c) Normalized frequency
- 6) Explain the term : 1) Numerical aperture 2) fractional refractive index change
- 7) Explain types of optical fiber on the basis of refractive index profile.
- 8) Derive the expression for acceptance Angle and acceptance cone for an optical fiber. Give its relation with Numerical aperture
- 9) What is Attenuation? What are the different types of attenuation losses in an optical fiber?
- 10) What are the advantages of fiber optics over conventional communication system?
- 11) What are applications of Laser.
- 12) Determine R.I of core and cladding of optical fiber having refractive index change 1.2×10^{-3} and N.A is equal to 0.22.

- 13) Explain Ruby Laser.
- 14) Explain three level action in Laser.
- 15) Define absorption, spontaneous emission and stimulated emission process.
- 16) What is an optical fiber? Give the conditions for total internal reflection in optical fiber.
- 17) Explain characteristics of Laser.

UNIT VI

- 1) Define Eco.
- 2) State applications of Bernoulli's equation.
- 3) What are the basic requirements of acoustically good hall.
- 4) Define reverberation and time of reverberation.
- 5) Write the Sabine's formula for reverberation time and explain meaning of each term in it.
- 6) What are Ultrasonic waves?
- 7) Enlist the applications of ultrasonic waves.
- 8) Explain the production of Ultrasonic waves by magnetostriction method.
- 9) Explain the production of Ultrasonic waves by Piezoelectric method.
- 10) State the conditions for good acoustics in auditorium?
- 11) Explain piezoelectric generator?
- 12) Distinguish between turbulent flow & streamline flow.
- 13) Explain Poiseuille's Equation for rate of flow of liquid through the capillary tube.
- 14) Explain Stoke's law of viscosity.
- 15) Derive Bernoulli's Equation for flow of liquid
- 16) What is continuity equation?
- 17) Define rate of flow of fluid.