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SIHS -N-188 B-18

B.Sc. IIIrd Semester Degree Examination

PHYSICS

(Mathematical, Electromagnetic, Energy and Biophysics)

Paper - III

(New)

Time : 3 Hours

Maximum Marks : 80

Instructions to Candidates:

1. Answer **ALL** questions from Section - A.
2. Answer any **FIVE** questions from Section B and **FOUR** questions from Section - C.

SECTION - A

L Answer **ALL** the following questions. (15×1=15)

1. Define Fourier series.
2. Find $\text{div } \vec{r}$ where $\vec{r} = x\hat{i} + y\hat{j} + z\hat{k}$.
3. State Dirichlet's theorem.
4. State Ampere's swimming rule.
5. What is electromagnetic induction?
6. State pointing theorem.
7. Define dipole moment.
8. What is skin effect?
9. Mention primary sources of energy.
10. Mention the use of "Moderator" in nuclear reactor.
11. Write the nuclear fusion reaction.
12. Mention any two characteristics of wind energy.

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13. What is active transport?
14. What is neuron?
15. Give an example for prokaryotic cell.

SECTION - B

II. Answer any FIVE of the following questions.

(5×5=25)

16. If $\vec{A} = \hat{i} + 2\hat{k}$, $\vec{B} = \hat{i} + \hat{j} - \hat{k}$ and $\vec{C} = 4\hat{i} - 2\hat{j} + 3\hat{k}$ then find $\vec{A} \times (\vec{B} \times \vec{C})$.
17. Find the Fourier series of the even function.
18. Distinguish between conventional and Non-conventional energy sources.
19. Distinguish between nuclear fission and nuclear fusion.
20. State and explain Biot -savart law.
21. Write a note on Hertz experiment.
22. Explain briefly the main types of muscles.

SECTION - C

III. Answer any FOUR of the following.

(4×10=40)

23. a) State and prove Gauss divergence theorem. (7)
- b) If $\vec{A} = \hat{i} + 2\hat{j} + 3\hat{k}$ and $\vec{B} = 2\hat{i} - \hat{j}$ then prove that $\vec{A} \cdot \vec{B} = 0$. (3)
24. a) Derive an expression for torque on a dipole. (7)
- b) State faradays law of EM induction. (3)
25. Write a note on Maxwell's field equations and give their physical significance. (10)
26. a) Explain Carbon - Nitrogen cycle. (5)
- b) Explain the phenomenon of nuclear fission. (5)
27. a) With neat diagram briefly explain the structure of neuron. (5)
- b) Explain thermodynamics analysis of membrane transport. (5)
28. a) Find the Fourier series of the function e^x in the interval $-\pi < x < \pi$ (5)
- b) Write a note on geothermal energy sources. (5)

13. What is active transport?
14. What is neuron?
15. Give an example for prokaryotic cell.

SECTION - B

(5×5=25)

II. Answer any FIVE of the following questions.

16. If $\vec{A} = \hat{i} + 2\hat{k}$, $\vec{B} = \hat{i} + \hat{j} - \hat{k}$ and $C = 4\hat{i} - 2\hat{j} + 3\hat{k}$ then find $\vec{A} \times (\vec{B} \times \vec{C})$.
17. Find the Fourier series of the even function.
18. Distinguish between conventional and Non-conventional energy sources.
19. Distinguish between nuclear fission and nuclear fusion.
20. State and explain Biot-savart law.
21. Write a note on Hertz experiment.
22. Explain briefly the main types of muscles.

SECTION - C

III. Answer any FOUR of the following.

(4×10=40)

23. a) State and prove Gauss divergence theorem. (7)
- b) If $\vec{A} = \hat{i} + 2\hat{j} + 3\hat{k}$ and $\vec{B} = 2\hat{i} - \hat{j}$ then prove that $\vec{A} \cdot \vec{B} = 0$. (3)
24. a) Derive an expression for torque on a dipole. (7)
- b) State faradays law of EM induction. (3)
25. Write a note on Maxwell's field equations and give their physical significance. (10)
26. a) Explain Carbon - Nitrogen cycle. (5)
- b) Explain the phenomenon of nuclear fission. (5)
27. a) With neat diagram briefly explain the structure of neuron. (5)
- b) Explain thermodynamics analysis of membrane transport. (5)
28. a) Find the Fourier series of the function e^x in the interval $-\pi < x < \pi$ (5)
- b) Write a note on geothermal energy sources. (5)

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SIIS-O-188 B-18

B.Sc. IIIrd Semester Degree Examination

PHYSICS

(Electricity and Electrodynamics)

Paper - III

(Old)

Time : 3 Hours

Maximum Marks : 80

Instructions to Candidates:

- 1) Answer all questions from section - A.
- 2) Answer any five questions from section - B and Four questions from section-C.

SECTION-A

I. Answer the following questions.

(15×1=15)

1. What is wattless current?
2. Define impedance.
3. Write the principle of C R O.
4. What are filters?
5. What is Power factor?
6. State Stoke's theorem.
7. State Lenz's Law.
8. Define dipole moment.
9. State Ampere's swimming rule.
10. What is meant by displacement current?
11. What is EM induction?
12. Mention the SI unit of self inductance.
13. Write the expression for energy density of an EM - wave.
14. What are dielectrics?
15. State Stoke's theorem.

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SECTION - B

(5×5=25)

II. Answer any **Five** of the following questions.

16. Obtain an expression for impedance of AC circuit containing L and C in parallel.
17. Describe working of Anderson's bridge.
18. What is meant by High - Pass filter? Explain the function of High - Pass filter with diagram.
19. Prove that $\text{div. curl } \vec{A} = 0$.
20. State and explain Faraday's laws of EM induction.
21. Obtain expression for magnetic field at a point on the axis of circular coil carrying current.
22. Write a note on skin effect.

SECTION - C

(4×10=40)

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

23. a) Distinguish between series resonant circuit and parallel resonant circuit. (5)
b) A resistance of 10 ohm and inductance of 0.1H connected in parallel with a capacitance of 10^{-4} farad. Calculate the impedance of the circuit. (5)
 24. Describe construction and working of C R O. (10)
 25. a) Prove that $\text{curl grad } \phi = 0$. (5)
b) Prove that $\text{div grad } \phi = \nabla^2 \phi$ (5)
 26. a) State and prove Ampere's circuital law. (5)
b) Obtain an expression for the torque on a dipole. (5)
 27. Write a note on Maxwell's field equations and give their physical significance. (10)
 28. a) Describe Hertz experimental to produce EM waves. (7)
b) Write a note on radiation pressure. (3)
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SIIS-N-188 B-19
B.Sc. III Semester (CBCS) Degree Examination
PHYSICS

Thermal Physics & Statistical Mechanics

Paper - III

(New)

Maximum Marks : 80

Time : 3 Hours

Instructions to Candidates:

1. Answer all the questions.
2. Draw diagrams wherever necessary.

(10×2=20)

I. Answer any TEN of the following in two or three sentences.

- 1) Define adiabatic and isobaric process.
- 2) State Carnot's theorems.
- 3) State First law of thermodynamics.
- 4) Write Maxwell's four thermodynamics relations.
- 5) Define enthalpy of the system.
- 6) What is refrigerant? Give examples.
- 7) What is the ratio of sp. heat of monoatomic and diatomic gas?
- 8) On what factors the coefficient of viscosity of a gas depends?
- 9) What is the black body? State Wien's displacement law.
- 10) Calculate the radiant emittance of a black body at a temperature of 400k and 2000k

$$(\sigma = 5.672 \times 10^{-8} \text{ MKSunits}).$$

- 11) What is the difference between Boson's and Fermions?
- 12) What is position space and find the volume element in position space?

II. Answer any FOUR questions.

(4×5=20)

- 13) Explain various thermodynamic processes.
- 14) Derive an expression for work done during isothermal process.
- 15) Explain briefly the principle and working of a refrigerator.
- 16) Obtain an expression for the ratio of sp. heat of monoatomic gases.

17) Derive Wien's displacement law from Plank's law of black body radiation.

18) Compare basic postulates of Maxwell's - Boltzmann and Bose - Einstein statistics. (4×10=40)

III. Answer any **FOUR** questions.

19) Describe the working of Carnot's engine? Obtain an expression for the efficiency in terms of temperature of the source and sink.

20) Deduce the clausius - cleypreyrms latent heat equation from Maxwell's thermodynamical relation. Explain its application.

21) a. Obtain an expression for the viscosity co-efficient of a gas on the basis of kinetic theory of gases. (8)

b. Calculate the rms velocity of oxygen molecules at 27°C. Density of oxygen at NTP is 1.43 Kgm⁻³ (2)

22) Explain the distribution of energy of a black body at different temperatures by drawing the graphs.

23) Derive Maxwell's law of distribution of velocities of molecules of a gas.

24) Show that:

Mean velocity

$$\bar{V} = \sqrt{\frac{8KT\pi}{m}}$$

Root mean square velocity

$$V_{rms} = \sqrt{\frac{3KT}{m}}$$

And most probable velocity

$$V_{mpv} = \sqrt{\frac{2KT}{m}}$$

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SIIS-N-188 A-21
B.Sc. III Semester (CBCS) Degree Examination
PHYSICS

Thermal Physics and Statistical Mechanics

Paper : DSC 3

(New)

Time : 3 Hours

Maximum Marks : 80

Instructions to Candidates:

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

I. Answer any **TEN** of the following in **Two or Three** sentences. (10×2=20)

1. Define irreversible process, Give example.
2. State second law of Thermodynamics
3. What is refrigerator? Name two refrigerants.
4. Define Internal energy and enthalpy of a system
5. What is the change in entropy for reversible and irreversible processes?
6. State the law of equipartition of energy.
7. On what factors the coefficient of viscosity of gas depends?
8. Define Emissive power and absorptive power.
9. What are the differences between Bosons and Fermions?
10. Define μ - space and Γ - space
11. State Stefan- Boltzmann Law. Write the value of Stefan constant.
12. Define entropy. Mention its two properties.

II. Answer any **Four** of the following. (4×5=20)

13. Derive the expression for workdone during adiabatic process.
14. Show that the change in entropy in reversible process is zero.
15. Deduce Wien's displacement law from Planck's law of radiation.
16. Explain Black-Body radiation spectrum with neat diagram.
17. Deduce the Boltzman entropy probability relation $S=K \log_e w$.
18. Compare, Maxwell-Boltzman, Bose-Einstein and Fermi-Dirac statistics.

III. Answer any Four of the following.

(4×10=40)

19. a) Describe the working of Carnot's engine. Obtain an expression for the efficiency. (8+2)
- b) The efficiency of Carnot engine is 50%. When the temperature of the sink is 300K. Find the temperature of the source.
20. Obtain Maxwell's equations in Thermodynamics (10)
21. a) Obtain an expression for thermal conductivity of a gas on the basis of Kinetic theory of gases. (7+3)
- b) Find the temperature at which the root mean square velocity of the molecules of a gas would become twice its value at 100°C.
22. a) Derive Planck's law of radiation. (8+2)
- b) Calculate the wavelength at which human body radiates maximum energy. Take body temperature at 37°C and Wien's constant $b=2.898 \times 10^{-3} \text{mk}$
23. Deduce Clausius-Clapeyron equation from Maxwell's Thermodynamical relations. Explain its applications. (10)
24. Derive Bose-Einstein Distribution law. (10)
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SIHS-O-188 A-21
B.Sc. III Semester Degree Examination

PHYSICS
Mathematical Electromagnetic Energy & Biophysics

Paper : III
(Old)

Maximum Marks : 80

Time : 3 Hours

Instructions to Candidates:

1. Answer **all** questions from section A
2. Answer any **five** questions from section B & Four questions from section C

SECTION - A

I. Answer All the following questions

(15×1=15)

1. Define Unit Vector?
2. Define impedance.
3. What is steady current?
4. Write the explanation of Q-factor in terms of band width.
5. What is electromagnetic induction?
6. What is skin effect?
7. Is an electromagnetic wave transverse in nature.
8. Write the explanation for energy density of an EM-wave.
9. Define Nuclear fission.
10. What is Solar Energy?
11. Define Primary Sources of Energy.
12. What is renewable Energy
13. What is Bio-Physics?
14. What is active Transport
15. Give an example for Prokaryotic cell.

SECTION - B

II. Answer any Five questions.

(5×5=25)

16. If $\vec{A} = i + 2k$, $\vec{B} = i + j - k$ and $\vec{C} = 4i - 2j + 3k$ then find $\vec{A} \times (\vec{B} \times \vec{C})$
17. State and explain Amper's Circuital law.
18. State and explain Faraday's laws of EM-waves
19. State and explain Biot-Savart law
20. Distinguish Conventional and non conventional energy sources.
21. Describe C-N cycle and P-P cycle of nuclear fusion.
22. Explain the scope of Bio-physics.

SECTION - C

III. Answer any Four questions.

(4×10=40)

23. a) Evaluate Fourier Co-efficients for even function
 - b) Prove that $\nabla(\nabla \times A) = \nabla(\nabla \cdot A) - \nabla^2 A$ (5+5)
 24. Write a note on Maxwell's field equations and give their physical significance. (10)
 25. a) Describe Hertz experimental to produce EM-waves
 - b) Write a note on radiation pressure (7+3)
 26. What is a nuclear reactor? Describe various types of nuclear reactor's. (10)
 27. a) Explain the Phenomenon of nuclear fission.
 - b) Write a note on Solar Energy (5+5)
 28. Describe the various methods (types) of passive transport across a biological cell membrane (10)
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SIIS-N-244-A-22
B.Sc. III Semester (CBCS) Degree Examination
PHYSICS
Thermal Physics and Statistical Mechanics
Paper : DSC III : PHY 303T
(New)

Time : 3 Hours

Maximum Marks : 80

Instructions to Candidates:

1. Answer all the following questions.
2. Draw diagrams wherever necessary.

I. Answer any **ten** of the following in two or **three** sentences.

(10×2=20)

1. State and explain zeroth law of thermodynamics.
2. Define specific heat at constant volume C_v .
3. Mention thermodynamic potentials.
4. What is mean free path and mean free time?
5. State law of equipartition of energy.
6. What is perfect black body? Explain.
7. Define emissive and absorptive power of black body.
8. State multiplicative law of probability.
9. What are ensembles.
10. What is fermi energy.
11. Draw entropy, - temperature diagram.
12. What is macrostate?

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

(4×5=20)

13. State and explain first law of thermodynamics.
14. Derive an expression for work done during adiabatic process.

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[Total No. of Pages : 2

SIIS-N-244-A-22
B.Sc. III Semester (CBCS) Degree Examination
PHYSICS
Thermal Physics and Statistical Mechanics
Paper : DSC III : PHY 303T
(New)

Time : 3 Hours

Maximum Marks : 80

Instructions to Candidates:

1. Answer all the following questions.
2. Draw diagrams wherever necessary.

I. Answer any ten of the following in two or three sentences.

(10×2=20)

1. State and explain zeroth law of thermodynamics.
2. Define specific heat at constant volume C_v .
3. Mention thermodynamic potentials.
4. What is mean free path and mean free time?
5. State law of equipartition of energy.
6. What is perfect black body? Explain.
7. Define emissive and absorptive power of black body.
8. State multiplicative law of probability.
9. What are ensembles.
10. What is fermi energy.
11. Draw entropy, - temperature diagram.
12. What is macrostate?

II. Answer any Four of the following.

(4×5=20)

13. State and explain first law of thermodynamics.
14. Derive an expression for work done during adiabatic process.

15. State and explain Joule - Thomson effect.

~~16.~~ Derive expression for mean free path.

~~17.~~ State and explain Stefan's Boltzmann's law.

18. Write a note on Photon gas.

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

(4×10=40)

19. a. Derive an expression for work done during isothermal process. (5)

b. What is Refrigerator ? Explain its working. (5)

~~20.~~ Derive T-ds equation using Maxwell's relations. (10)

21. a. Derive expression for transport of energy in gas layers. (7)

b. The r.m.s. velocity of a gas molecule is 450m/s and the density of the gas is 1kg/m^3 . Calculate the viscosity of the gas if the mean free path of the gas molecules is $1.5 \times 10^{-8}\text{m}$. (3)

~~22.~~ Derive expression for Planck's radiation law. (10)

23. a. Derive expression for Boltzmann's entropy relation. (8)

~~b.~~ Calculate the probability that in tossing a coin 5 times, we get 3 heads and 2 tails. (2)

~~24.~~ a. Distinguish between BE and FD statistics. (8)

b. The efficiency of a Carnot engine is 20% when the temperature of sink is 300K. Find the temperature of source. (2)

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SIIIS-N-244-A-22
B.Sc. III Semester (CBCS) Degree Examination
PHYSICS

Thermal Physics and Statistical Mechanics

Paper : DSC III : PHY 303T

(New)

Time : 3 Hours

Maximum Marks : 80

Instructions to Candidates:

1. Answer all the following questions.
2. Draw diagrams wherever necessary.

I. Answer any ten of the following in two or three sentences.

(10×2=20)

1. State and explain zeroth law of thermodynamics.
2. Define specific heat at constant volume C_v .
3. Mention thermodynamic potentials.
4. What is mean free path and mean free time?
5. State law of equipartition of energy.
6. What is perfect black body? Explain.
7. Define emissive and absorptive power of black body.
8. State multiplicative law of probability.
9. What are ensembles.
10. What is fermi energy.
11. Draw entropy - temperature diagram.
12. What is macrostate?

II. Answer any Four of the following.

(4×5=20)

13. State and explain first law of thermodynamics.
14. Derive an expression for work done during adiabatic process.

15. State and explain Joule - Thomson effect.
16. Derive expression for mean free path.
17. State and explain stefan's Boltzmanns law.
18. Write a note on Photon gas.

III. Answer any Four of the following :

(4×10=40)

19. a. Derive an expression for work done during isothermal process. (5)
- b. What is Refrigerator ? Explain its working. (5)
20. Derive T-ds equation using Maxwells relations. (10)
21. a. Derive expression for transport of energy in gas layers. (7)
- b. The r.m.s. velocity of a gas molecule is 450m/s and the density of the gas is 1kg/m^3 . Calculate the viscosity of the gas if the mean free path of the gas molecules is $1.5 \times 10^{-8}\text{m}$. (3)
22. Derive expression for Planck's radiation law. (10)
23. a. Derive expression for Boltzmann's entropy relation. (8)
- b. Calculate the probability that in tossing a coin 5 times, we get 3 heads and 2 tails. (2)
24. a. Distinguish between BE and FD statistics. (8)
- b. The efficiency of a carnot engine is 20% when the temperature of sink is 300K. Find the temperature of source. (2)
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Paper Code : PHYDSC 13L

B.Sc. III Semester Degree Examination (NEP), April 2023

Subject : PHYSICS (Paper – I)

Paper : DSC – I : Wave Motion and Optics

Time : 2 Hours

Max. Marks : 60

Instructions : 1) Answer *all* the questions.

2) Draw diagrams *wherever* necessary.

SECTION – A

Answer **any five (5)** questions from the following :

(5×2=10)

1. a) What are longitudinal and transverse waves ?
- b) State the principle of superposition of wave.
- c) What is zone plate ? Write the different types of the zone plate.
- d) Define reverberation and reverberation time.
- e) What is interferometer ?
- f) What is wave front ? Mention different types of wave front.
- g) Mention the methods of producing plane polarized light.

SECTION – B

Answer **any four (4)** questions from the following :

(4×5=20)

2. What is progressive wave ? Obtain an expression for intensity of progressive wave.
$$J = 2\pi^2 f^2 a^2 \rho v$$
3. The speed of a wave in a medium is 760 m/s. If 3600 waves are passing through a point in the medium in 2 minutes what is wave length ? $f = \frac{v}{\lambda}$, $\lambda = \frac{v}{f}$
 $f = \frac{3600}{2 \times 60} = 30 \text{ Hz}$
 $\lambda = \frac{760}{30} = 25.3 \text{ m}$
4. Derive an expression for velocity of a transverse wave along a stretched string.
$$f = \frac{1}{2L} \sqrt{\frac{T}{m}}$$
5. Explain in detail factors affecting acoustics in buildings.

P.T.O.



Paper Code : PHYDSC 13L

B.Sc. III Semester Degree Examination (NEP), April 2023
Subject : PHYSICS (Paper – I)
Paper : DSC – I : Wave Motion and Optics

Time : 2 Hours

Max. Marks : 60

Instructions : 1) Answer *all* the questions.

2) Draw diagrams *wherever* necessary.

SECTION – A

Answer **any five (5)** questions from the following :

(5×2=10)

1. a) What are longitudinal and transverse waves ?
- b) State the principle of superposition of wave.
- c) What is zone plate ? Write the different types of the zone plate.
- d) Define reverberation and reverberation time.
- e) What is interferometer ?
- f) What is wave front ? Mention different types of wave front.
- g) Mention the methods of producing plane polarized light.

SECTION – B

Answer **any four (4)** questions from the following :

(4×5=20)

2. What is progressive wave ? Obtain an expression for intensity of progressive wave.
$$J = 2\pi^2 f^2 a^2 \rho v$$
3. The speed of a wave in a medium is 760 m/s. If 3600 waves are passing through a point in the medium in 2 minutes what is wave length ? $f = \frac{n}{t}$, $\lambda = \frac{v}{f}$
 $\lambda = 25.3 \text{ m}$
4. Derive an expression for velocity of a transverse wave along a stretched string.
$$f = \frac{1}{2l} \sqrt{\frac{T}{m}}$$
5. Explain in detail factors affecting acoustics in buildings.

P.T.O.

Paper Code : PHYDSC 13L



6. Describe the phenomenon of Fresnel's diffraction by opaque disc.
7. What are polaroid's ? Mention the construction and uses of polaroid's.

SECTION - C

Answer any three (3) questions from the following :

(3x10=30)

8. a) Derive Newton's formula for velocity of sound. $v = \sqrt{\frac{E}{\rho}}$, $p v = \text{constant}$ $v = \sqrt{\frac{p}{\rho}}$
b) Discuss Laplace correction for Newton's formula. $v = \sqrt{\frac{\gamma p}{\rho}}$ $v = 332.5 \text{ m s}^{-1}$
9. Mention the assumptions and derive Sabine's reverberation formula. $E e^{\alpha t} = \frac{4P}{CA} e^{\alpha t} + K$
10. a) Explain how Michelson's interferometer is used for the determination of wave length of a light. $\lambda = \frac{2x}{N}$
b) Give the theory of Newton's rings by reflected light.
11. Derive an expression for energy density and energy transport of a transverse wave along a stretched string. $I = \frac{1}{2} \omega^2 a^2 z$
12. a) Derive an expression for superposition of two collinear oscillations having different frequencies. $R = 2a \cos 2\pi \left(\frac{f_1 - f_2}{2}\right) t$.
b) Derive expression for resolving power of grating. $\frac{\lambda}{d\lambda} = Nn$

Paper Code : PHYDSC 13L



6. Describe the phenomenon of Fresnel's diffraction by opaque disc.
7. What are polaroid's ? Mention the construction and uses of polaroid's.

SECTION - C

Answer any three (3) questions from the following : (3×10=30)

8. a) Derive Newton's formula for velocity of sound. $v = \sqrt{\frac{E}{\rho}}$, $\rho v = \text{constant}$ $v = \sqrt{\frac{P}{\rho}}$
b) Discuss Laplace correction for Newton's formula. $v = \sqrt{\frac{\gamma P}{\rho}}$ $v = 332.5 \text{ m s}^{-1}$
9. Mention the assumptions and derive Sabine's reverberation formula. $E e^{\alpha t} = \frac{4P}{CA} e^{\alpha t} + k$
10. a) Explain how Michelson's interferometer is used for the determination of wave length of a light. $\lambda = \frac{2x}{N}$
b) Give the theory of Newton's rings by reflected light.
11. Derive an expression for energy density and energy transport of a transverse wave along a stretched string. $I = \frac{1}{2} \omega^2 a^2 z$
12. a) Derive an expression for superposition of two collinear oscillations having different frequencies. $R = 2a \cos 2\pi \left(\frac{f_1 - f_2}{2} \right) t$
b) Derive expression for resolving power of grating. $\frac{\lambda}{\Delta \lambda} = Nn$



Paper Code : PHYDSC 13L

B.Sc. III Semester Degree Examination (NEP), April 2023

Subject : PHYSICS (Paper – I)

Paper : DSC – I : Wave Motion and Optics

Time : 2 Hours

Max. Marks : 60

Instructions : 1) Answer **all** the questions.

2) Draw diagrams **wherever** necessary.

SECTION – A

Answer **any five (5)** questions from the following :

(5×2=10)

1. a) What are longitudinal and transverse waves ?
- b) State the principle of superposition of wave.
- c) What is zone plate ? Write the different types of the zone plate.
- d) Define reverberation and reverberation time.
- e) What is interferometer ?
- f) What is wave front ? Mention different types of wave front.
- g) Mention the methods of producing plane polarized light.

SECTION – B

Answer **any four (4)** questions from the following :

(4×5=20)

2. What is progressive wave ? Obtain an expression for intensity of progressive wave.
3. The speed of a wave in a medium is 760 m/s. If 3600 waves are passing through a point in the medium in 2 minutes what is wave length ?
4. Derive an expression for velocity of a transverse wave along a stretched string.
5. Explain in detail factors affecting acoustics in buildings.

P.T.O.



- 6. Describe the phenomenon of Fresnel's diffraction by opaque disc.
- 7. What are polaroid's ? Mention the construction and uses of polaroid's.

SECTION - C

Answer any three (3) questions from the following : (3×10=30)

- 8. a) Derive Newton's formula for velocity of sound.
b) Discuss Laplace correction for Newton's formula.
- 9. Mention the assumptions and derive Sabine's reverberation formula.
- 10. a) Explain how Michelson's interferometer is used for the determination of wave length of a light.
b) Give the theory of Newton's rings by reflected light.
- 11. Derive an expression for energy density and energy transport of a transverse wave along a stretched string.
- 12. a) Derive an expression for superposition of two collinear oscillations having different frequencies.
b) Derive expression for resolving power of grating.

5k2
5k3
5q7
605
606
697
699
69a
700
254
9k3
9k4
519



Paper Code : PHYDSC 13L

B.Sc. III Semester Degree Examination (NEP), April 2023

Subject : PHYSICS (Paper – I)

Paper : DSC – I : Wave Motion and Optics

Time : 2 Hours

Max. Marks : 60

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

SECTION – A

Answer any five (5) questions from the following :

(5×2=10)

1. a) What are longitudinal and transverse waves ?
- b) State the principle of superposition of wave.
- c) What is zone plate ? Write the different types of the zone plate.
- d) Define reverberation and reverberation time.
- e) What is interferometer ?
- f) What is wave front ? Mention different types of wave front.
- g) Mention the methods of producing plane polarized light.

SECTION – B

Answer any four (4) questions from the following :

(4×5=20)

2. What is progressive wave ? Obtain an expression for intensity of progressive wave.
3. The speed of a wave in a medium is 760 m/s. If 3600 waves are passing through a point in the medium in 2 minutes what is wave length ?
4. Derive an expression for velocity of a transverse wave along a stretched string.
5. Explain in detail factors affecting acoustics in buildings.

P.T.O.

Paper Code : PHYDSC 13L

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Paper Code : PHYDSC 13L



6. Describe the phenomenon of Fresnel's diffraction by opaque disc.
7. What are polaroid's ? Mention the construction and uses of polaroid's.

SECTION - C

Answer any three (3) questions from the following :

(3×10=30)

8. a) Derive Newton's formula for velocity of sound.
b) Discuss Laplace correction for Newton's formula.
9. Mention the assumptions and derive Sabine's reverberation formula.
10. a) Explain how Michelson's interferometer is used for the determination of wave length of a light.
b) Give the theory of Newton's rings by reflected light.
11. Derive an expression for energy density and energy transport of a transverse wave along a stretched string.
12. a) Derive an expression for superposition of two collinear oscillations having different frequencies.
b) Derive expression for resolving power of grating.

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Paper Code : PHYDSC 13L

B.Sc. III Semester Degree Examination (NEP), March/April 2024
Subject : PHYSICS Paper – I
Paper : WAVE MOTION AND OPTICS (DSC – I)

17

Time : 2½ Hours

Max. Marks : 60

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

SECTION – A

Answer **any five** (5) questions from the following.

(5×2=10)

1. a) What are Lissajous figures ? ✓
- b) What do you mean by damped and undamped free vibrations ?
- c) Write an expression for acoustic intensity level. ✓
- d) What is Fresnel's Biprism ? *AS*
- e) Why are Newton's Rings circular ? *AS*
- f) What is diffraction grating ?
- g) Define acoustic intensity.
- h) Define specific Rotation. Write its unit.

SECTION – B

Answer **any four** (4) of the following questions.

(4×5=20)

2. Differentiate between progressive waves and stationary waves. ✓ *JA*
3. Explain in detail the acoustic aspects of hall and auditorium..
4. In Young's double slit experiment, the separation of slits is 0.18×10^{-2} m at a distance of 1m from the slits. What is the wavelength of light if fringe width = 0.05 mm ?
5. Describe with necessary theory of interference in a wedge shaped thin film. ✓ *AS*

P.T.O.

Ans = 18 - Unit-3
 70 16 Unit-4

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6. What is zone plate ? How it is constructed ? Show that a zone plate has multiple foci. Compare the zone plate with a convex lens.,
7. a) What is polarised light ? *JA*
 b) Describe the method of producing plane polarized light by reflection.

SECTION - C

Answer **any three (3)** questions from the following. (3×10=30)

8. Derive Newton's formula for velocity of sound in air. Discuss Laplace correction for Newton's formula. Explain the factors affecting velocity of sound in air.
9. a) Obtain the expression for normal modes of the string.
 b) Calculate the reverberation time for an auditorium in which sound decays absorption through 40 decibels in 1.2 sec.
10. Describe an experiment to determine the radius of curvature of a plano-convex lens surface by Newton's Ring method. *ASS*
11. Distinguish between Fresnel and Fraunhofer diffraction. Discuss the Fraunhofer diffraction at a double slit. *JA*
12. a) What is optical activity ? Explain on the basis of Fresnel's theory.
 b) Calculate the length of the solution of concentration 50 kgm^{-3} which produces an optical rotation of 45° . The specific rotation of the solution is $0.0524 \text{ m}^2\text{kg}^{-1}$.

Handwritten calculations:

6.320
 1.2

$0.158 \times 1.2 = 0.316$
 $0.158 + 0.316 = 0.474$
 $0.474 \times 1.2 = 0.5688$

$0.158 \times 40 = 6.32$
 6.320

$t_1 = \frac{0.158 \times 1.2}{u_0}$

$1.2 = \frac{0.158 \times 40}{u_0}$

$u_0 = \sqrt{1.896 \text{ Co}}$

0.1896

0.0047 u

0.158×40

Roll No. _____

[Total No. of Pages : 2

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B.Sc. IIIrd Semester Degree Examination

PHYSICS

(Mathematical, Electromagnetic, Energy and Biophysics)

Paper - III

(New)

Time : 3 Hours

Maximum Marks : 80

Instructions to Candidates:

1. Answer **ALL** questions from Section - A.
2. Answer any **FIVE** questions from Section B and **FOUR** questions from Section - C.

SECTION - A

I. Answer ALL the following questions.

(15×1=15)

1. Define Fourier series.
2. Find $div \vec{r}$ where $\vec{r} = x\hat{i} + y\hat{j} + z\hat{k}$.
3. State Dirichlet's theorem.
4. State Ampere's swimming rule.
5. What is electromagnetic induction?
6. State pointing theorem.
7. Define dipole moment.
8. What is skin effect?
9. Mention primary sources of energy.
10. Mention the use of "Moderator" in nuclear reactor.
11. Write the nuclear fusion reaction.
12. Mention any two characteristics of wind energy.

13. What is active transport?
14. What is neuron?
15. Give an example for prokaryotic cell.

SECTION - B

II. Answer any **FIVE** of the following questions. (5×5=25)

16. If $\vec{A} = \hat{i} + 2\hat{k}$, $\vec{B} = \hat{i} + \hat{j} - \hat{k}$ and $C = 4\hat{i} - 2\hat{j} + 3\hat{k}$ then find $\vec{A} \times (\vec{B} \times \vec{C})$.
17. Find the Fourier series of the even function.
18. Distinguish between conventional and Non-conventional energy sources.
19. Distinguish between nuclear fission and nuclear fusion.
20. State and explain Biot -savart law.
21. Write a note on Hertz experiment.
22. Explain briefly the main types of muscles.

SECTION - C

III. Answer any **FOUR** of the following. (4×10=40)

23. a) State and prove Gauss divergence theorem. (7)
 b) If $\vec{A} = \hat{i} + 2\hat{j} + 3\hat{k}$ and $\vec{B} = 2\hat{i} - \hat{j}$ then prove that $\vec{A} \cdot \vec{B} = 0$. (3)
24. a) Derive an expression for torque on a dipole. (7)
 b) State faradays law of EM induction. (3)
25. Write a note on Maxwell's field equations and give their physical significance. (10)
26. a) Explain Carbon - Nitrogen cycle. (5)
 b) Explain the phenomenon of nuclear fission. (5)
27. a) With neat diagram briefly explain the structure of neuron. (5)
 b) Explain thermodynamics analysis of membrane transport. (5)
28. a) Find the Fourier series of the function e^x in the interval $-\pi < x < \pi$ (5)
 b) Write a note on geothermal energy sources. (5)