



Paper Code : PHYDSC 12L

B.Sc. II Semester Degree Examination (NEP), October 2022

Subject : PHYSICS

Paper : Electricity and Magnetism (Paper - I)

Time : 2.30 Hours

Max. Marks : 60

- Instructions :**
- 1) Answer **all** Sections.
  - 2) Section **A** : Answer **any five** of the following.
  - 3) Section **B** : Answer **any four** of the following.
  - 4) Section **C** : Answer **any three** of the following.

SECTION - A

1. Answer **any five** of the following : (5×2=10)
- a) Define electric dipole. *pair of coll charge equal magnitude by* 2
  - b) State Gauss's Law for Electrostatic Charge ?  *$\phi = q/\epsilon_0$  open sum* 2
  - c) Give the concept of conductors and insulators. 2
  - d) Define current density. Give its units.  *$A/m^2$*  2
  - e) Define Faraday's Laws of Induction.  *$e \propto \frac{d\phi}{dt}$*  2
  - f) Define Hall Effect and Hall Coefficient. 2
  - g) Define magnetic susceptibility and give its units.  *$m^3 kg^{-1}$*  2

SECTION - B

- Answer **any four** of the following : (4×5=20)
2. Derive the expression for potential energy of charge. 5
  3. What do you mean by electric quadrapole ? Derive expression for its potential.  *$V = \frac{1}{4\pi\epsilon_0} \frac{3 \cos^2 \theta - 1}{2R^3} p^2$*  5
  4. What is parallel plate capacitor ? How do you calculate capacitance ?  *$C = \frac{\epsilon_0 A}{d}$*  5
  5. Compare conduction in metals and semiconductors with examples. 5
  6. If earth receives 1400 watts/m<sup>2</sup> solar energy then what are the amplitudes  $\vec{E}$  and  $\vec{B}$  fields of radiation.  *$E = \sqrt{\mu_0 c} \cdot 14\pi \times 10^7 \times 3 \times 10^{-8} \times 1400$*  5
  7. How do you understand the phenomenon of self and mutual inductance of coil ? 5

*$\epsilon_0 = \frac{1}{36\pi \times 10^9} = 8.85 \times 10^{-12} F/m$*

*$\mu_0 = 4\pi \times 10^{-7} Tm/A$*

*$= 726.3$*

P.T.O.



SECTION - C

Answer any three of the following :

(3x10=30)

8. Determine the electric field due to

$$E = \frac{\rho}{4\pi\epsilon_0 r^2}$$

i) Uniformly charged sphere.

$$E = \frac{\rho r}{2\epsilon_0}$$

ii) Uniformly charged cylinder using Gauss's Law.

(5+5)

9. Explain electric potential. Derive the expression due to point charge and distribution of charges.

$$V = \frac{1}{4\pi\epsilon_0} \int \frac{dq}{r} \quad V_D - V_A = \frac{q}{4\pi\epsilon_0} \left( \frac{1}{r_D} - \frac{1}{r_A} \right)$$

10. What are the dielectric materials ? Discuss the effect of electric field on conductors insulators and dielectrics.

10

11. Explain the working with neat ckt. diagram of RL and RC ac circuits and discuss the role of quality factor.

$$E = RE + \frac{q}{\epsilon}$$

10

12. What are the different types of magnetic materials ? Discuss the properties with specific examples.

10

$$E = RZ + i \frac{dI}{dt} \quad I = I_0 (1 - e^{-t/\tau})$$



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- Instructions :**
- 1) Answer **all** Sections
  - 2) Section **A** Answer **any five** of the following.
  - 3) Section **B** Answer **any four** of the following
  - 4) Section **C** Answer **any three** of the following.

**SECTION - A**

- 1 Answer **any five** of the following :
  - a) Define electric dipole. *pair of (+) charge & (-) charge separated by distance by* (5x2=10)
  - b) State Gauss's Law for Electrostatic Charge ?  *$\oint \vec{E} \cdot d\vec{A} = \frac{q_{enc}}{\epsilon_0}$*  2
  - c) Give the concept of conductors and insulators. 2
  - d) Define current density. Give its units.  *$\vec{J} = \frac{dQ}{dt \cdot dA}$*  2
  - e) Define Faraday's Laws of Induction. *Induced EMF is proportional to rate of change of magnetic flux* 2
  - f) Define Hall Effect and Hall Coefficient. 2
  - g) Define magnetic susceptibility and give its units.  *$\chi = \frac{M}{H}$*  2

**SECTION - B**

- Answer **any four** of the following :
2. Derive the expression for potential energy of charge. (4x5=20)
  3. What do you mean by electric quadrupole ? Derive expression for its potential. 5
  4. What is parallel plate capacitor ? How do you calculate capacitance ?  *$C = \frac{Q}{V} = \frac{\sigma A}{\frac{\sigma d}{\epsilon_0}} = \frac{\epsilon_0 A}{d}$*  5
  5. Compare conduction in metals and semiconductors with examples. 5

6. If earth receives 1400 watts/m<sup>2</sup> solar energy then what are the amplitudes  $\vec{E}$  and  $\vec{B}$  fields of radiation.  *$E = \sqrt{1400 \times 3 \times 10^8}$ ,  $B = \frac{E}{c}$*  5
7. How do you understand the phenomenon of self and mutual inductance of coil ? 5

*$\phi_0 = \int \vec{B} \cdot d\vec{A}$*

*$\phi_0 = \int \vec{B} \cdot d\vec{A} = \int \mu_0 \vec{H} \cdot d\vec{A}$*

*$\phi_0 = \int \mu_0 \vec{H} \cdot d\vec{A} = \int \mu_0 \vec{H} \cdot d\vec{A}$*

P.T.O.

Paper Code : PHYDSC 12L



SECTION - C

Answer any three of the following :

(3×10=30)

8. Determine the electric field due to

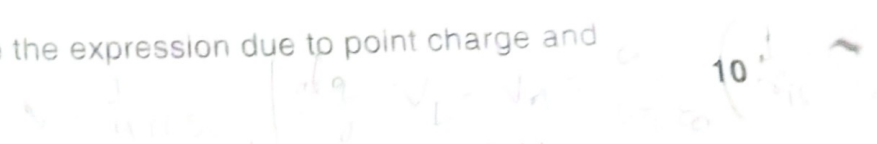


i) Uniformly charged sphere.

ii) Uniformly charged cylinder using Gauss's Law.

(5+5)

9. Explain electric potential. Derive the expression due to point charge and distribution of charges



10

10. What are the dielectric materials ? Discuss the effect of electric field on conductors insulators and dielectrics.

10

11. Explain the working with neat ckt. diagram of RL and RC ac circuits and discuss the role of quality factor.

$$Z = R + j\omega L + \frac{1}{j\omega C}$$

10

12. What are the different types of magnetic materials ? Discuss the properties with specific examples.

10

$$E = E_0 + \left(1 - \frac{1}{\epsilon_r}\right) E_0 \quad I = I_0 \left(1 - \frac{1}{\epsilon_r}\right)$$



Paper Code : PHYDSC 12L

B.Sc. II Semester Degree Examination (NEP), Oct./Nov. 2023  
Subject : PHYSICS (Paper – I)  
Paper : Electricity and Magnetism

Time : 2½ Hours

Max. Marks : 60

**Instructions :** 1) Answer **all** the questions.  
2) **Draw** diagrams **wherever** necessary.

SECTION – A

I. Answer **any five** of the following :

(5×2=10)

- 1) a) Mention the basic properties of electric charge.
- b) Express Coulomb's law in vector form.
- c) What is sharpness of resonance ?
- d) Define electric dipole moment. Mention its expression.
- e) What is Q-factor ?
- f) State Biot-Savart's Law.
- g) State Faraday's law of induction and write its expression.

SECTION – B

II. Answer **any four** of the following :

(4×5=20)

- 2) State and prove Gauss's theorem in electrostatic.
- 3) Derive an expression for potential due to a point charge.
- 4) Obtain an expression for capacitance of spherical capacitor.
- 5) Write a note on mutual induction.
- 6) Write the difference between series and parallel resonance circuit.
- 7) Distinguish between dia, para and ferromagnetic materials.

P.T.O.



SECTION – C

III. Answer **any three** of the following :

(3×10=30)

- 8) Obtain an expression for potential at any point due to an electric dipole. 10
- 9) a) Explain the phenomenon of electric field due to uniformly charged sphere. 5  
b) Write the importance of Hall effect. 5
- 10) a) Derive an equation for AC circuit containing inductor, capacitor and resistance connected in series. 5  
b) A resistance of  $8 \Omega$  is in series with a inductance of  $0.01 \text{ H}$ . If a potential difference of  $220 \text{ V}$  is applied. Calculate the current, the voltage across the inductance and phase. Take the frequency of the applied voltage is  $50 \text{ Hz}$ . 5
- 11) a) Obtain expression for energy stored in a capacitor. 5  
b) Derive the relation between electric field and drift velocity. 5
- 12) a) What is Hysteresis loop ? Explain B-H curve for magnetic hysteresis. 5  
b) State and prove Ampere's circuital law. 5



Paper Code : PHYDSC 12L

B.Sc. II Semester Degree Examination (NEP), Oct./Nov. 2023

Subject : PHYSICS (Paper – I)

Paper : Electricity and Magnetism

Time : 2½ Hours

Max. Marks : 60

- Instructions** : 1) Answer **all** the questions.  
2) **Draw** diagrams **wherever** necessary.

SECTION – A

I. Answer **any five** of the following :

(5×2=10)

- 1) a) Mention the basic properties of electric charge.
- b) Express Coulomb's law in vector form.
- c) What is sharpness of resonance ?
- d) Define electric dipole moment. Mention its expression.
- e) What is Q-factor ?
- f) State Biot-Savart's Law.
- g) State Faraday's law of induction and write its expression.

SECTION – B

II. Answer **any four** of the following :

(4×5=20)

- 2) State and prove Gauss's theorem in electrostatic.
- 3) Derive an expression for potential due to a point charge.
- 4) Obtain an expression for capacitance of spherical capacitor.
- 5) Write a note on mutual induction.
- 6) Write the difference between series and parallel resonance circuit.
- 7) Distinguish between dia, para and ferromagnetic materials.

P.T.O.



SECTION – C

- III. Answer **any three** of the following : (3×10=30)
- 8) Obtain an expression for potential at any point due to an electric dipole. 10
  - 9) a) Explain the phenomenon of electric field due to uniformly charged sphere. 5  
b) Write the importance of Hall effect. 5
  - 10) a) Derive an equation for AC circuit containing inductor, capacitor and resistance connected in series. 5  
b) A resistance of  $8\ \Omega$  is in series with a inductance of  $0.01\ \text{H}$ . If a potential difference of  $220\ \text{V}$  is applied. Calculate the current, the voltage across the inductance and phase. Take the frequency of the applied voltage is  $50\ \text{Hz}$ . 5
  - 11) a) Obtain expression for energy stored in a capacitor. 5  
b) Derive the relation between electric field and drift velocity. 5
  - 12) a) What is Hysteresis loop ? Explain B-H curve for magnetic hysteresis. 5  
b) State and prove Ampere's circuital law. 5



Paper Code : PHYOEC 12L



B.A./B.Sc./B.B.A./B.Com./B.C.A. II Semester Degree Examination (NEP),  
October/November 2023

Subject : PHYSICS

Paper : Astronomy (Open Elective)

Time : 2½ Hours

Max. Marks : 60

**Instructions :** 1) Answer **all** the questions.  
2) Draw diagram **wherever** necessary.

SECTION – A

I. Answer **any five** of the following.

(5×2=10)

- 1) a) What is lunar orbit ?
- b) What is Stellar parallax ?
- c) Write the types of telescope.
- d) What is complex identity ?
- e) What is a sun-spot ?
- f) Define azimuth and altitude.
- g) List out the inner and outer planets.

SECTION – B

II. Answer **any four** of the following.

(4×5=20)

- 2) Write a note on ancient Greek observation of astronomy.
- 3) Explain the difference between superior conjunction and inferior conjunctions.
- 4) Explain constellations visible during March to June.
- 5) Write a note on lunar eclipse.
- 6) Explain the observations by Kepler in Medieval and Modern Astronomy.
- 7) How did Saturn's rings form ?

P.T.O.

Paper Code : PHYOEC 12L



SECTION – C

III. Answer **any three** of the following.

(3×10=30)

- 8) Explain the optical tools for astronomy.
  - 9) Write a note on zero-shadow day.
  - 10) Explain in brief about Vedic astronomy.
  - 11) Explain prominent stars and constellation visible during December to March.
  - 12) Write a note on observation of the sun from earth during seasons with neat diagram.
-

SIIS-N-59-A-18

**B.Sc. II<sup>nd</sup> Semester Degree Examination**

**PHYSICS**

(Thermodynamics, Waves and Oscillation, Electrical Measurements and Theory of Relativity)

**Paper-II**

(New)

Time : 3 Hours

Maximum Marks : 80

**Instructions to candidates:**

Answer **all** questions from Section-I any **five** from Section-II and any **four** from Section-III

**Section-I**

(15×1 = 15)

- I. 1) What is adiabatic process
- 2) What are mechanical waves
- 3) What is refrigerator
- 4) What is the heart of CRO
- 5) Give the formula for efficiency of heat engine
- 6) What are two dimensional waves? Give example
- 7) What are stationary waves
- 8) What is relativity
- 9) Who designed cathode ray oscilloscope(CRO)
- 10) What is the relation between wavelength, wave velocity and frequency of a wave
- 11) Mention application of CRO
- 12) Give an expression for growth current in RL circuit.
- 13) What is the sum of currents during charging and discharging
- 14) Define inductive reactance
- 15) What is minkowski world

{Contd.---

## Section-II

II. Answer any FIVE

(5 × 5 = 25)

- 16) Explain applications of first law of Thermodynamics
- 17) What are progressive wave? Derive kinetic energy of a progressive wave
- 18) Explain construction and working of CRO with neat labelled diagram
- 19) Explain Q-factor, Band width and sharpness of resonance
- 20) Discuss length contraction
- 21) What is entropy? Explain principle of increase in entropy?
- 22) Derive an expression for current and admittance when A.C is applied to a pure resistor.

## Section-III

III. Answer any FOUR of the following

(4 × 10 = 40)

- 23) a) Derive Clausius-Clapeyron's latent heat equation (6)  
b) Explain with diagram principle of regenerative cooling of He. (4)
- 24) a) Derive an expression for harmonics of free free rod (6)  
b) Give the applications of CRO (4)
- 25) a) Derive an expression for charging of a capacitor through inductance and resistance (LCR in series) (7)  
b) Find the efficiency of carnot engine working between steam point and ice point (3)
- 26) a) State and explain significance of II<sup>nd</sup> law of thermodynamics (4)  
b) Describe porous-plug experiment for idea of low temperature (6)
- 27) a) Derive Lorentz transformation equations (7)  
b) A rod of one meter long is moving along its length with a velocity of 0.6 C. Calculate its length as it appears to an observer  
i) on earth  
ii) moving with rod itself (3)
- 28) a) Derive an expression for measurement of inductance using Anderson's bridge (7)  
b) Find natural frequency of a circuit containing inductance 50  $\mu$  H and capacity of 0.005 microfarad. (3)

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[Total No. of Pages : 2

SCIIS-N-056 A-19  
B.Sc. II - Semester (CBCS) Degree Examination  
PHYSICS  
(Electricity and Magnetism)  
Paper : DSC2 - PHY204T  
(New)

Time : 3 Hours

Maximum Marks : 80

*Instructions to Candidates:*

- 1) Answer ALL the parts.
- 2) Draw Diagrams wherever necessary.

**PART - I**

Answer any **TEN** of the following in **One** or **Two** sentences

(10×2=20)

1. Define Divergence of a vector.
2. Define Electrostatic field.
3. Explain, what happens, when a charge  $Q$ , is placed at a point inside the charged sphere.
4. What is an Electric Dipole?
5. Define flux linkage.
6. What is Magnetic Intensity?
7. Define Energy Loss due to hysteresis.
8. When Electro- Magnetic waves gets polarise?
9. How a Constant voltage source is converted into a constant current source?
10. State KVL.
11. What is a time constant in RL circuit?
12. What is Resonance? Write an expression for resonance frequency.

**PART - II**

Answer any **FOUR** of the following

(4×5=20)

13. Show that  $\text{curl grad } E = 0$  or  $\nabla \times (\nabla E) = 0$ .
14. Derive an expression for Energy stored in a capacitor
15. Define Ampere's circuital law. And hence derive an expression for differential form of Ampere's law.

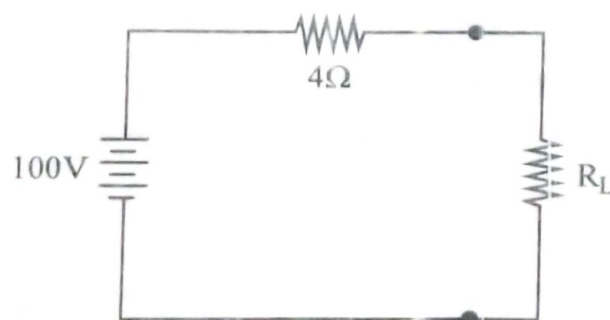
16. Define Displacement current And hence derive an expression for magnitude Displacement Current.
17. Show that voltage and current sources are equivalent.
18. Derive an expression for the current when AC applied to a Pure Resistor.

### PART - III

(4×10=40)

Answer any **FOUR** of the following.

19. Show that the divergence of a vector field is the total normal outward flux passing through the point. Hence derive Gauss's divergence theorem and Equation of Continuity. (10)
20. a) What are Basic properties of Electric charge? (2+8)  
 b) Derive an expression for Electric potential due to a uniformly charged Spherical Shell at an internal point.
21. a) Show that Energy per unit Volume in any region of Space is directly proportional to the square of the electro static field. (8+2)  
 b) Calculate the magnetic field at a distance of 500cms from an infinite Straight conductor Carrying current of 500mA.
22. a) Obtain an expression for "Energy Stored in a magnetic field. (5+5)  
 b) Derive an expression for Energy loss due to Hysteresis.
23. a) Show that a Plane - Electromagnetic wave travelling in Space is transverse in nature. (6+4)  
 b) Find the max power for the network shown in the figure.



24. a) Derive an expression for discharge of a capacitor through inductance and Resistance. (7+3)  
 b) Find the reactance of a capacitor of capacity  $20\mu F$  at 5000 Hz frequency.

Paper Code : PHYOEC 12L

II Semester Open Elective Degree Examination (NEP), October 2022

Subject : PHYSICS

Paper : Astronomy

Paper : OE – II

Time : 2 30 Hours

Max. Marks : 60

*Instruction : Answer all following Sections.*

SECTION – A

Answer **any five** of the following

(5×2=10)

1. a) What are solstice and an equinox ? (1+1)
- b) What is meant by star ? 2
- c) How do you calculate zero shadow day ? 2
- d) What is solar system ? 2
- e) What is stellar parallax ? 2
- f) Define constellation with example. (1+1)
- g) Define lunar eclipses and lunar month. (1+1)

SECTION – B

Answer **any four** of the following :

(4×5=20)

2. Write a note on astronomy in Indian scriptures. 5
3. Explain the observations by Tycho-Brahe in medieval and modern astronomy. 5
4. Define ecliptic and explain orientation of the ecliptic plane around sun. 5
5. Explain the difference between superior and inferior conjunctions. 5

P.T.O.

Paper Code : PHYOEC 12L



6. Convert the following :

a) 100 parasac

b) 100 LY

c) 1000 Au, into meters

5

5

5

7. Explain constellations visible during December to march.

SECTION - C

Answer **any three** of the following :

(3×10=30)

8. Explain briefly about Indian astronomy.

10

9. Write a note on mathematical methods for observations of astronomy

10

10. Explain the optical tools for astronomy.

10

11. List out the inner and outer planets and explain them.

10

12. Explain prominent stars and constellation visible during June to September.

10