

P.R. GOVERNMENT COLLEGE (A), KAKINADA

III B.Sc Physics Paper V – Semester – V

w.e.f. 2017-18 ADMITTED BATCH

Course Code : PH5203

No. of credits : 03

Electrostatic & Magnetostatics, Basic and Digital Electronics

No. of Hours per week: 3

Total Lectures:45

UNIT-I (8 hrs)

1. **Electric field intensity and potential:**

Gauss's law statement and its proof- Electric field intensity due to (1) Uniformly charged sphere and (2) an infinite conducting sheet of charge. Electrical potential – equipotential surfaces- potential due to i) a point charge, ii) *Dipole* and iii) circular disc

UNIT-II (6 hrs)

2. **Dielectrics:**

Electric dipole moment and molecular polarizability - Electric displacement D, electric polarization P – relation between D, E and P- Dielectric constant and susceptibility. Boundary conditions at the dielectric surface.

UNIT-III (7 hrs)

3. **Electric and magnetic fields**

Biot-Savart's law, explanation and calculation of B due to long straight wire, a circular current loop and solenoid – Lorentz force – Hall effect – determination of Hall coefficient and applications.

UNIT-IV (8 hrs)

4. **Electromagnetic induction & Introduction to Maxwell's Equations**

Faraday's law-Lenz's law- Self and mutual inductance, coefficient of coupling, calculation of self inductance of a long solenoid, energy stored in magnetic field.

**Maxwell's Equations –**

*Maxwell equations in integral and differential forms (No derivation), wave equation and wave velocity, Poynting theorem (Definition only).*

UNIT-V (7 hrs)

5. **Basic electronics:**

Band theory of solids, *Basic semiconductor physics and P type and N type semiconductors* - PN junction diode, Zener diode I-V characteristics, *Zener diode as voltage regulator*, PNP and NPN transistors, CB, CE and CC configurations – Relation between  $\alpha$ ,  $\beta$  and  $\gamma$  - transistor (CE) characteristics, Transistor as an amplifier.

UNIT-VI: (9 hrs)

6. **Digital electronics**

Number systems - Conversion of binary to decimal system and vice versa. Binary addition and subtraction (1's and 2's complement methods). Laws of Boolean algebra - De Morgan's laws-statement and proof, Basic logic gates, NAND and NOR as universal gates, exclusive-OR gate, Half adder and Full adder, Parallel adder circuits.

**Note: Topics in Bold & Italic are newly added from this academic year**

## Physics – Board of Studies

### REFERENCE BOOKS

1. BSc Physics, Vol.3, Telugu Akademy, Hyderabad.
2. Electricity and Magnetism, D.N. Vasudeva. S. Chand & Co.
3. Electricity, Magnetism with Electronics, K.K.Tewari, R.Chand& Co.,
4. Principles of Electronics, V.K. Mehta, S.Chand& Co.,
5. Digital Principles and Applications, A.P. Malvino and D.P.Leach, McGrawHill Edition.

### P.R. GOVERNMENT COLLEGE (A), KAKINADA

#### III B.Sc Physics Paper – V – Semester – V – Model Paper

w.e.f. 2017-18 ADMITTED BATCH

Course Code : PH5203

No. of credits : 03

#### Electrostatic & Magneto statics, Basic and Digital Electronics

**Note:-** Set the question paper as per the blue print given at the end of this model paper.

Time: 2 1/2Hrs.

Max. Marks: 60

Section	Questions to be given	Questions to be answered	Marks
A	5	3	3 x 10M = 30M
B	9	6	6 x 5 M = 30M
Total	14	9	60M

### Blue Print

Module	Essay Questions 10 marks	Short Questions 5 marks	Problems 5 marks	Marks allotted
I	1	1	--	15
II	--	2	--	10
III	1	--	1	15
IV	1	1	1	20
V	1	1	--	15
VI	1	1	1	20
<b>Total Marks</b>				95

**Note:** At least two problems should be answered.

**QUESTION BANK**

**SUBJECT: PHYSICS**

**PAPER: V**

**SEMESTER: V**

**UNIT-I (Electric field intensity & Potential)**

**Essay questions-10M**

1. State and Prove Gauss theorem in electrostatics
2. State Gauss theorem and derive an expression for the electric field due to uniformly charged sphere?
3. Define Electric potential. Calculate the electric potential due to a circular disc.
4. Define Electric dipole. Derive an expression for Electric potential due to a dipole.

**Short questions- 5M**

5. Derive an expression for electric potential due to a point charge
6. What are equipotential surfaces?
7. Derive an expression for Electric field intensity due to an infinitely conducting sheet

**UNIT-II (Dielectrics)**

**Short questions- 5M**

8. Define Electric Dipole Moment and molecular polarizability.
9. Define D, E and P and deduce relation between them.
10. Write a note on boundary conditions at dielectric surfaces?
11. Find the relation between Susceptibility and Dielectric Constant.

**UNIT-III (Electric & Magnetic fields)**

**Essay questions-10M**

12. Derive an expression for the magnetic induction at a point due to an infinitely long straight current carrying current.
13. State and explain Biot-Savart's law. Derive an expression for the magnetic induction on the axis due to circular loop.
14. Derive an expression for the Magnetic induction due to Solenoid.
15. Define Hall Effect? Derive an expression for hall coefficient? Mention its applications.

**Problems – 5M**

16. A long straight wire carries a current 3.5A. Find the magnetic induction at a point 0.2m from the wire.
17. A current of 1A is flowing in a circular coil of radius 10 cm and 20 turns. Calculate the magnetic field at a distance 10cm on the axis of the coil and centre.
18. A Solenoid of length 100 cm has 1000 turns wounded on it. Calculate the magnetic field at the middle point of its axis, when a current of 2 amps is passed through it.
19. The single carrier holes in a shaped silicon sample are  $2.05 \times 10^{22} \text{ m}^{-3}$ . Calculate its Hall Coefficient.

**UNIT-IV (Electromagnetic Induction & Maxwell equations)**

**Essay questions-10M**

20. Define Coefficient of Self induction and obtain an expression for self inductance of a solenoid.
21. Derive the equation of Electromagnetic wave. Show that the velocity of EM wave is equal to velocity of light in free space.
22. Derive Maxwell's equations in differential form.

**Short questions – 5M**

23. Obtain an expression for the energy stored in a solenoid.
24. State and explain Faraday's and Lenz's law?
25. Explain self inductance and mutual inductance.
26. Derive an expression for the coefficient of coupling.
27. Write a short note on Poynting Vector.

### **UNIT-V (Basic Electronics)**

#### **Essay questions-10M**

28. Describe the construction & working of a PN junction diode. Explain the V-I characteristics of PN junction diode.
29. Describe the construction & working of a Zener diode. Explain the V-I characteristics of Zener diode.
30. Explain the Input & Output characteristics of PNP transistor in CE configuration.

#### **Short questions - 5M**

31. Define  $\alpha$ ,  $\beta$  &  $\gamma$  of a transistor. Obtain a relation between them.
32. Explain a Zener diode as a voltage regulator.
33. How does transistor work as an amplifier?

### **UNIT- VI (Digital Electronics)**

#### **Essay questions-10M**

34. State and prove De-Morgan's theorem?
35. Draw the circuit diagrams of Half adder & full-adder and explain its operation with truth table.

#### **Short questions - 5M**

36. Draw the truth table of AND, OR & NOT logic gates?
37. Show that NAND Gate is a universal gate?
38. Show that NOR Gate is a universal gate?

#### **Problems-5M**

39. Convert the following (A)  $55_{10} = \dots\dots\dots_2$  (b)  $10010.1011_2 = \dots\dots\dots_{10}$
40. Using 2's complemental, subtract  $(100111)_2$  from  $(110011)_2$
41. Add the following using binary addition method  $(10111)_2$  and  $(10101)_2$