NALANDA OPEN UNIVERSITY

M.Sc. Physics, Part-I

PAPER–I

(Mathematical Physics)

Annual Examination, 2016

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

Answer any Five Questions.
All questions carry equal marks.

1. Solve the equation $(1 - x^2)y'' - 2xy' + 2y = 0$ given that $y = x$ is a solution.

2. State and prove the fundamental theorems on Laplace transforms of derivatives. Solve the equation $\frac{dx}{dt} + \alpha x = 0$ subject to initial condition $x = x_0 \ \ at \ \ t = 0$.

3. Prove the following recurrence formulae for Legendre polynomial

   (a) $P_{n+1}(x) = \frac{(2n+1)}{(n+1)} \cdot x \ P_n(x) - \left(\frac{n}{n+1}\right) \cdot P_{n-1}(x)$

   (b) $P'_{n+1}(x) - P'_{n-1}(x) = (2n+1) P_n(x)$

4. Laguerre polynomials are given by the Rodrigue's formula $L_n(x) = e^x \cdot \frac{d^n}{dx^n}\left(x^n e^{-x}\right)$. Find $L_1(x)$ and $L_3(x)$.

5. Determine the conjugate metric tensor in (a) Cylindrial and (b) Spherical Co-ordinates.

6. Using Hamiltonian formulation discuss the motion of a linear harmonic Oscillator.

7. C is a matrix given by $C = \begin{vmatrix} 4 & 6 & 2 \\ 6 & 0 & 3 \\ 2 & 3 & -1 \end{vmatrix}$, then find (i) $\frac{1}{2}C^2 - C$ and (ii) $C\left(\frac{1}{2}C - 1\right)$.

8. Taking $\vec{A} = 3\hat{i} - \hat{j} + 2\hat{k}$, $\vec{B} = 2\hat{i} + \hat{j} - \hat{k}$ and $\vec{C} = \hat{i} - 2\hat{j} + 2\hat{k}$. Prove that $\vec{A} \times (\vec{B} \times \vec{C}) = (\vec{A} \cdot \vec{C})\vec{B} - (\vec{A} \cdot \vec{B})\vec{C}$.

9. Prove that Poisson's brackets remain invariant with respect to canonical transformation.

10. From Fourier integral, define Fourier integral transform in three different manners.

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Examination Programme, 2016

M.Sc. Physics, Part-I

Date	*Papers*	*Time*	*Examination Centre*
13.05.2016	Paper-I	8.00 AM to 11.00 AM	Nalanda Open University, Patna
17.05.2016	Paper-II	8.00 AM to 11.00 AM	Nalanda Open University, Patna
19.05.2016	Paper-III	8.00 AM to 11.00 AM	Nalanda Open University, Patna
21.05.2016	Paper-IV	8.00 AM to 11.00 AM	Nalanda Open University, Patna
23.05.2016	Paper-V	8.00 AM to 11.00 AM	Nalanda Open University, Patna
25.05.2016	Paper-VI	8.00 AM to 11.00 AM	Nalanda Open University, Patna
27.05.2016	Paper-VII	8.00 AM to 11.00 AM	Nalanda Open University, Patna
30.05.2016	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, 2016

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

Answer any Five Questions.
All questions carry equal marks.

1. State and prove Heisenberg's uncertainty principle. What are its consequences.
2. State the postulates of Schrödinger formulation of quantum mechanics.
3. Give a brief account of quantum mechanical theory of Stark effect for splitting of energy levels of hydrogen atom.
4. State the hypothesis of de Broglie. Derive the de Broglie relation for a photon from the principle of mass-energy equivalence.
5. Set up Schrödinger equation for an one dimensional harmonic Oscillator and solve it to find the energy eigenvalues and eigenfunctions.
6. Using perturbation theory find the energy levels and energy eigenfunctions for the matrix $H = \begin{vmatrix} 1+\in & \in \\ \in & -1+\in \end{vmatrix}$, $\in << 1$ correct upto first order in $\in$. Compare these energy eigenvalues with the exact one i.e. by diagonalizing the matrix H.
7. Write down Schrödinger's wave equation for hydrogen atom and apply the separation of variables method to obtain the radial wave function for the system.
8. What is an operator ? Explain the use of matrix representation of operatiors in quantum mechanics. What are unitary and Hermitian operators ?
9. Using the method of partial waves for the study of scattering problems. Show that total scattering cross-section is given by $\sigma = \frac{4\pi}{k^2} \sum_{l=0}^{\infty} (2l+1)\, Sin^2 \delta l$.
10. Write short notes on any ***Two*** of the following :—
    (a) Dirac delta function.
    (b) Expectation values.
    (c) Ehrenfest's theorem.
    (d) Bra nad Ket notations.

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NALANDA OPEN UNIVERSITY

M.Sc. Physics, Part-I

PAPER–III

(Electrodynamics and Plasma Physics)

Annual Examination, 2016

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. Find transformation equations for $\vec{E}$ and $\vec{B}$ under Lorentz transformations and show that $\vec{E}\cdot\vec{B}$ is invariant.
2. Explain Lienard-Weichert potential. Obtain an expression for Lienard-Weichert potential of a uniformly moving charge.
3. Discuss the motion of a charged particle in an oscillating electromagnetic field.
4. Discuss the motion of a charged particle in a non-uniform electric field.
5. Deduce Larmor's formula for a non-relativistic accelerated charge.

GROUP 'B'

6. Give Saha's theory of thermal ionisation and explain the determination of plasma ionisation on its basis.
7. Write Maxwell's equations in tensor form and show that they are covariant under Lorentz transformations.
8. What are magneto Sonic waves ? Deduce the expression for velocity of magnet Sonic waves in plasma. How are these waves different form the Alfven moves ?
9. Derive Boltzmann's equation. What is Boltzmann-Vlasov equation ?
10. Derive an expression for plasma frequency from the mass conservation equation of continuity.

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NALANDA OPEN UNIVERSITY

M.Sc. Physics, Part-I

PAPER–IV

(Statistical Mechanics)

Annual Examination, 2016

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

Answer any Five Questions.
All questions carry equal marks.

1. What is entropy ? Show that, (a) $S = K \ln z + \frac{U}{T}$, (b) $U = -\frac{\partial}{\partial \beta}(\ln z)$, where U = mean energy of the gas, S = entropy, k = Boltzmann constant, z = partition function and T= absolute temperature of the gas.
2. Explain partition function. Deduce expression for partition function of a monoatomic gas.
3. Prove that the one dimensional Ising model does not explain the spontaneous magnetization. How does the solution of the two dimensional Ising model overcome these difficulties ?
4. State and prove Liouvill theorem. How is it analogous to the equation of continuity of an incompressible fluid ?
5. Explain : ensembles, microcanonical and the grand canonical ensembles. Derive Sackur-Tetrode equation for a perfect gas.
6. Explain cluster expansion. Discuss the classical approach towards the theory of cluster expansion.
7. Explain the first and the second order phase transitions. Give the Landau theory of phase transition.
8. Derive the Virial equation of state and evaluate the Virial coefficients.
9. Derive Fermi-Dirac distribution law or Bose-Einstein distribution law.
10. What are critical indices ? Explain the different kinds of critical indices.

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NALANDA OPEN UNIVERSITY

M.Sc. Physics, Part-I

PAPER–V

(Nuclear and Particle Physics)

Annual Examination, 2016

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

Answer any Five Questions.
All questions carry equal marks.

1. Explain clearly nuclear quadrupole moment and discuss the ground state of deuteron in the light of the fact that it has small but definite quadrupole moment.

2. What is β-decay ? Give Fermi theory of β-decay. Discuss Fermi and Gamow-Teller selection rules in the context of Fermi's theory of β-disintegration.

3. Discuss the nature and properties of π-mesons. How does it account for the charge independence of nuclear forces ? Show that the parity of π-mesons is negative.

4. What is majorana force ? Explain why a neutron-proton pair forms bound nucleus, while a bi-neutron and a di-proton pair does not. How this exchange force gives rise to saturation in binding energy ?

5. Discuss the quark model in detail. How does this model explain baryons and mesons ?

6. What are electric and magnetic transitions in Gamma-ray emission ? Explain multipolarity in the Gamma transition.

7. Define the Q-value of a nuclear reaction. Establish the Q-equation of the nuclear reaction.

8. What are stripping and pick-up reactions ? Obtain an expression for reaction amplitude using Born approximation for stripping and pick-up reaction.

9. Describe the compound nucleus theory of nuclear reactions. Give experimental evidences in support of this theory.

10. Give an account of classification of hadrons. Explain SU(3) symmetry and discuss octet and decuplet multiplets for hadrons and baryons as well as octet multiplets for measons.

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NALANDA OPEN UNIVERSITY

M.Sc. Physics, Part-I

PAPER–VI

(Atomic and Molecular Physics)

Annual Examination, 2016

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. Deduce an expression for the spectral series of hydrogen-like atoms, taking into account the finite mass of the nucleus. Estimate the energy required to remove the electron from singly ionized helium atom.
2. Discuss the theory of hyperfine structure of spectral lines. What light does this throw on the spin and magnetic moment of atomic nuclei ?
3. Describe the general features of the spectra of alkali-like atoms. How are they explained ?
4. Outline the theory of Stark effect. Show that the splitting in Stark effect increases with the increase of principal quantum number(n).
5. What are normal and anomalous Zeeman effects ? Explain them theoretically.

GROUP 'B'

6. Give the complete theory of the vibrational-rotational spectrum of diatomic molecules.
7. Discuss Raman spectra of diatomic molecule and point out the similarities and differences of this with the infra-red Raman spectra.
8. Discuss the principal features of the electronic spectrum of a diatomic molecule.
9. What do you mean by ESR ? Explain basic principles of interaction of electron spin and applied magnetic field giving specific examples.
10. Discuss the intensities of rotational lines produced by a non-rigid rotator. How is I_{max} related to the absolute temperature(T) of the molecule ?

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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, 2016

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

Answer any Five Questions.
All questions carry equal marks.

1. What are Brillouin Zones ? How are these zones constructed ? Give the sketches of the first Billouin zones of bcc and fcc lattices.
2. What are Miller indices ? How the orientation of plane is specified by Miller indices ? Explain their importance. Write down the Miller indices for plans with intercepts $\left(a, \frac{b}{2}, c\right)$.
3. Discuss the quantisation of electron orbits in a magnetic field.
4. Discuss Kronig-Penny model for a linear lattice. How does it lead to the formation of energy bands in solids.
5. (a) State and prove Bloch theorem.
   (b) Explain the significance of the effective mass of the electron.
6. Explain the schottky and the Frankel defects. Calculate the equilibrium concentration of each defect and indicate the order of their magnitude.
7. What is atomic scattering factor ? Derive the general expression for this quantity using spherical polar co-ordinates. How is it related to the geometrical structure factor ?
8. What are symmetry operations ? Describe the principal symmetry operation applicable to a three dimensional lattice.
9. What is quantum hall effect ? Give an account of its relevant theory.
10. What is a Fermi surface ? What are its main characteristics ? Discuss the effect of electric field and magnetic field on Fermi Surface.

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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–VIII

(Electronic Devices)

Annual Examination, 2016

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

Answer any Five Questions.
All questions carry equal marks.

1. Describe the construction and the working Uni junction transistor. Discuss its operating characteristics. Explain intrinsic stand off ratio.
2. Describe construction of a JFET. Discuss its characteristics. What is pinch off and how does it take place.
3. Explain large angle diffraction with special reference to co-directional and contra directional coupling.
4. Explain piezoelectricity and discuss the application of piezoelectric material in sensors and actuators.
5. Give the full name of SAW. Discuss its use in surface wave sensors.
6. What is Raman-Nath diffraction ? Give its theory. How can it be observed.
7. Describe the mechanism of current flow in a properly biased BJT. Define various BJT parameters.
8. Give the basic design of a Charge-Coupled-Device (CCD) and explain its working.
9. Distinguish between RAM and ROM. What are static and dynamic RAMs ? How can these be obtained.
10. What is Pockels effect ? What is a Pockels Cell ? Explain the dynamics within the cell. Also discuss the applications of Pockel Cells.

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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, 2016

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

Answer any Five Questions.
All questions carry equal marks.

1. Find the root of the equation $x\,Sinx + Cos\,x = 0$ using Newton-Raphson formula.

2. Using matrix inversion method, find the solution of the following set of equations.

$$\left.\begin{aligned} 3x + y + 2z &= 3 \\ 2x - 3y - z &= -3 \\ x + 2y + z &= 4 \end{aligned}\right\}$$

3. Using Newton's Backward. Difference Interpolation Formula estimate f (7.5) from following data.

x	1	2	3	4	5	6	7	8
f(x)	1	8	27	64	125	216	343	512

4. State and prove Sterling's formula for interpolation.

5. From the Taylor series for $y(x)$, find $y(0, 1)$, correct to three decimal places if $y(x)$ satisfies $y' = x - y^2$ and $y(0) = 1$.

6. With the help of Euler-Maclaurin formula, evaluate the integral $\int_0^{\pi/2} \sin x\ dx$.

7. Give the theory of Crank-Nicolson Method to solve the parabolic partial differential equation. Explain it with a suitable solved example.

8. Use Splin method to solve the initial value problem $y'' + 2y' + y = 0$, $y(0) = 0$ and $y(1) = 0$.

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

10. Find the eigenvalues and eigenvectors of the given matrix. Show that n × n matrix may have n linearly independent eigenvectors.

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Examination Programme, 2016

M.Sc. Physics, Part-II

Date	Papers	Time	Examination Centre
01.06.2016	Paper-IX	8.00 AM to 11.00 AM	Nalanda Open University, Patna
03.06.2016	Paper-X	8.00 AM to 11.00 AM	Nalanda Open University, Patna
07.06.2016	Paper-XI	8.00 AM to 11.00 AM	Nalanda Open University, Patna
09.06.2016	Paper-XII	8.00 AM to 11.00 AM	Nalanda Open University, Patna
11.06.2016	Paper-XIII	8.00 AM to 11.00 AM	Nalanda Open University, Patna
13.06.2016	Paper-XIV	8.00 AM to 11.00 AM	Nalanda Open University, Patna
15.06.2016	Paper-XV	8.00 AM to 11.00 AM	Nalanda Open University, Patna
17.06.2016	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, 2016

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

Answer any Five Questions.
All questions carry equal marks.

1. Write short notes on (a) Machine language, (b) Assembly language and (c) High level programming.

2. What are executable and non-executable statements ? Explain the difference between them.

3. Discuss the following three ways of writing *x2* in Fortran; (a) X*X, (b) X**2, (c) X**2.0.

4. Write Fortran program which counts the number of positive numbers and the number of negative numbers.

5. Write a SUBROUTINE subprogram which doenot have any (a) argument (b) RETURN statement.

6. Write a program in C^{++} perform the following (a) Area of a triangle (b) Area of a rectangle.

7. Write a function in C^{++} to generate a Fibonacci series of n numbers, where n is defined by a program.

8. What is a function ? List out the advantages and disadvantages of using functions in C^{++}. What do you mean by local and global variables ?

9. Write a program to initialize the numbers of a union and to display the contents of the union.

10. Explain the various functions involved in opening and closing sequential file in C^{++}.

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NALANDA OPEN UNIVERSITY

M.Sc. Physics, Part-II

PAPER–XI

(Physics of Nan-Materials)

Annual Examination, 2016

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

Answer any Five Questions.
All questions carry equal marks.

1. Derive an expression for the electrical conductivity of a free electron gas using the collision time concept. Does this result explain the experimental value of resistivity of a metal ?

2. Discuss the motion of electrons in two dimensional potential well and obtain expression for density of states.

3. What is a quantum wire ? Discuss the optical properties of quantum wires. Describe various quantum wire devices.

4. What is difference between 'bottom up' and 'bottom down' methods of producing nanoparticles ? Describe, in detail, the 'Sol-Gel method' of preparation of nanoparticles.

5. What is multiferroic magnetoelectric material ? Describe the applications of such materials.

6. What is Raman effect ? Discuss variations in Raman spectra of nanomaterials.

7. Describe the Hartree-Fock approximation of the Coulomb interaction between 3D confined electrons. Mention the application of Hund's rule in quantum dots.

8. Name the six widely known methods to produce nanomaterials. Describe, briefly, at least three of them.

9. Explain the phenomenon of photoluminescence, phosphorescence and chemiluminescence. How do you account for the shift in the peaks of PL-spectra ?

10. Write notes on (a) Plasma Arcing (b) Biological nanomaterials.

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NALANDA OPEN UNIVERSITY

M.Sc. Physics, Part-II

PAPER–XII

(Science and Technology of Renewable Energy)

Annual Examination, 2016

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

Answer any Five Questions.
All questions carry equal marks.

1. Explain spectral response. How will you calculate quantum efficiency from spectral response ?
2. What do you understand by first, second and third generation of solar cells ? What efficiency they can achieve ?
3. State and explain the Diode equation for non-ideal and ideal Diodes. Illustrate the Diode law graphically and explain the importance of dark current. Explain depletion approximation.
4. Explain importance of Fill Factor (FF) in a solar cell and derive its expression. Also, discuss, in details, the efficiency of solar cell.
5. Derive Betz's law and show that maximum efficiency of the rotors can't exceed 60%. What are the factors that limit the use of wind energy ?
6. What are environmental impacts of harnessing the geothermal, the wave and the tidal energy ? What are the methods employed in harnessing the tidal energy ?
7. Explain minority carrier life time and diffusion length in simple semi conductor crystals.
8. Explain series and shunt resistance and their effects on Fill Factor (FF) in solar cells. Distinguish between characteristics and parasitic resistances.
9. Explain the perspectives of hydrogen energy in the World. Give an account of the pilot programmes. What are safety risks involved with application of hydrogen fuel ?
10. Write notes on (a) Ideal Solar Cell (b) Wind Energy.

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NALANDA OPEN UNIVERSITY

M.Sc. Physics, Part-II

PAPER–XIII

(Environmental Physics)

Annual Examination, 2016

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

Answer any Five Questions.
All questions carry equal marks.

1. What is LIDAR ? Explain its principle, physical and technical aspects with applications.

2. Explain Einstein's A and B coefficients of absorption, stimulated emission and spontaneous emission. Hence deduce Lambert-Beer's law.

3. Discuss equations of motion for fluid and hence obtain the Navier-Stokes equation for fluids.

4. What do you mean by End-of-Year Cost' and 'Rest Value' ? What is 'building times' and 'break-even points' with reference to conventional energy sources ?

5. Enumerate the basic atmospheric forces to study laws of motion in atmosphere. Explain what do you mean by 'Baroclinic Model' and 'Reynolds Number' (R_e.).

6. Discuss improvements in diffusion equations to predict the transport of pollutants to a fair accuracy. What is Dupuit Approximation ? Discuss.

7. Why Bifuels are called renewable energy source ? Explain, briefly, the four generations of Bifuels.

8. Derive Fick's law and explain its analogy with heat transfer equation.

9. Show that efficiency (η) of a real heat engine is always smaller than that of an ideal cannot engine (η_c) by a factor $\left[1+\sqrt{\frac{T_C}{T_H}}\right]$. The smaller efficiency implies that entropy Δ s is not produced while operating the engine. Show that $\Delta s = \frac{(\eta_c - \eta) Q_H}{T_C}$.

10. Write short notes on any ***Two*** of the following :—
    (a) Photovoltaic effect.
    (b) Green house gas model.
    (c) Black body radiation.
    (d) Solar Pond.

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NALANDA OPEN UNIVERSITY

M.Sc. Physics, Part-II

PAPER–XIV

(Photonics)

Annual Examination, 2016

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

Answer any Five Questions.
All questions carry equal marks.

1. What is LED ? Describe its design and explain its working.
2. Derive relation between Einstein's A and B Co-efficients. Give the weak points in Einstein's theory.
3. What do you mean by 'Core and Cladding' ? Describe the structures of different types of optical fibres with ray path.
4. Describe Avalanche Photodiode (APD). Illustrate its advantages.
5. How plasma screen is different from LCD screen ? What is the future of LCD screen ?
6. Explain the difference between analog and digital communication. Why digital communication is more suitable with modern day requirements ?
7. Describe the principles of Nd-Yag Laser. What are its applications.
8. What is optical fibre flow sensor ? Describe optical fibre gyroscope.
9. Describe intrinsic semiconductor laser and doped semiconductor laser. What is the limitation for these lasers to operate continuously ?
10. Obtain a relation between divergence and waist size of the beam for a Gaussian distribution of wave energy.

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NALANDA OPEN UNIVERSITY
M.Sc. Physics, Part-II
PAPER–XV
(Advanced Condensed Matter Physics)

Annual Examination, 2016

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

Answer any Five Questions.
All questions carry equal marks.

1. Derive Clausius-Mossotti formula relating the dielectric constant and the polarisability for a composite dielectric material.

2. What is Mösbauer effect ? Explain Doppler broadening through intensity-frequency graphs for gamma emission and absorption by identical nuclei.

3. State Gruneisen law. Derive equation of state and gruneisen parameter for solid.

4. Establish Lydden-Sach-Teller relation between the static dielectric constant and that at optical frequencies.

5. What is skin effect ? Distinguish between normal and anamalous skin effect. Give the mathematical theory of anomalous skin effect. How do you get information about Fermi structure with the help of this effect ?

6. Discuss A.C. Josephson effect. Show that current oscillates with the frequency $w = \frac{2ev}{\hbar}$.

7. What is Debye-Waller factor ? What is its origin ? Discuss the temperature dependance of the Bragg reflection.

8. Give a quantitative treatment of BCS ground state. Obtain an expression for the energy gap at 0K.

9. What is polariton ? Obtain polariton dispension relation. How does it stand the experiment test ?

10. Give an account of Ginzberg-Landon theory of the phenomenology of the super conducting state. How do you get coherence length ?

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M.Sc. Physics, Part-II
Practical Counseling and Practical Examination Programme, 2016
(Venue : Physics Lab, 1st Floor Biscomaun Tower, Patna-800001)

Counselling Class Programme		***Practical Examination Programme***		
Date	***Time***	***Paper***	***Date***	***Time***
27.07.2016 to 03.08.2016	11.30 AM to 5.30 PM	X	04.08.2016	11:30 AM to 2:30 PM
		XII	04.08.2016	2:45 PM to 5:45 PM
		XIV	05.08.2016	11:30 AM to 2:30 PM
		XV	05.08.2016	2:45 PM to 5:45 PM
		XVI	06.08.2016	11:30 AM to 2:30 PM

NALANDA OPEN UNIVERSITY

M.Sc. Physics, Part-II

PAPER–XVI

(Advanced Electronics)

Annual Examination, 2016

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

Answer any Five Questions.
All questions carry equal marks.

1. Describe DC Equivalent circuit and AC Equivalent circuit of a dual-input, balanced output differential amplifier.

2. What is a multiplexer ? Draw the logic circuit for a 4-to-1 multiplexer. Write the Boolean equation and describe the truth table.

3. How can op-amp be used as a voltage-to-current and current-to-voltage converters ? What is a logarithmic amplifer ?

4. What is a decoder ? Describe seven segment displays for an LED circuit.

5. What is Read Only Memory (ROM) ? Distinguish between PROM and EPROM. Give some of the important applications of ROM.

6. What is an encoder ? Draw the logic circuit of 8-time-to-3 time encoder.

7. What is flip-flop ? Explain the functioning of NOR and NAND latch.

8. What is a comparator ? Explain the working of a comparator. What are its important characteristics ?

9. Derive an expression for frequency of oscillation of phase shift oscillator. Following specifications are given for a particular phase shift oscillator $C = 0.1\,\mu F$, $R = 3.9Kr$ and $\left|\frac{R_f}{R_i}\right| = 29$. Determine the frequency of oscillation.

10. Explain the architecture of 8086 microprocessor.

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M.Sc. Physics, Part-II

Practical Counseling and Practical Examination Programme, 2016

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

Counselling Class Programme		***Practical Examination Programme***		
Date	***Time***	***Paper***	***Date***	***Time***
27.07.2016 to 03.08.2016	11.30 AM to 5.30 PM	X	04.08.2016	11:30 AM to 2:30 PM
		XII	04.08.2016	2:45 PM to 5:45 PM
		XIV	05.08.2016	11:30 AM to 2:30 PM
		XV	05.08.2016	2:45 PM to 5:45 PM
		XVI	06.08.2016	11:30 AM to 2:30 PM