NALANDA OPEN UNIVERSITY

B.Sc. Physics, Part-I

PAPER–I (Honours)

(Methods of Mathematical Physics and Mechanics, Special Theory of Relativity, Waves and Vibration)

Annual Examination, 2023

Time : 3 Hours. **Full Marks : 80**

*Answer **Five** questions in all, selecting at least one question from each group.*
All questions carry equal marks.

GROUP 'A'

1. Describe Cartesian, spherical polar and cylindrical coordinate system and show the position coordinates in each of them and establish their inter relations. Write expressions for infinite-simal volume element in each of them.
2. Explain generalised coordinates, degrees of freedom and constraints.
3. State and explain the principle of least action. Use this to derive Langronge's equations of motion.
4. Deduce equation of motion of a compound pendulum by writing the Laqrangian of the same.
5. Obtain expression for the force acting on a particle in a rotating frame and explain centripetal & centrifugal forces.

Group - B

6. Establish the relation $E^2 = p^2c^2 + m_0^2c^4$ and discuss it.
7. Using four dimensional formulations in relativity, obtain the equation for variation of mass with velocity.
8. Write down Einstein's portulates of the special theory of relativity and hence derive Lorentz transformation equations.

Group - C

9. Obtain the equation of stationary waves and find the positions of nodes and antinodes.
10. Explain the following :-
    (a) D' Alembert's principle. (b) Curl, divergence and grad

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EXAMINATION PROGRAMME, 2023

B.Sc. Physics, Chemistry, Botany, Zoology & Mathematics (Hons.), Part-I

Date	***Papers***	***Time***	***Examination Centre***
01.09.2023	Honours Paper-I	**2.30 PM to 5.30 PM**	Nalanda Open University, 2nd Floor, Biscomaun Bhawan, Patna
05.09.2023	Honours Paper-II	**2.30 PM to 5.30 PM**	Nalanda Open University, 2nd Floor, Biscomaun Bhawan, Patna
07.09.2023	Hindi Composition-100 or Hindi-50 + Urdu-50 or Eng-50	**2.30 PM to 5.30 PM**	Nalanda Open University, 2nd Floor, Biscomaun Bhawan, Patna
12.09.2023	Chemistry (Sub)-I	10.30 AM to 1.30 PM	Nalanda Open University, 2nd Floor, Biscomaun Bhawan, Patna
13.09.2023	Mathematics (Sub)-I	10.30 AM to 1.30 PM	Nalanda Open University, 2nd Floor, Biscomaun Bhawan, Patna
14.09.2023	Zoology (Sub)-I	10.30 AM to 1.30 PM	Nalanda Open University, 2nd Floor, Biscomaun Bhawan, Patna
15.09.2023	Physics (Sub)-I	10.30 AM to 1.30 PM	Nalanda Open University, 2nd Floor, Biscomaun Bhawan, Patna
16.09.2023	Botany (Sub)-I	10.30 AM to 1.30 PM	Nalanda Open University, 2nd Floor, Biscomaun Bhawan, Patna
18.09.2023	Geography (Sub) P-I	10.30 AM to 1.30 PM	Nalanda Open University, 2nd Floor, Biscomaun Bhawan, Patna
19.09.2023	Home Science (Sub) P-I	10.30 AM to 1.30 PM	Nalanda Open University, 2nd Floor, Biscomaun Bhawan, Patna

NALANDA OPEN UNIVERSITY

B.Sc. Physics, Part-I

PAPER–II (Honours)

(Heat, Thermodynamics and Statistical Physics)

Annual Examination, 2023

Time : 3 Hours. **Full Marks : 80**

*Answer **Five** questions in all, selecting at least Two question from each group.*
All questions carry equal marks.

GROUP 'A'

1. Deduce Maxwell's law of velocity distribution amongst the molecules of an ideal gas. Use this law to find an expression for the most probable velocity.
2. State the principle of equipartition of energy and derive the result that the mean energy of a system of gases is 1/2KT per degree of freedom.
3. Give the Einstein's theory of Brownian motion.
4. Deduce an expression for steady state temperature distribution along a uniform metal rod heated at one end.
5. Use Debye theory to find the formula for specific heat of a solid.

Group – B

6. Derive Maxwell's thermodynamics relations. On their basis solve at least two simple physical problems.
7. What is first order phase transition? Derive the Clausius-Clapeyron equation for these transitions. Also explain triple point with the help of suitable diagram.
8. Describe porus plug experiment and discuss Joule-Thomson effect.
9. Derive the expression for efficiency of a Carnot engine using the second law of thermodynamics. Define Carnot's refrigerator.
10. Write brief notes on any two of the following:-
    (a) Adiabatic and isothermal charges (b) Chemical potential
    (c) Reversible & irreversible process (d) Triple point.

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B.Sc. Part-I Physics (Hons.)

Programme for Practical Counselling Class & Practical Examination 2023

Venue : Ist Floor, Physics Lab, Biscomaun Tower, Patna

(For Enrollment No-220500001 to 220500010, & All Old Students)

Councelling Class Programme		*Practical Examination*		
Date	**Time**	**Paper**	**Date**	**Time**
08.09.2023	10.00 AM to 04.00 PM	I (Hons)	09.09.2023	10.00 AM to 01.00 PM
		II(Hons)	09.09.2023	02.00 PM to 05.00 PM

(For Enrollment No-220500011 to 220500070)

Councelling Class Programme		*Practical Examination*		
Date	**Time**	**Paper**	**Date**	**Time**
10.09.2023	10.00 AM to 04.00 PM	I (Hons)	11.09.2023	10.00 AM to 01.00 PM
		II(Hons)	11.09.2023	02.00 PM to 05.00 PM

(For Enrollment No-220500071 to 220500140)

Councelling Class Programme		*Practical Examination*		
Date	**Time**	**Paper**	**Date**	**Time**
20.09.2023	10.00 AM to 04.00 PM	I (Hons)	21.09.2023	10.00 AM to 01.00 PM
		II(Hons)	21.09.2023	02.00 PM to 05.00 PM

(For Enrollment No-220500141 to 22050180)

Councelling Class Programme		*Practical Examination*		
Date	**Time**	**Paper**	**Date**	**Time**
22.09.2023	10.00 AM to 04.00 PM	I (Hons)	23.09.2023	10.00 AM to 01.00 PM
		II(Hons)	23.09.2023	02.00 PM to 05.00 PM

(For Enrollment No-220500181 to 22050300)

Councelling Class Programme		*Practical Examination*		
Date	**Time**	**Paper**	**Date**	**Time**
25.09.2023	10.00 AM to 04.00 PM	I (Hons)	26.09.2023	10.00 AM to 01.00 PM
		II(Hons)	26.09.2023	02.00 PM to 05.00 PM

B.Sc. Part-I Physics (Hons.)

Programme for Practical Counselling Class & Practical Examination 2022

Venue : Ist Floor, Physics Lab, Biscomaun Tower, Patna

(For Enrollment No-190500001 to 190500200, 200500001 to 200500260)

Councelling Class Programme		*Practical Examination*		
Date	**Time**	**Paper**	**Date**	**Time**
23.12.2022	10.00 AM to 04.00 PM	I (Hons)	24.12.2022	10.00 AM to 01.00 PM
		II(Hons)	24.12.2022	02.00 PM to 05.00 PM

(For Enrollment No-200500261 to 200500600)

Councelling Class Programme		*Practical Examination*		
Date	**Time**	**Paper**	**Date**	**Time**
25.12.2022	10.00 AM to 04.00 PM	I (Hons)	27.12.2022	10.00 AM to 01.00 PM
		II(Hons)	27.12.2022	02.00 PM to 05.00 PM

(For Enrollment No-210500001 to 21050080)

Councelling Class Programme		*Practical Examination*		
Date	**Time**	**Paper**	**Date**	**Time**
07.01.2023	10.00 AM to 04.00 PM	I (Hons)	08.01.2023	10.00 AM to 01.00 PM
		II(Hons)	08.01.2023	02.00 PM to 05.00 PM

(For Enrollment No-210500081 to 21050160)

Councelling Class Programme		*Practical Examination*		
Date	**Time**	**Paper**	**Date**	**Time**
12.01.2023	10.00 AM to 04.00 PM	I (Hons)	13.01.2023	10.00 AM to 01.00 PM
		II(Hons)	13.01.2023	02.00 PM to 05.00 PM

(For Enrollment No-210500161 to 21050250)

Councelling Class Programme		*Practical Examination*		
Date	**Time**	**Paper**	**Date**	**Time**
14.01.2023	10.00 AM to 04.00 PM	I (Hons)	15.01.2023	10.00 AM to 01.00 PM
		II(Hons)	15.01.2023	02.00 PM to 05.00 PM

(For Enrollment No-210500251 to 21050300)

Councelling Class Programme		*Practical Examination*		
Date	**Time**	**Paper**	**Date**	**Time**
16.01.2023	10.00 AM to 04.00 PM	I (Hons)	17.01.2023	10.00 AM to 01.00 PM
		II(Hons)	17.01.2023	02.00 PM to 05.00 PM

NALANDA OPEN UNIVERSITY
B.Sc. Physics, Part-I
PAPER–I (Subsidiary)
Annual Examination, 2023

Time : 3 Hours. **Full Marks : 80**

*Answer any **Five** Questions. All Questions carry equal marks.*

1. A metal wire is fixed at its upper end. Deduce an expression for torsional torque to produce a twist θ at its lower end. Derive an expression for time period of torsional oscillation of this wire.
2. Explain generalised co-ordinates and momenta. Differentiate between holonomic and non-holonomic constraints.
3. Write Fourier series and discuss the method of evaluation of its coefficients. Apply it to the case of vibration of a plucked string.
4. Discuss Planck's quantum theory of radiation. Show that Wien's displacement law may be derived from this theory.
5. Give the different kinds of statement of the second law of thermodynamics and discuss their different respective aspects.
6. State and explain the Einstein's postulates of the special theory of relativity. Deduce Lorentz transformation equations.
7. Define and deduce expression for the elastic constants *Y, k, n and* σ and establish relations between them.
8. Give the theory of Michelson-Morley experiment. Deduce the results of this experiment.
9. What do you mean by ultrasonics and supersonics? Discuss the production and applications of ultrasonics.
10. Derive Van der Waal's equation of state for a real gas. Evaluate its coefficients *a* and *b* in terms of critical pressure P_c critical valume V_c and critical temperature T_c

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Practical Counselling Classes and Practical Examination Programme, 2023 of
Programme of B.Sc., Part-I (Physics Subsidiary, Paper-I)
Venue : Physics Lab, 1st Floor, Biscomaun Tower, Patna

PRACTICAL COUNSELLING CLASS PROGRAMME

Date	Time	
	10:00 AM to 01:00 PM	**01:30 PM to 04:30 PM**
05.10.2023	Enrollment No. of Mathematics (Hons.) Students All Old Students & 220490001 to 220490050	Enrollment No. of Mathematics (Hons.) Students 220490051 to 220490120
07.10.2023	Enrollment No. of Mathematics (Hons.) Students 220490121 to 220490210	Enrollment No. of Mathematics (Hons.) Students 220490211 to 220490400
09.10.2023	Enrollment No. of Chemistry (Hons.) Students All Old Sudents & 220020635, 220470001 to 220470090	Enrollment No. of Chemistry (Hons.) Students 220470091 to 220470800 & All Old and New Students of Botany (H), Geography (H), Yoga (H), Home Science (H)
11.10.2023	Enrollment No. of Zoology (Hons.) Students All Old Students & 220510001 to 220510170	Enrollment No. of Zoology (Hons.) Students 220510171 to 220510600

PRACTICAL EXAMINATION PROGRAMME

Date	Time	
	10:00 AM to 01:00 PM	**01:30 PM to 04:30 PM**
06.10.2023	Enrollment No. of Mathematics (Hons.) Students All Old Students & 220490001 to 220490050	Enrollment No. of Mathematics (Hons.) Students 220490051 to 220490120
08.10.2023	Enrollment No. of Mathematics (Hons.) Students 220490121 to 220490210	Enrollment No. of Mathematics (Hons.) Students 220490211 to 220490400
10.10.2023	Enrollment No. of Chemistry (Hons.) Students All Old Sudents & 220020635, 220470001 to 220470090	Enrollment No. of Chemistry (Hons.) Students 220470091 to 220470800 & All Old and New Students of Botany (H), Geography (H), Yoga (H), Home Science (H)
12.10.2023	Enrollment No. of Zoology (Hons.) Students All Old Students & 220510001 to 220510170	Enrollment No. of Zoology (Hons.) Students 220510171 to 220510600

Nalanda Open University

Annual Examination - 2023

B.Sc. Physics (Honours), Part-II

Paper-III (Optics & Electromagnetic Theory)

Time: 3.00 Hrs. **Full Marks: 80**

*Answer any **Three** questions from group 'A' and **Two** Questions from group 'B'.*
All questions carry equal marks.

Group - 'A'

1. Describe the construction of a zone plate and show that it has a number of Focci. Enumerate the difference between a zone plate and a convex lens.
2. Describe the construction of a diffraction grating and give the theory of its working. Derive an expression for its resolving power.
3. Describe the construction of a Michelson's interferometer. Discuss the theory of its working.
4. Give the construction of a Nicol prism and the theory of its working. How is it used as a polariser and analyser ?
5. What is Rayleigh criterion of resolution ? Deduce expression for resolving power of a microscope.
6. Give the construction and explain the working of a Babinet compensator.

Group - 'B'

7. Discuss the laws of reflection and refraction on the basis of e.m. waves.
8. Write down Maxwell's equations and deduce the equation of plane wave in vacuum. Show that velocity of this wave in equal to that of light.
9. Discuss the theory of Thomson's scattering of e.m. waves.
10. Write notes on any **Two** of the following:-
    (a) Dispersion in gases (b) Scattering of e.m. waves
    (c) Maxwell stress tensor (d) Poynting Vector

Programme of B.Sc. Part-II Physics (Hons.),
Practical Counselling Class and Practical Examination Programme, 2023
Venue:- *1st Floor, Physics Lab, Biscomaun Tower, Patna*

(A) Practical Counselling Class

Date	*Paper*	*Time*	*Roll No.*
22.08.2023	III & IV	*10:30 AM to 05:00 PM*	*190500001 to 190500300* *200500001 to 200500300*
29.08.2023	III & IV	*10:30 AM to 05:00 PM*	*200500301 to 200500700* *210500001 to 210500100*
01.09.2023	III & IV	*10:30 AM to 05:00 PM*	*210500101 to 210500400*

(B) Practical Examination

Date	*Paper*	*Time*	*Roll No.*
23.08.2023	III	*10:30 AM to 01:30 PM*	*190500001 to 190500300* *200500001 to 200500300*
	IV	*02:00 PM to 05:00 PM*	
31.08.2023	III	*10:30 AM to 01:30 PM*	*200500301 to 200500700* *210500001 to 210500100*
	IV	*02:00 PM to 05:00 PM*	
02.09.2023	III	*10:30 AM to 01:30 PM*	*210500101 to 210500400*
	IV	*02:00 PM to 05:00 PM*	

Nalanda Open University

Annual Examination - 2023

B.Sc. Physics (Honours), Part-II

Paper-IV (Electrostatics, Magnetism current Electricity and Modern Physics)

Time: 3.00 Hrs. **Full Marks: 80**

*Answer any **five** questions. All questions carry equal marks.*

1. Obtain the electric potential and field due to a linear quadrupole at a point away from it.
2. Discuss Langevin's theory of paramagnetism. What are its shortcomings.
3. Define peltier coefficient (π) and Thomson's coefficient (σ). Applying the laws of thermodynamics to a thermocouple circuit, establish the relations

   (a) $\pi = T\frac{dE}{dT}$ (b) $\sigma = -T\frac{d^2E}{dT^2}$

4. Give the theory of Anderson's a.c. bridge. Give its relevant vector diagram.
5. Describe the theory of Thomson's method to determine the value of e/m.
6. Describe a Cyclotron and give the theory of its working. Obtain expression for energy of the particle accelerated by it.
7. Obtain the resonance frequency of a series resonant circuit. Discuss the sharpness of resonance of the Circuit.
8. Explain Compton effect and find expression for change in wave length of light.
9. Give Einstein's quantum hypothesis and hence write down the famous photoelectric equation. Explain work function and threshold frequency.
10. Describe Geiger Muller counter and explain the theory of its working.

Programme of B.Sc. Part-II Physics (Hons.),
Practical Counselling Class and Practical Examination Programme, 2023

Venue:- ***1st Floor, Physics Lab, Biscomaun Tower, Patna***

(A) Practical Counselling Class

Date	*Paper*	*Time*	*Roll No.*
22.08.2023	III & IV	***10:30 AM to 05:00 PM***	***190500001 to 190500300*** ***200500001 to 200500300***
29.08.2023	III & IV	***10:30 AM to 05:00 PM***	***200500301 to 200500700*** ***210500001 to 210500100***
01.09.2023	III & IV	***10:30 AM to 05:00 PM***	***210500101 to 210500400***

(B) Practical Examination

Date	*Paper*	*Time*	*Roll No.*
23.08.2023	III	***10:30 AM to 01:30 PM***	***190500001 to 190500300*** ***200500001 to 200500300***
	IV	***02:00 PM to 05:00 PM***	
31.08.2023	III	***10:30 AM to 01:30 PM***	***200500301 to 200500700*** ***210500001 to 210500100***
	IV	***02:00 PM to 05:00 PM***	
02.09.2023	III	***10:30 AM to 01:30 PM***	***210500101 to 210500400***
	IV	***02:00 PM to 05:00 PM***	

Nalanda Open University
Annual Examination – 2023
B.Sc. Physics (Subsidiary), Part-II
Paper-II

Time: 3.00 Hrs. **Full Marks: 80**

*Answer any **five** questions. All questions carry equal marks.*

1. Explain magnetic vector potential and give its unit. Explain the importance of vector potential.
2. Define $\vec{E}$, $\vec{P}$ and $\vec{D}$. Establish the relation between them.
3. Discuss Langevin's theory of paramagnetism.
4. Explain Seeback effect and Thomson's effect. Also explain inversion temperature, thermoelectric power and Thomson Co efficient.
5. Discuss the growth of charge in a d c circuit having resistance, inductance and capacitance all connected in series.
6. What is photoelectric effect ? Derive Einstein's photoelectric equation.
7. Describe a plane diffraction grating and explain the theory of its working.
8. What is LASER ? Describe construction and working of Ruby laser.
9. Discuss Rutherford-Soddy's theory of radioactive decay and obtain expression for half-life.
10. Give the circuit diagram of common emitter amplifier and explain its working

Nalanda Open University, Patna
Programme of B.Sc. Part-II Physics (Subsidiary), Practical Class and Practical Examination, 2023

Venue:- ***1st Floor, Physics Lab, Ist Floor Biscomaun Tower, Patna***

(A) Practical Counselling Class

Date	*Time:- 10.00 AM to 01.00 PM*	*Time:- 01.30 PM to 04.30 PM*
27.09.2023	All Old and New Students B.Sc. Chemistry (H), B.Sc. Botany (H), B.Sc. Yoga (H), B.Sc. Geography (H), Home Science. (H)	Mathematics (Hon's) Student 190490001-200490700
29.09.2023	Mathematics (Hon's) Students 210490001-210490120	Mathematics (Hon's) Students 210490121-210490400
03.10.2023	All Old and New Students B.Sc. Zoology (Hon's)	–

(B) Practical Examination

Date	*Time:- 10.00 AM to 01.00 PM*	*Time:- 01.30 PM to 04.30 PM*
28.09.2023	All Old and New Students B.Sc. Chemistry (H), B.Sc. Botany(H), B.Sc. Yoga (H), B.Sc. Geography (H), Home Science. (H)	Mathematics (Hon's) Student 190490001-200490700
30.09.2023	Mathematics (Hon's) Students 210490001-210490120	Mathematics (Hon's) Students 210490121-210490400
04.10.2023	All Old and New Students B.Sc. Zoology (Hon's)	–

Nalanda Open University

Annual Examination - 2023

B.Sc. Physics (Honours), Part-III

Paper-V (Mathematical Physics and Classical Mechanics)

Time: 3.00 Hrs. **Full Marks: 80**

Answer any five questions. All questions carry equal marks.

1. Explain analytic function. Derive Cauchy-Riemann conditions for such function.
2. State and prove Cauchy's integral theorem.
3. Following the rules of Vector differentiation, show that $\vec{\nabla} r^n = nr^{n-1} r$.
4. Solve the problem of motion of harmonic oscillator by using the Hamiltonian-Jacobi method.
5. On the basis of d' Alembert's principle of Virtual Work. Obtain Hamilton's equation of least action.
6. Obtain Kepler's laws of planetary motion on the basis of the theory of motion under central force.
7. Discuss the motion of symmetric top moving under gravity.
8. Solve Legendre's differential equation and obtain the recurrence formula $nP_n = xP'_{n+1} - P'_{n-1}$.
9. What are Poisson's brackets ? State and prove some of its properties.
10. (a) Show that energy tensor can be expressed as the sum of two tensors, one of which symmetric and the other skew symmetric.
    (b) Show that by contraction, the rank of a tensor is reduced by two.

EXAMINATION PROGRAMME-2023

B.Sc. Physics & Mathematics (Hons.), Part-III

Date	Papers	Time	Examination Centre
02.08.2023	Paper-V	10.30 AM to 1.30 PM	Nalanda Open University, 2nd Floor, Biscomaun Bhawan, Patna
04.08.2023	Paper-VI	10.30 AM to 1.30 PM	Nalanda Open University, 2nd Floor, Biscomaun Bhawan, Patna
07.08.2023	Paper-VII	10.30 AM to 1.30 PM	Nalanda Open University, 2nd Floor, Biscomaun Bhawan, Patna
09.08.2023	Paper-VIII	10.30 AM to 1.30 PM	Nalanda Open University, 2nd Floor, Biscomaun Bhawan, Patna
11.08.2023	Paper-XV (General Studies)	10.30 AM to 1.30 PM	Nalanda Open University, 2nd Floor, Biscomaun Bhawan, Patna

NALANDA OPEN UNIVERSITY

B.Sc. Physics, Part-III

PAPER–VI (Honours)

(Quantum Mechanics and Statistical Mechanics)

Annual Examination, 2023

Time : 3 Hours. **Full Marks : 80**

*Answer any **Five** Questions.*
All Questions carry equal marks.

1. What are basic postulates of quantum mechanics ? Explain correspondence principle in quantum mechanics.
2. Give the physical interpretation of wave function. Derive Schrödinger equation in both (i) time independent and (ii) time dependent cases.
3. Define angular momentum $\left(\vec{L}\right)$ in quantum mechanics. Show that Lx, Ly and Lz commute with L^2 but they do not commute with each other.
4. Define expectation value of a quantum mechanical operator and show that it corresponds to a classical observable.
5. What are symmetric and anti-symmetric wave functions ? Discuss their important properties.
6. Write down the fundamental assumptions of statistical mechanics. Define and explain the three types of statistical ensembles.
7. What do you mean by statistical entropy ? Obtain expression for entropy of an ideal gas. What is Gibb's paradox and how is it explained ?
8. Deduce Bose Einstein statistics for bosons and obtain Planck's radiation formula.
9. State and prove Liouville's theorem.
10. Give the possible states of the He-atom and its Hamiltonian. Also, find ground state of the He-atom and its energy.

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EXAMINATION PROGRAMME-2023
B.Sc. Physics (Hons.), Part-III

Date	Papers	Time	Examination Centre
02.08.2023	Paper-V	10.30 AM to 1.30 PM	Nalanda Open University, 2nd Floor, Biscomaun Bhawan, Patna
04.08.2023	Paper-VI	10.30 AM to 1.30 PM	Nalanda Open University, 2nd Floor, Biscomaun Bhawan, Patna
07.08.2023	Paper-VII	10.30 AM to 1.30 PM	Nalanda Open University, 2nd Floor, Biscomaun Bhawan, Patna
09.08.2023	Paper-VIII	10.30 AM to 1.30 PM	Nalanda Open University, 2nd Floor, Biscomaun Bhawan, Patna
11.08.2023	Paper-XV (General Studies)	10.30 AM to 1.30 PM	Nalanda Open University, 2nd Floor, Biscomaun Bhawan, Patna

NALANDA OPEN UNIVERSITY

B.Sc. Physics, Part-III

PAPER–VII (Honours)

(Classical Electrodynamics, Plasma Physics, Physics of Atoms, Molecules & Nuclei)

Annual Examination, 2023

Time : 3 Hours. **Full Marks : 80**

*Answer any **Five** Questions.*
All Questions carry equal marks.

1. Explain Lienard-wiechert potential. Calculate the intensities of electric and magnetic field due to a uniformly moving charge making use of this potential.
2. Explain plasma state and describe plasma parameters. Discuss collective behaviour of plasma and explain concept of temperature in plasma.
3. Establish the covariance of Maxwell's equations under Lorentz transformation.
4. Give quantum mechanical treatment of Paschen-Back effect.
5. Explain spin magnetic moment and electric quadrupole magnetic moment associated with atomic nucleus.
6. Give a brief account of the liquid drop model of nucleus. Explain magic number of the nuclei.
7. Explain the theory of molecular spectra of diatomic molecule treated as a harmonic vibrator. What are the short comings of this model ?
8. Describe the construction and the principle of working of a He-Ne laser.
9. Describe the Stern-Gerlach experiment and explain how does it explain the existence of spin magnetic moment of nucleus.
10. What do you mean by NMR spectroscopy ? Describe with diagram, the continuous wave NMR spectrometer.

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Programme of B.Sc. Part-III Physics (Hons.)
Annual Practical Counselling & Practical Examination - 2023

Venue : *1st Floor, Physics Lab, Biscomaun Tower, Patna - 800 001*

Practical Counselling

Date	*Paper*	*Time*	*Roll No*
14.08.2023	VII & VIII	10.00 AM to 04.00 PM	All Old & New Students

Practical Examination

Date	*Paper*	*Time*	*Roll No*
16.08.2023	VII	09.00 AM to 12.00 Noon	200500001 to 200500050 & All Old Students
	VIII	01.00 PM to 04.00 PM	
17.08.2023	VII	09.00 AM to 12.00 Noon	200500051 to 200500600
	VIII	01.00 PM to 04.00 PM	

NALANDA OPEN UNIVERSITY

B.Sc. Physics, Part-III

PAPER–VIII (Honours)

(Condensed Matter Physics & Electronics)

Annual Examination, 2023

Time : 3 Hours. **Full Marks : 80**

*Answer any **Five** Questions.*
All Questions carry equal marks.

1. What is Lattice Energy ? Calculate the lattice energy of an ionic crystal. Define Madlung constant and show that for an infinite line of ions its values is 2ln2.
2. Explain Hall effect. Define Hall coefficient and give its importance. How are they determined in the laboratory ?
3. Deduce Laue's equation of diffraction of x-ray by a crystal and obtain Bragg's diffraction condition from them.
4. Explain the nuclear shell model. How this model is used to explain the angular momentum of ground slate of the nucleus.
5. State and prove :

   (a) Norton's theorem (b) Reciprocity theorem
6. What is a zener diode ? Explain its working. How can it be used as a voltage stabilizer ?
7. What is an Amplifier ? Discuss the working of an R.C. Coupled amplifier with a circuit diagram. Obtain expression for voltage gain.
8. What is a Photodiode ? Discuss its working and uses with the help of its characteristics curve.
9. Explain the principle of frequency modulation. Define frequency modulation and modulation index for a frequency modulated carrier.
10. Distinguish between Einstein's theory and Debye theory of specific heat of solids. Discuss Debye theory and explain why this theory is most successful.

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Programme of B.Sc. Part-III Physics (Hons.)
Annual Practical Counselling & Practical Examination - 2023

Venue : *1st Floor, Physics Lab, Biscomaun Tower, Patna - 800 001*

Practical Counselling

Date	*Paper*	*Time*	*Roll No*
14.08.2023	VII & VIII	10.00 AM to 04.00 PM	All Old & New Students

Practical Examination

Date	*Paper*	*Time*	*Roll No*
16.08.2023	VII	09.00 AM to 12.00 Noon	200500001 to 200500050 & All Old Students
	VIII	01.00 PM to 04.00 PM	
17.08.2023	VII	09.00 AM to 12.00 Noon	200500051 to 200500600
	VIII	01.00 PM to 04.00 PM	