1. (a) State electric potential. Derive an expression for the potential due to a uniformly charged sphere.

(b) Define the terms electric displacement (D), electric field (E), electric polarization (P). Deduce the relation between D, E and P.

Or

2. (a) State Biot-savart’s law? Derive an expression for the magnetic induction inside a long solenoid carrying current.

(b) State and explain Faraday’s laws and deduce the expression for energy stored in a magnetic field.

Or

3. (a) Describe the LCR series circuit? Derive an expression for current?

(b) Derive the wave equation for electromagnetic waves using Maxwell’s electromagnetic equations.

Or

4. (a) Describe the PN junction diode with a neat diagram. Draw the V-I characteristics of PN junction diode.

(b) Explain how Hybrid-parameters can be estimated from transistor characteristics?
5. (a) State and prove De-morgan's theorems. Prove that NAND gate an universal gate?
(b) Explain the operation of Half and Full adder?

Or

SECTION-B

(Short Answer Type Questions) Marks : 5 x 5M = 25 Marks
Answer any five out of the following eight questions

6. State and prove Gauss's law?
7. Define Dielectric constant(K) and susceptibility( )?
8. What is Hall effect? Write any two applications?
9. Write a brief note of self induction and mutual induction with examples?
10. State and prove the Poynting theorem?
11. What is a zener diode? Explain its characteristics?
12. Explain the basic logic gates?
13. Convert the following binary to Decimal
   a) (10100)2 b) (11001)2?

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Professor of Physics
Chairman - Physics Board of Studies (UG)
Andhra University
II Year B.Sc.-PHYSICS - Semester IV – PAPER-5
(MODERN PHYSICS)
(w.e.f 2020-21)

Time: 3 Hours

Max Marks: 75

Section -A
(Essay Type Questions)
Marks: 5 x 10M = 50 Marks

Answer All questions with internal choice from each Unit

1. (a) Explain the theory of stern-Gerlach experiment and discuss its importance?

Or

(b) What is Raman effect? Explain the formation of stoke and antistoke lines on the basics
of quantum theory?

2. (a) Describe Davisson and Germer experiment to demonstrate the wave character of
electrons?

Or

(b) State and explain Heisenberg’s uncertainty principle in terms of position and
momentums and extend it to energy and time?

3. (a) Derive Schrodinger time independent wave equation?

Or

(b) Obtain an expression for the energy levels of a particle in one dimensional potential
well of infinite height?

4. (a) Explain the liquid drop model of the nucleus?

Or

(b) Explain the basic properties of the nucleus?

5. (a) Briefly Explain the size effect surface to volume ratio?
(b) What is superconductivity? Explain type-I and type-II superconductors?

Or

SECTION-B

(Short Answer Type Questions) Marks : 5 x 5M = 25 Marks

Answer any five out of the following eight questions

6. What is Zeeman effect? Explain the experimental arrangement

7. Mention the properties of matter waves?

8. Explain Eigenfunctions and eigenvalues?

9. Give the physical interpretation of wave function?

10. Write about mass defect and binding energy?

11. Classification of GM counter?

12. Applications of superconductors?

13. Explain the properties of nanomaterials?