

NALANDA OPEN UNIVERSITY

M.Sc. Physics, Part-I

PAPER-I

(Mathematical Physics)

Annual Examination, 2017

Time : 3 Hours.

Full Marks : 80

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

1. Find the equation of motion for a charged particle in an electromagnetic field using the Hamiltonian of the particle.
2. Show that (a) row-equivalent matrices have the same rank,
(b) the row-space and the column-space of a matrix A have same dimension equal to rank A .
3. Write notes on orthonormality of column and row vectors. Prove that eigenvectors of a symmetric matrix corresponding to different eigenvalues are orthogonal.
4. Starting with the series expansion, derive Rodrigues formula for Legendre polynomials.
5. Derive integral representation of $J_n(x)$, the Bessel's function of first kind of order n .
6. Show that the integral representation of Laguerre polynomials is given by

$$L_n(x) = \frac{e^x}{n!} \int_0^{\infty} e^{-t} \cdot t^n J_0 \left[2(xt)^{\frac{1}{2}} \right] dt.$$

Where J_0 is the Bessel's functions of Zero order.

7. State and prove (a) Parseval's theorem (b) Convolution theorem of Fourier-transforms.
8. If ϕ is an invariant, determine whether $\frac{\partial^2 \phi}{\partial x^p \partial x^q}$ is a tensor.
9. Find g and g^{jk} corresponding to $ds^2 = 5(dx^1)^2 + 3(dx^2)^2 + 4(dx^3)^2 - 6dx^1 dx^2 + 4dx^2 dx^3$.
10. Find the Laplace transform for (a) $3t^4 - 2t^3 + 4e^{-3t} - 2\sin 5t + 3\cos 2t$.

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Examination Programme, 2017

M.Sc. Physics, Part-I

Date	Papers	Time	Examination Centre
11.05.2017	Paper-I	8.00 AM to 11.00 AM	Nalanda Open University, Patna
13.05.2017	Paper-II	8.00 AM to 11.00 AM	Nalanda Open University, Patna
15.05.2017	Paper-III	8.00 AM to 11.00 AM	Nalanda Open University, Patna
17.05.2017	Paper-IV	8.00 AM to 11.00 AM	Nalanda Open University, Patna
19.05.2017	Paper-V	8.00 AM to 11.00 AM	Nalanda Open University, Patna
23.05.2017	Paper-VI	8.00 AM to 11.00 AM	Nalanda Open University, Patna
25.05.2017	Paper-VII	8.00 AM to 11.00 AM	Nalanda Open University, Patna
27.05.2017	Paper-VIII	8.00 AM to 11.00 AM	Nalanda Open University, Patna

NALANDA OPEN UNIVERSITY

M.Sc. Physics, Part-I

PAPER-II

(Quantum Mechanics)

Annual Examination, 2017

Time : 3 Hours.

Full Marks : 80

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

1. Obtain expressions for the group velocity and the phase velocity of a de Broglie wave.
2. State Ehrenfest's theorem and show that classical mechanics agrees with quantum mechanics so far as the expectation values are concerned.
3. Calculate the reflection and the refraction coefficients when a charged particle is incident from the left with energy $E > 0$, on a square well potential given by
$$V(x) = -V_0, \quad 0 < x < a$$
$$= 0, \quad x < 0 \text{ and } x > a$$
4. (a) Prove that momentum operation is self-adjoint.
(b) Find the commutation relations of components of angular momentum.
5. Starting with momentum-position uncertainty obtain (a) $\Delta\phi \cdot \Delta\ell \geq \frac{\hbar}{2}$ and (b) $\Delta E \cdot \Delta t \geq \frac{\hbar}{2}$.
6. Find the energy levels and energy eigenfunctions of a particle of mass m moving in a potential
$$V(x) = \frac{1}{2}kx^2, \quad x > 0$$
$$= \infty, \quad x < 0$$
7. Present the quantum mechanical theory of H-like atoms and discuss its energy level diagram in relation to potential.
8. On the basis of WKB method discuss the case of one-dimensional harmonic oscillator and show that the theoretical results match with exact results.
9. Discuss the scattering of particles by a spherically symmetric potential. Explain partial waves and phase shift.
10. State and explain Fermi's golden rule. What do you understand by adiabatic and sudden approximation ?

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NALANDA OPEN UNIVERSITY
M.Sc. Physics, Part-I
PAPER–III

(Electrodynamics and Plasma Physics)
Annual Examination, 2017

Time : 3 Hours.

Full Marks : 80

Answer any Five Questions.
All questions carry equal marks.

1. Calculate vector potential of a current loop.
2. Show that D' Alembertian operator \square^2 is invariant under Lorentz transformation.
3. Explain advanced and retarded potential obtain an expression for angular distribution of power for uniformly moving point charge.
4. Give notes on (a) synchrotron radiation (b) Cerenkov radiation.
5. Discuss the motion of a charged particle in oscillating electromagnetic fields.
6. What is plasma ? Give the key difference between plasma and normal gas. Derive an expression for Debye length.
7. Derive the zeroth, first and second moments of Boltzmann's equation.
8. Derive expression for plasma frequency. Explain the significance of lower and upper hybrid frequencies.
9. While discussing the behaviour of plasma particles in static magnetic field, deduce and discuss Larmor frequency.
10. Explain the following terms (a) Mach number, (b) Reynold's number, (c) Stuart number and (d) Hartmann number.

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NALANDA OPEN UNIVERSITY

M.Sc. Physics, Part-I

PAPER-IV

(Statistical Physics)

Annual Examination, 2017

Time : 3 Hours.

Full Marks : 80

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

1. State and prove Boltzmann theorem of entropy. Obtain expression for the entropy of a monoatomic gas.
2. What do you mean by partition function ? Show that the partition function of a monoatomic gas is given by $Z = \frac{V}{h^3} (2\pi m k T)^{3/2}$.
3. State and explain the fundamental assumptions of statistical mechanics. Explain phase space and density of states.
4. Explain microcanonical and grand canonical ensembles. Derive Sackur-Tetrod equation for a perfect gas.
5. What is phase transition ? Explain the first order and the second order phase transitions. Discuss Landau theory of phase transition.
6. Derive Virial equation of state and evaluate the Virial coefficients.
7. What are critical indices ? Explain the different scaling relations and the critical indices.
8. Describe the two dimensional Ising model and show how does it explain the phenomenon of spontaneous magnetisation.
9. Show that the pressure exerted by a Fermi gas at $T = 0$ is $P_F = \frac{2}{5} \left(\frac{N}{V} \right) E_F$, where E_F = Fermi Energy.
10. Write notes on any **Two** of the following :—
 - (a) Phase-space, trajectory of phase point and density of states.
 - (b) Bose-Einstein Condensation.
 - (c) Gibbs' paradox.
 - (d) Scale transformation in phase transition.

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NALANDA OPEN UNIVERSITY

**M.Sc. Physics, Part-I
PAPER-V**

(Nuclear and Particle Physics)
Annual Examination, 2017

Time : 3 Hours.

Full Marks : 80

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

1. Give an account of the nature of force existing between a proton and a neutron in a deuteron for the ground state.
2. Discuss neutron-proton scattering at low energies. What light does it throw on the nature of nuclear force ?
3. Show that the nuclear force is spin dependent. Justify your answer with substantive experimental facts.
4. Describe the basic ideas of Yukawa's meson exchange theory of the nuclear forces. Give the properties of π -meson.
5. Define total and differential cross section. Describe experimental determination of cross section.
6. Describe the compound nucleus theory of nuclear reactions. Give experimental evidences in support of this theory.
7. Give the simple Breit-Wigner one level formula for the cross-section of neutron reaction in nuclei. Explain how the width of the resonance level can be obtained from this formula.
8. What are stripping and pick-up reactions ? Obtain an expression for the reaction amplitude using Butler theory for stripping and pick-up reactions.
9. Give a brief account of Fermi's theory of β -decay and show how it was necessary to postulate the existence of neutrino.
10. Describe Wu's experiment and give its interpretation to explain the non-conservation of parity in weak interaction.

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<p>For Practical Counselling Class & Practical Examination Programme Please See on Back Page.</p>
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NALANDA OPEN UNIVERSITY

M.Sc. Physics, Part-I

PAPER-VI

(Atomic and Molecular Physics)

Annual Examination, 2017

Time : 3 Hours.

Full Marks : 80

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

GROUP 'A'

1. Describe and explain the different types of coupling of vector atomic models. Give their respective merits.
2. Write down the Schrödinger equation of one electron atom and solve it by the method of separation of variables. Explain the physical meaning of the different quantum numbers that come out in the solution.
3. State and explain Pauli's exclusion principle and discuss how this principle is connected with the symmetry of the wave function.
4. How does the nuclear spin affect the hyperfine structure of the emission spectra of atoms.
5. Discuss briefly the various factors which contribute to the broadening of spectral line.

GROUP 'B'

6. Describe the principal feature of the rotational bond spectrum of a diatomic molecule. Estimate the energy difference between the rotational levels $J = 0$ and $J = 1$ of HCl molecule. Its moment of inertia is 2.66×10^{-47} kg.m².
7. State Franck-Condon principle and give its wave mechanical interpretation. How does it help in understanding the intensity distribution in the vibrational structure of the electronic transitions of a diatomic molecule.
8. Discuss the principal features of the electronic spectrum of a diatomic molecule.
9. What do you mean by ESR ? Explain the basic principles of interaction of electrons spin and applied magnetic field.
10. Write notes on any **Two** of the following :—
 - (a) LS and JJ Coupling.
 - (b) NMR spectroscopy.
 - (c) Spin-spin coupling between two or more nuclei.
 - (d) Raman spectra of diatomic molecules.

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**For Practical Counselling Class & Practical Examination Programme
Please See on Back Page.**

NALANDA OPEN UNIVERSITY

M.Sc. Physics, Part-I

PAPER–VII

(Condensed Matter Physics)

Annual Examination, 2017

Time : 3 Hours.

Full Marks : 80

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

1. Explain lattice, Bravais lattice, point group and space group. Show that the base centred and the face centred tetragonal do not give any new Bravais lattice.
2. What is crystal defect ? Describe different types of point defects. Derive an equation relating the number of vacancies found under equilibrium in a monoatomic crystal at a constant temperature and the average energy required to create one vacancy.
3. Describe cellular method for studying the band structure of the solids. What are the problems encountered in this method.
4. Discuss the quantization of electron orbits in a magnetic field.
5. What is a superconductor ? Explain how their properties differ from those of normal conductors.
6. What is quantum hall effect ? Give an account of the theory of this effect.
7. Give a qualitative description of the BCS theory (Bardeen, Cooper and Schrieffer theory). How does it account for the superconductivity ?
8. What are symmetry operations ? Describe the principal symmetry operation applicable to a three dimensional lattice.
9. Write down the main characteristics of Fermi surface. Discuss the effects of the electric and the magnetic fields on the Fermi surface.
10. Describe the powder method for X-ray diffraction. Discuss the formation of diffraction pattern on the photographic film and its utility.

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<p>For Practical Counselling Class & Practical Examination Programme Please See on Back Page.</p>
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NALANDA OPEN UNIVERSITY
M.Sc. Physics, Part-I
PAPER–VIII
(Electronic Devices)
Annual Examination, 2017

Time : 3 Hours.

Full Marks : 80

Answer any Five Questions.
All questions carry equal marks.

1. Describe the design and operating characteristics of tunnel diode. What is meant by tunneling.
2. Describe the mechanism of current flow in a properly biased BJT. Define the various parameters of BJT.
3. How can NMOS device be used to implement memory device ? Explain it.
4. What are Lyotropic Liquid Crystals ? Discuss generic progression of phases going from low to high amphiphile concentration.
5. Give an account of the theoretical treatment of liquid crystals.
6. What is meant by magneto optic effect ? Explain it with special reference to Faraday effect and magneto-optic-Kerr effect.
7. State and explain (i) Electrostrictive effect and (ii) Magnetostrictive effect.
8. What are ferroelectric materials ? Discuss their classification. Give the important properties of these materials.
9. Explain the transmissive and the reflective type LCDs.
10. What do you mean by piezoelectricity ? Discuss the applications of piezoelectric materials in sensors and actuators.

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For Practical Counselling Class & Practical Examination Programme Please See on Back Page.

NALANDA OPEN UNIVERSITY

M.Sc. Physics, Part-II

PAPER-IX

(Computational Mathematics)

Annual Examination, 2017

Time : 3 Hours.

Full Marks : 80

Answer any Five Questions.
All questions carry equal marks.

1. Give the theory of Newton-Raphson method to find the root of equations ? Using this method, find a root of the equation $x^5 + 5x + 1 = 0$ correct upto three decimal places.

2. What do you understand by eigenvalues and eigenvector of a matrix ? Let $\begin{bmatrix} 0 & 1 \\ -1 & 0 \end{bmatrix}$ be a matrix. Find its eigenvalues and eigenvectors.

3. In a decennial census, the population of a town is given as

Year : x	1891	1901	1911	1921	1931
Population (in thousand) : y	46	66	81	93	101

Estimate the population for the year 1895.

4. The values of x and y are given in the table here

x	1.0	1.2	1.4	1.6	1.8	2.0	2.2
y	2.7183	3.3201	4.0552	4.9530	6.0496	7.3891	9.0250

From this table calculate $\frac{dy}{dx}$ and $\frac{d^2y}{dx^2}$ for $x = 1.2$.

5. Find by Gauss's formula $I = \int_a^b x dx$ in terms of abscissa and weights of Gaussian integration.

6. Write notes on (i) Sampling distribution and (ii) Monte-Carlo integration.

7. Use Runge-Kutta method to solve $10 \frac{dy}{dx} = x^2 + y^2$, $y(0) = 1$ for the interval $0 < x \leq 0.4$ with $h = 0.1$.

8. Using Crank-Nicholson method solve the equation $\frac{\partial^2 f}{\partial x^2} = 8 \frac{\partial f}{\partial x}$, given $f(0, t) = 0$, $f(20, t) = 10$ and $f(x, 0) = 2.0$.

9. Explain the use of the cubic spline method in numerical differentiation with illustrative examples.

10. Solve the equation $y'' + y + 1 = 0$, with boundary conditions; $y = 0$ when $x = 0$ and $y = 0$ when $x = 1$.

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Examination Programme, 2017 M.Sc. Physics, Part-II

Date	Paper	Time	Examination Centre
01.06.2017	Paper-IX	8.00 AM to 11.00 AM	Nalanda Open University, Patna
03.06.2017	Paper-X	8.00 AM to 11.00 AM	Nalanda Open University, Patna
05.06.2017	Paper-XI	8.00 AM to 11.00 AM	Nalanda Open University, Patna
07.06.2017	Paper-XII	8.00 AM to 11.00 AM	Nalanda Open University, Patna
09.06.2017	Paper-XIII	8.00 AM to 11.00 AM	Nalanda Open University, Patna
13.06.2017	Paper-XIV	8.00 AM to 11.00 AM	Nalanda Open University, Patna
15.06.2017	Paper-XV	8.00 AM to 11.00 AM	Nalanda Open University, Patna
17.06.2017	Paper-XVI	8.00 AM to 11.00 AM	Nalanda Open University, Patna

NALANDA OPEN UNIVERSITY
M.Sc. Physics, Part-II
PAPER-X
(Programming with Fortran and C++)
Annual Examination, 2017

Time : 3 Hours.

Full Marks : 80

Answer any Five Questions.
All questions carry equal marks.

1. Write acceptable and unacceptable Fortran integer constant.
2. Discuss the following three ways of writing $\times 2$ in Fortran; (a) $x*x$ (b) $x**2$ (c) $x**2.0$
3. Write a FUNCTION subprogram which calculates the sum of the elements in a linear array with N elements.
4. Discuss the characteristics of OPEN, READ, END FILE and CLOSE FILE statement used in file format of Fortran.
5. List out all C++ operators along with their ASSOCIATIVITY.
6. Write a program in C++ to perform the work of finding (i) the area of a triangle, (ii) the circumference of a circle.
7. Summarize the syntactic rules of the following loop statements :-
 - (i) While loop,
 - (ii) DO-while loop
8. What is meant by conditional compilation ?
9. What is multidimensional array and how is it different from a one dimensional array ?
10. Distinguish a structure data type with other data type variable.

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For Practical Counselling Class & Practical Examination Programme Please See on Back Page.

NALANDA OPEN UNIVERSITY

M.Sc. Physics, Part-II PAPER–XI

(Physics of Nano-materials)
Annual Examination, 2017

Time : 3 Hours.

Full Marks : 80

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

1. On the basis of free electron theory derive expression for the electrical and thermal conductivity of metal and hence establish Wiedmann-Franz law.
2. Explain the band formation in the hydrogen molecule. What do you mean by energy bands in Crystals ?
3. Show that the effective mass of a free electron is the same as its mass in vacuum.
4. Obtain the eigenvalues and normalized eigenwavefunction of a particle in one dimensional infinite potential box of side 'a'.
5. What is a quantum dot ? Discuss the structure and characteristics of various types of quantum dots.
6. What is Raman effect ? Discuss the variations in Raman Spectra of nanomaterials.
7. Describe the citrate precursor technique for preparation of nanoparticles.
8. Discuss Drude's free electron theory and deduce expression for electrical conductivity.
9. Discuss the properties of electrons in a band. Why liquid hydrogen is like liquid metal.
10. Discuss the motion of electron of mass m in a rectangular box ($a \times b \times c$) and obtain expression for total normalized wave function and eigenvalue of energy of the electron.

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NALANDA OPEN UNIVERSITY

M.Sc. Physics, Part-II

Practical Counseling and Practical Examination Programme, 2017

(Venue : Physics Lab, 1st Floor Biscomaun Tower, Patna-800001)

Practical Programme for Paper-X of All Students

<i>Counselling Class Programme</i>		<i>Practical Examination Programme</i>		
<i>Date</i>	<i>Time</i>	<i>Paper</i>	<i>Date</i>	<i>Time</i>
05.08.2017 to 10.08.2017	01.00 PM to 5.00 PM	X	11.08.2017	12:00 Noon to 3:00 PM
Venue : School of Computer Education (IT), Nalanda Open University, 12 th Floor, Biscomaun Tower, Patna-800001				

For Enrollment No. All Old Batch Students & 150280001 to 150280105

<i>Counselling Class Programme</i>		<i>Practical Examination Programme</i>		
<i>Date</i>	<i>Time</i>	<i>Paper</i>	<i>Date</i>	<i>Time</i>
29.07.2017 to 02.08.2017	11.00 AM to 5.00 PM	XII	03.08.2017	11:30 AM to 2:30 PM
		XIV	03.08.2017	2:45 PM to 5:45 PM
		XV	04.08.2017	11:30 AM to 2:30 PM
		XVI	04.08.2017	2:45 PM to 5:45 PM

For Enrollment No. 150280106 to 150280543

<i>Counselling Class Programme</i>		<i>Practical Examination Programme</i>		
<i>Date</i>	<i>Time</i>	<i>Paper</i>	<i>Date</i>	<i>Time</i>
16.08.2017 to 19.08.2017	11.00 AM to 5.00 PM	XII	21.08.2017	11:30 AM to 2:30 PM
		XIV	21.08.2017	2:45 PM to 5:45 PM
		XV	22.08.2017	11:30 AM to 2:30 PM
		XVI	22.08.2017	2:45 PM to 5:45 PM

NALANDA OPEN UNIVERSITY
M.Sc. Physics, Part-II
PAPER–XII
 (Science and Technology of Renewable Energy)
Annual Examination, 2017

Time : 3 Hours.

Full Marks : 80

Answer any Five Questions.
All questions carry equal marks.

1. Explain 'Green house effect' and the co-relation of the rise of atmospheric carbon dioxide concentration with the rise in average temperature.
2. State and explain drift velocity. Derive expression for conductivity and mobility.
3. Explain absorption depth, absorption coefficient and generation rate in semiconductor materials.
4. Explain diode equation for ideal and nonideal diodes and explain the importance of dark current.
5. Explain I V curve of a solar cell and discuss the short circuit Current and differentiate it from illuminated current.
6. What is meant by airmass and how is it related to the standardized solar spectrum ? What are major atmospheric effects limiting the performance of photovoltaic applications ?
7. Discuss the efficiency of a solar cell and explain the importance of fill factor in a solar cell.
8. Explain minority carrier life time and diffusion length in a single semiconductor crystal.
9. Explain light trapping mechanism and lambertian reflectors. Point out the applications of these reflectors in reducing optical losses.
10. Explain capacity factor of wind farms. How does it help in increasing the reliability of wind farms.

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NALANDA OPEN UNIVERSITY
M.Sc. Physics, Part-II
Practical Counseling and Practical Examination Programme, 2017
 (Venue : Physics Lab, 1st Floor Biscomaun Tower, Patna-800001)

Practical Programme for Paper-X of All Students

Counselling Class Programme		Practical Examination Programme		
Date	Time	Paper	Date	Time
05.08.2017 to 10.08.2017	01.00 PM to 5.00 PM	X	11.08.2017	12:00 Noon to 3:00 PM
Venue : School of Computer Education (IT), Nalanda Open University, 12 th Floor, Biscomaun Tower, Patna-800001				

For Enrollment No. All Old Batch Students & 150280001 to 150280105

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For Enrollment No. 150280106 to 150280543

Counselling Class Programme		Practical Examination Programme		
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16.08.2017 to 19.08.2017	11.00 AM to 5.00 PM	XII	21.08.2017	11:30 AM to 2:30 PM
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		XVI	22.08.2017	2:45 PM to 5:45 PM

NALANDA OPEN UNIVERSITY

M.Sc. Physics, Part-II

PAPER–XIII

(Environmental Physics)

Annual Examination, 2017

Time : 3 Hours.

Full Marks : 80

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

1. Discuss Clausius Clapeyron Equation and the global climate change.
2. What do you mean by Contact Temperature ? Obtain an expression for it.
3. Explain the Stability and vertical motion of air.
4. Explain General (or Global) Climate Model (GCM) and Numerical Weather Prediction Model (NWPM). What do these two models have in common ?
5. What do you mean by renewable energy ? Describe the various types of renewable energy. Point out the economic importance of the renewable energy.
6. Discuss the working principle of Gratzel Cell. Give the properties of this cell.
7. Explain nuclear fission. Explain how the fission reactor size can be optimized.
8. 'Biofuels are renewable energy sources why ? Explain in brief the four generations of biofuels.
9. What is an urban heat island ? What are the problems with urban heat island effect ?
10. Discuss diffusion of guest particles in a host medium.

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NALANDA OPEN UNIVERSITY

M.Sc. Physics, Part-II

Practical Counseling and Practical Examination Programme, 2017

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For Enrollment No. 150280106 to 150280543

<i>Counselling Class Programme</i>		<i>Practical Examination Programme</i>		
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		XVI	22.08.2017	2:45 PM to 5:45 PM

NALANDA OPEN UNIVERSITY

M.Sc. Physics, Part-II

PAPER–XIV

(Photonics)

Annual Examination, 2017

Time : 3 Hours.

Full Marks : 80

Answer any Five Questions. All questions carry equal marks.

1. What do you mean by photonics ? How is it different from electronics ? Comment on the future of this branch of physics.
2. Describe a light emitting diode (LED). What do you mean by injected holes and electrons ?
3. Describe the composition of a solar cell. How does the output current of solar cell depend on the intensity of the incident radiation ?
4. Explain the following terms :–
(i) Brewster Window, (ii) Quantum well diode laser,
(iv) Monolayer diode laser, and (iv) Fermi Level.
5. Describe an injection laser. What is double heterojunction injection laser ? Explain the term injection.
6. Derive the condition of lasing in terms of the gain and loss coefficient per unit length and the relativity to mirrors placed at the end faces of the laser crystal.
7. Obtain expressions for the following terms related to an optical fibre : (i) Critical angle, (ii) Numerical aperture, (iii) acceptance angle, (iv) relative refractive index difference.
8. Starting from the Maxwell's field equations, derive the wave equations for E_z and H_z components for an e.m. wave travelling along positive z-direction.
9. Extend the concept of beats from the acoustical to optical region. How does the beat formation help in deciding the changes in phase of the laser source ?
10. How optical computer is different from electronic computer ? Why the optical computer is going to be faster than electronic computes in operation ?

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NALANDA OPEN UNIVERSITY

M.Sc. Physics, Part-II

Practical Counseling and Practical Examination Programme, 2017

(Venue : Physics Lab, 1st Floor Biscomaun Tower, Patna-800001)

Practical Programme for Paper-X of All Students

Counselling Class Programme		Practical Examination Programme		
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For Enrollment No. 150280106 to 150280543

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16.08.2017 to 19.08.2017	11.00 AM to 5.00 PM	XII	21.08.2017	11:30 AM to 2:30 PM
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		XV	22.08.2017	11:30 AM to 2:30 PM
		XVI	22.08.2017	2:45 PM to 5:45 PM

NALANDA OPEN UNIVERSITY

M.Sc. Physics, Part-II PAPER–XV

(Advanced Condensed)
Annual Examination, 2017

Time : 3 Hours.

Full Marks : 80

Answer any Five Questions. All questions carry equal marks.

1. What is Madlung constant ? Show that the madlung constant for an infinite linear chain of ions of alternating unit charge at an equilibrium separation is $2 \ell n 2$.
2. Obtain dispersion relation for a one dimensional crystal with two types of items and discuss the nature of optical and acoustic modes.
3. Establish the Lyddane-Sachs-Teller relation between the static dielectric constant and that at optical frequencies.
4. (a) What is a phonon ? Enumerate the salient features of phonon.
(b) What are normal and umklapp processes ? Explain with the help of suitable vector diagrams.
5. Derive an expression for the thermal conductivity of a crystal. Discuss the variation of thermal conductivity with temperature.
6. Discuss the theory of indirect transition and obtain an expression for transition probability.
7. Give the theory of interaction of electron with acoustic phonons.
8. Present an account of Ginzberg-Landau theory. How do you obtain coherence length ?
9. Discuss A.C. Josphson effect. Show that the current oscillates with frequency $\omega = \frac{2ev}{\hbar}$.
10. Discuss the theory of Isomer shift and electric quadrupole interaction vis-a-vis Mössbauer spectrum.

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NALANDA OPEN UNIVERSITY

M.Sc. Physics, Part-II

Practical Counseling and Practical Examination Programme, 2017

(Venue : Physics Lab, 1st Floor Biscomaun Tower, Patna-800001)

Practical Programme for Paper-X of All Students

<i>Counselling Class Programme</i>		<i>Practical Examination Programme</i>		
<i>Date</i>	<i>Time</i>	<i>Paper</i>	<i>Date</i>	<i>Time</i>
05.08.2017 to 10.08.2017	01.00 PM to 5.00 PM	X	11.08.2017	12:00 Noon to 3:00 PM
Venue : School of Computer Education (IT), Nalanda Open University, 12 th Floor, Biscomaun Tower, Patna-800001				

For Enrollment No. All Old Batch Students & 150280001 to 150280105

<i>Counselling Class Programme</i>		<i>Practical Examination Programme</i>		
<i>Date</i>	<i>Time</i>	<i>Paper</i>	<i>Date</i>	<i>Time</i>
29.07.2017 to 02.08.2017	11.00 AM to 5.00 PM	XII	03.08.2017	11:30 AM to 2:30 PM
		XIV	03.08.2017	2:45 PM to 5:45 PM
		XV	04.08.2017	11:30 AM to 2:30 PM
		XVI	04.08.2017	2:45 PM to 5:45 PM

For Enrollment No. 150280106 to 150280543

<i>Counselling Class Programme</i>		<i>Practical Examination Programme</i>		
<i>Date</i>	<i>Time</i>	<i>Paper</i>	<i>Date</i>	<i>Time</i>
16.08.2017 to 19.08.2017	11.00 AM to 5.00 PM	XII	21.08.2017	11:30 AM to 2:30 PM
		XIV	21.08.2017	2:45 PM to 5:45 PM
		XV	22.08.2017	11:30 AM to 2:30 PM
		XVI	22.08.2017	2:45 PM to 5:45 PM

NALANDA OPEN UNIVERSITY

M.Sc. Physics, Part-II

PAPER–XVI

(Advanced Electronics)

Annual Examination, 2017

Time : 3 Hours.

Full Marks : 80

Answer any Five Questions. All questions carry equal marks.

1. What is level translator circuit ? Why is it used with the cascaded differential amplifier.
2. What is an Op-Amp ? What are the characteristics of an ideal Op-Amp ? Draw the block diagram of Op-Amp.
3. What is logarithmic amplifier ? Show that in a logarithmic amplifier, output voltage changes as the logarithm of the input voltage.
4. Define an oscillator. What is the principle of operation of an oscillator ? How are oscillators classified ?
5. Convert the following Boolean expression to their schematic equivalents. Do not modify the original expression (i) $\overline{A \cdot B} + C$, (ii) $(\overline{A + B \cdot C}) + A \cdot \overline{D}$ and (iii) $A \cdot \overline{B} + \overline{A} \cdot B$.
6. What is the difference between asynchronous and synchronous counters ? What is the advantage of an asynchronous counter ?
7. What is encoder ? Discuss 4-bit priority encoder.
8. Explain the functioning of 'Successive-Approximation' ADC and 'Sigma-Delta' ADC. [ADC = Analog to Digital Converter].
9. Explain the architecture of 8086 microprocessor.
10. Describe basic hardware blocks of a computer.

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NALANDA OPEN UNIVERSITY

M.Sc. Physics, Part-II

Practical Counseling and Practical Examination Programme, 2017

(Venue : Physics Lab, 1st Floor Biscomaun Tower, Patna-800001)

Practical Programme for Paper-X of All Students

<i>Counselling Class Programme</i>		<i>Practical Examination Programme</i>		
<i>Date</i>	<i>Time</i>	<i>Paper</i>	<i>Date</i>	<i>Time</i>
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For Enrollment No. All Old Batch Students & 150280001 to 150280105

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For Enrollment No. 150280106 to 150280543

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<i>Date</i>	<i>Time</i>	<i>Paper</i>	<i>Date</i>	<i>Time</i>
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