SCIM GOVERNMENT COLLEGE TANUKU W.G.Dt
DEPARTMENT OF PHYSICS
QUESTION BANK
PHYSICS PAPER –IV
(ELECTRICITY, MAGNETISM AND ELECTRONICS)

UNIT-I   ELECTRIC FIELD INTENSITY AND POTENTIAL, DIELECTRICS

1. **Define electric field intensity and obtain an expression for electric field intensity due to uniformly charged sphere? (10M)**
2. Define electric potential and obtain an expression for electric potential due to spherical shell? (10M)
3. **Define the letters D, E, P and obtain the relation between them? (10M)**
4. State and prove Gauss's law? (5M)
5. Obtain an expression for electric field intensity due to an infinite conducting sheet of charge? (5M)
6. Explain the boundary conditions of dielectric surface? (5M)
7. Explain the atomic view of dielectrics? (5M)
8. Derive an expression for capacitance of parallel plate capacitor with dielectric? (5M)

UNIT –II MAGNETOSTATICS, ELECTROMAGNETIC INDUCTION
1. **State Biot-Savart's law and obtain an expression for magnetic field induction due to circular   current loop? (10M)**
2. **State Biot-Savart's law and obtain an expression for magnetic field induction due to solenoid? (10M)**
3. **Define self-induction. Obtain an expression for self-induction due to long solenoid? (10M)**
4. State and explain Biot-Savart's law? (5M)
5. State and explain Hall Effect? (5M)
6. Explain the mutual induction of two coils? (5M)
7. Derive an expression for energy stored in magnetic field? (5M)
8. State and explain Faraday's law? (5M)
9. Define and explain self-induction? (5M)
10. Define and explain mutual-induction? (5M)
11. Explain eddy currents? (5M)

UNIT-III ALTERNATING CURRENTS AND ELECTROMAGNETIC WAVES,MAXWELLS EQUATIONS

1. **Construct L-C-R series resonant circuit .Obtain the equation for resonance frequency and explain with vector diagram? (10M)**
2. Construct L-C-R parallel resonant circuit .Obtain the equation for resonance frequency and explain with vector diagram? (10M)
3. **Derive the differential form of Maxwell's equations from integral form? (10M)**
4. Explain the growth and decay of currents in R-C circuit with vector diagram? (10M)
5. Derive Maxwell's electromagnetic wave equation? (10M)
6. State and explain pointing theorem and also explain Hertz experiment? (10M)
7. Obtain the relation between current and voltage in L-R circuit? (5M)
8. Obtain the expression for power in ac circuit? (5M)
9. Derive the expression for resonant frequency in L-C-R parallel circuit? (5M)
10. Write a brief note on Q-factor? (5M)
11. What arte the integral and differential forms of Maxwell's equations? (5M)

UNIT-IV   BASIC ELECTRONICS

1. **What is Zener diode and explain the current –Voltage characteristics of a Zener Diode? (10M)**
2. **Explain the transistor configurations and obtain the relations between α, β, &Υ. (10M)**
3. Explain the i-v characteristics of a p-n junction diode? (5M)
4. Explain the working of PNP transistor? (5M)
5. Explain the working of NPN transistor? (5M)
6. Explain how the transistor works as amplifier? (5M)
7. Explain the construction and working of LED? (5M)

UNIT-V   DIGITAL ELECTRONICS

1. **State and explain De Morgan's theorems? (10M)**
2. **Explain the construction and working of Half and Full adders? (10M)**
3. How NAND and NOR gates are universal gates? (5M)
4. What are logic gates- explain? (5M)
 5. Explain exclusive –OR gate? (5M)

   Some problems on binary and decimal conversions

UNIT-I   ATOMIC AND MOLECULAR PHYSICS
  1. **Describe the construction and working of Stern- Gerlach experiment? (10M)**
  2. **What is Raman Effect? Explain the experimental demonstration and quantum theory of Raman Effect?**
  3. **What is Zeeman Effect? Explain the experimental study of Zeeman Effect?**
  4. **What are coupling schemes and explain? (5M)**
  5. Explain different quantum numbers associated with vector atom model? (5M)
  6. Explain the concept of vector atom model? (5M)
  7. What are the applications of Raman Effect? (5M)
  8. State and explain Raman Effect? (5M)
  9. What are selection rules for the electron transition? (5M)
  10. What are spectral terms and explain? (5M)
  11. What are intensity rules of spectral lines? (5M)
  12. What are the characteristics of Raman Effect? (5M)

UNIT-II   MATTER WAVES AND UNCERTAINTY PRINCIPLE
  1. **Describe the construction and working of Davisson and Germer experiment? (10M)**
  2. **State and explain Heisenberg's uncertainty principle and derive the relation between energy and time? (10M**)
  3.**State Heisenberg's uncertainty principle and explain the gamma ray microscope**
  4. Derive an expression for the wavelength of matter waves? (5M)
  5. What are the properties of matter waves? (5M)
  6. Derive an expression for group velocity? (5M)
  7. Derive an expression for phase velocity? (5M)
  8. Explain the Bohr's complementary principle? (5M)

UNIT-III   QUANTUM MECHANICS
  1. **Develop time independent wave equation and explain the energy levels of a particle in one dimensional box? (10M)**
  2.**What are the basic postulates of wave mechanics and derive time independent wave   equation? (10M)**
  3. **Explain the energy levels of a particle in three dimensional box? (10M)**
  4. Derive time dependent wave equation? (5M)
  5. What are the properties of wave function and explain its physical significance? (5M)
  6. Explain the terms Operators, Eigen values and Eigen functions? (5M)

UNIT-IV   NUCLEAR PHYSICS
1. **What are different nuclear models and explain liquid drop model? (10M)**
2. **What magic numbers and shell model of the nucleus? (10M)**
3. **Explain the principle, construction and working of G.M.counter? (10M)**
4. **Explain the construction and working of Wilson Cloud chamber? (10M)**
5. Explain the basic properties of nucleus? (10M)
6. Explain the quadrupole moment and magnetic moment? (5M)
7. Explain the binding energy of deuteron? (5M)
8. Explain the shell model with magic numbers? (5M)
9. Explain the Yukawa's meson theory? (5M)
10. What are the properties of nuclear forces? (5M)
11. Explain the classification of elementary particles? (5M)

UNIT-V   NANO MATERIALS AND SUPER CONDUCTIVITY
1. **Explain the classification of Nano materials? (10M)**
2. **What is superconductivity and explain types of super conductors? (10M)**
3. Explain the distinct properties of Nano materials? (10M)
4. What are the applications of Nano materials? (5M)
5. Write a short note on graphene? (5M)
6. Write a short on Nano wires? (5M)
7. **Write a short on carbon Nano tubes? (5M)**
8. **State and explain Meissner's effect? (5M)**
9. State and explain Isotope effect? (5M)
10. What are the applications of super conductors? (5M)
11. Explain the concepts of critical temperature and critical field? (5M)
12. Briefly explain the BCS theory? (5M)