Sub. Code	
7MPH1C1	

M.Sc. DEGREE EXAMINATION, APRIL 2022

First Semester

Physics

MATHEMATICAL PHYSICS - I

(CBCS – 2017 onwards)

Time : 3 Hours

Maximum : 75 Marks

Part A $(10 \times 2 = 20)$

Answer all questions.

- 1. Evaluate the double integral $\iint_A (2x 3y) dx dy$.
- 2. Suppose the vectors $\vec{a}, \vec{b}, \vec{c}$ are given as follows. $\vec{a} = \vec{j} + \hat{k}$, $\vec{b} = 2\hat{i} + 3\hat{j} - 5\hat{k}$ and $\vec{c} = \hat{j} - \hat{k}$. Find out the direction of the product of $\vec{a} \times (\vec{b} \times \vec{c})$.
- 3. For the matrix $A = \begin{pmatrix} 0 & 1 \\ 1 & 0 \end{pmatrix}$ find sin *kA*, where *k* is a constant.
- 4. Are the functions {1, x, sin x} linearly independent or dependent?
- 5. Using residue theorem evaluate the integral $\int_{-3}^{3} \frac{dx}{x^2 + 3x + 2}.$

- 6. What are the values of the integer *n* if $x^n y^n$ is harmonic?
- 7. Find the Fourier series of the periodic function $f(x) = x + \pi(-\pi < x < \pi)$ having period 2π .
- 8. What is Fourier integral?
- 9. State any two conditions for the Fourier transform should exist.
- 10. What do you mean by Fourier transform of the derivative of a function?

Part B $(5 \times 5 = 25)$

Answer **all** questions, choosing either (a) or (b).

11. (a) Show that $\iint_{S} \vec{F} \cdot \vec{n} \, dS = \frac{3}{2}, \quad \text{where}$ $\vec{F} = 4xz\hat{i} - y^{2}\hat{j} + yz\hat{k} \text{ and } S \text{ is the surface of the cube}$ bounded by the planes x = 0, x = 1, y = 0, y = 1, z = 0, z = 1.

Or

- (b) Show that the equations 3x + 4y + 5z = a, 4x + 5y + 6z = b, 5x + 6y + 7z = c don't have a solution unless a + c = 2b.
- 12. (a) Show that the inverse of the matrix $M = \begin{pmatrix} 0 & 1 & 1 \\ 0 & 0 & 1 \\ 1 & 0 & 0 \end{pmatrix}$

can be written in the form $M^2 - I$, where I is the identity matrix.

Or

- (b) Write a short note on the properties of Sturm-Liouville differential equation.
 - $\mathbf{2}$

13. (a) Find a function which is harmonic conjugate to $u(x, y) = \frac{y}{x^2 + y^2}$ and hence find a function f(z) having u(x, y) as its real part.

Or

(b) Compute the integral
$$\int_{0}^{2\pi} \frac{d\theta}{7+6\cos\theta}$$
.

- 14. (a) Find the Fourier series representing f(x) = x, $0 < x < 2\pi$ and sketch its graph from $x = -4\pi$ to 4π .
 - \mathbf{Or}
 - (b) Expand $f(x) = e^x$ in a Fourier cosine series over (0, 1).
- 15. (a) Find the Fourier transform of the function

$$f(x) = \begin{cases} 1 + \frac{x}{a} & -a < x < 0, \\ 1 - \frac{x}{a} & 0 < x < a, \\ 0 & \text{otherwise} \end{cases}$$

 \mathbf{Or}

(b) Find the Fourier sine and cosine transform of x^{n-1} .

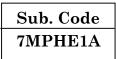
$$Part C \qquad (3 \times 10 = 30)$$

Answer any three questions.

- 16. State and prove Stokes' theorem.
- 17. Obtain the general solution of the differential equation $x^2y'' + xy' + y = x \log x$.

- 18. Find the Laurent series expansion of $f(z) = \frac{z}{(z-1)(z-2)}$ valid for |z-1| > 1.
- 19. Obtain the half-range sine series for the function $f(x) = x^2$ in the interval 0 < x < 3.
- 20. Using Fourier sine transform to solve the functions u_t = u_{xx} with the boundary conditions (a) u(0,t) = 0,
 (b) u(x,0) = e^{-x} and (c) u(x, t) is bounded.

4



M.Sc. DEGREE EXAMINATION, APRIL 2022

First Semester

Physics

Elective : NUMERICAL METHODS

(CBCS – 2017 onwards)

Time : 3 Hours

Maximum : 75 Marks

Part A $(10 \times 2 = 20)$

Answer **all** the questions.

- 1. State the least-squares approximation criterion.
- 2. Define systematic and random errors.
- 3. Give the statement of the process of solving a system of linear equation by the Gauss elimination method.
- 4. Define the pivoting process in the Gauss elimination method.
- 5. Define first-order divided differences.
- 6. What are called Lagrange fundamental polynomials? Write the n^{th} order Lagrange polynomial.
- 7. Define numerical solution of an ordinary differential equation.
- 8. Find y(0.1) applying Euler method to the equation $y' = y^3 + \exp(-x), y(0) = 1$.

- 9. What is a numerical integration?
- 10. Obtain the two-point forward difference formula for first-order derivative of a function.

Part B $(5 \times 5 = 25)$

Answer **all** the questions, choosing either (a) or (b).

11. (a) Explain the error estimation by the method of averages.

Or

- (b) Describe the method of linear regression.
- 12. (a) Obtain the solution of the following system of equations by applying the Gauss elimination method.

2x + 15720y = 15750, 3210x + 12310y = 60460.

 \mathbf{Or}

- (b) Find the root of the equation $x^3 8 = 0$ with 3 decimal accuracy using $x_0 = 2.5$ by Newton-Raphson method.
- 13. (a) The measured value of current I in an electronic circuit as a function of applied voltage V is given below. It is required to know the current for the applied voltage 1.65 V. Calculate it using Lagrange interpolation formula.

 V in volts
 1
 1.5
 2

 I in ampere
 0.2
 0.35
 0.5

Or

(b) Develop a C program for Lagrange interpolation.

 $\mathbf{2}$

14. (a) Find the numerical solution of the equation y'=1-y+x with y(0)=0 at x=0.05 and 0.1 by the Euler method.

 \mathbf{Or}

- (b) Derive the improved Euler formula for first-order differential equation.
- 15. (a) Obtain a five-point formula for the second derivative of a function.

Or

(b) The distance travelled by a car at intervals of 2 minutes are given below. Evaluate the speed of the car at 4 minutes applying an appropriate difference formula.

 Time in minutes :
 0
 2
 4
 6
 8

 Distance in km
 0
 4
 5.8
 7.4
 9.2

Istance III KIII 0 4 5.0 7.4 5

 $(3 \times 10 = 30)$

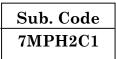
Answer any three questions.

16. Make a fit of the following data to the function $y = a + bx + cx^2$.

- 17. Solve the system x + y + 2 = 2, 2x + y + 2z = 2, 3x y + 2z = -1 by the Gauss-Jordan method.
- 18. The mass of a radioactive decaying sample measured at 4 times is given below. Determine the mass of the sample after 12 days using divided difference interpolation formula.

- 19. Find the numerical solution of the equation $x'=1-x^2$ with x(0)=0 at t=0.05 and 0.1 by the improved Euler method.
- 20. Evaluate the integral $_0 \int {}^3(1 + \exp(x)) dx$ using trapezoidal rule by dividing the interval [0, 3] into 6 subintervals.

4



M.Sc. DEGREE EXAMINATION, APRIL 2022.

Second Semester

Physics

SOLID STATE PHYSICS

(CBCS – 2017 onwards)

Time : 3 Hours

Maximum : 75 Marks

Part A $(10 \times 2 = 20)$

Answer **all** the questions.

- 1. What is point group and space group?
- 2. What is ionic bond and give an example?
- 3. How do you analysis the stiffness constant?
- 4. What is lattice vibration?
- 5. Define Hall effect. Mention its different parameters.
- 6. Mention the properties of metal.
- 7. Define Hund's rule.
- 8. What is dielectric breakdown?
- 9. What is Meissner's effect?
- 10. Mention the applications of superconductivity?

Part B (5 × 5 = 25)

Answer **all** questions, choosing either (a) or (b).

11. (a) What is defect? Mention its different types. Explain any two.

Or

- (b) Explain the determination of crystal structure by Laue method.
- 12. (a) Explain how to analysis stress and strain.

Or

- (b) Describe the theory of phonon momentum.
- 13. (a) Explain the expression of effect of temperature on the Fermi Dirac distribution.

Or

- (b) State and explain Bloch function and theorem.
- 14. (a) Applying cooling by adiabatic demagnetization, find the change of entropy (ΔS) at a given temperature (T_H) for the given value of H.

Or

- (b) Deduce the expression of Weiss theory of paramagnetism and prove that the susceptibility of paramagnetism becomes negative.
- 15. (a) What is ferromagnetism? Describe the quantum theory of ferromagnetism.

Or

(b) Explain the occurrence of superconductivity. Distinguish between Type I and Type II superconductor.

Part C $(3 \times 10 = 30)$

Answer any three questions.

- 16. Mention the different types of bonding in a crystal. Explain them with relevant examples.
- 17. Explain the vibration of one dimensional mono atomic lattice.
- 18. (a) Explain De Hass Van Alphen effect to determine the Fermi surface of the materials.
 - (b) Briefly explain on semiconductor crystals.
- 19. Obtain Clausius- Mosotti equation and explain how it can be used to find the dipole moment of polar molecules.
- 20. (a) What is London's effect? Using this, obtain the penetration depth λ and a.c. skin depth δ .
 - (b) Describe BCS theory.

3

Sub. Code	
7MPH2C2	

M.Sc. DEGREE EXAMINATION, APRIL 2022

Second Semester

Physics

MATHEMATICAL PHYSICS – II

(CBCS – 2017 onwards)

Time : 3 Hours

Maximum : 75 Marks

Part A $(10 \times 2 = 20)$

Answer **all** questions.

- 1. Find the Laplace transform of e^{at} .
- 2. Find the Laplace transforms of the formula $F(t) = \begin{cases} \sin t &, \quad 0 < t < \pi \\ 0 &, \quad t > \pi \end{cases}.$
- 3. What is heat flow equation?
- 4. Solve $xu_x + u_y = -uy$.
- 5. Define contravariant and covariant vectors.
- 6. Show that the contraction of A_q^p is a scalar.
- 7. Define Abelian group.
- 8. Prove that every subgroup of a cyclic group is cyclic.

- 9. Show that n+1 = n n.
- 10. Write Legendre's differential equation. Write its two independent solutions.

Part B $(5 \times 5 = 25)$

Answer **all** questions, choosing either (a) or (b).

11. (a) Find the Laplace transform of $F(t) = \sin at - at \cos at$.

Or

- (b) State and prove convolution theorem for the inverse of Laplace transform.
- 12. (a) Find the particular integral of $u_{xx} u_{xy} 6u_{yy} = e^{2x+y} + \sin(2x-3y)$.

 \mathbf{Or}

- (b) Derive heat conduction equation and solve it in two dimensional Cartesian coordinates.
- 13. (a) Write short note on transformation of coordinates.

Or

- (b) Describe Raising and Lowering of Indices in tensor analysis.
- 14. (a) Explain isomorphic and homomorphic groups.

Or

- (b) State and prove Schur's lemma.
- 15. (a) Find the relation between beta and gamma function.

Or

(b) Find Rodrigue's formula for Legendre polynomials.

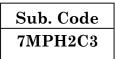
 $\mathbf{2}$

Part C
$$(3 \times 10 = 30)$$

Answer any three questions.

- 16. Using the method of Laplace transform, show that $\int_{0}^{\alpha} \cos x^{2} dx = \frac{1}{2} \sqrt{\frac{\pi}{2}}.$
- 17. Derive the equation of motion for the vibrating string.
- 18. Show that in Cartesian coordinate system the contravariant and covariant components of a vector are identical.
- 19. Prove the great orthogonality theorem.
- 20. Derive an expression for the generating function for the Laguerre's polynomials and hence show that $L_n(0) = 1$.

3



M.Sc. DEGREE EXAMINATION, APRIL 2022.

Second Semester

Physics

ELECTROMAGNETIC THEORY

(CBCS – 2017 onwards)

Time : 3 Hours

Maximum : 75 Marks

Part A $(10 \times 2 = 20)$

Answer **all** questions.

- 1. Define Electric potential. What is its unit?
- 2. What is an Electric image?
- 3. State Ampere circuital law. Give its limitation.
- 4. What is a magnetic dipole?
- 5. Define Displacement current.
- 6. What is Coulomb gauge transformation.
- 7. Define Skin effect.
- 8. Give the properties of Isotropic medium.
- 9. Define Scattering cross-section.
- 10. What do you mean by disperson?

Part B $(5 \times 5 = 25)$

Answer all questions, choosing either (a) or (b).

11. (a) Give multipole expansion of potential of charge distribution.

Or

- (b) Find electric field due continuous charge distribution.
- 12. (a) Using Biot-Savart law, calculate the value of magnetic field due to an infinitely long straight wire carrying current 'i' amp at a distance 'a' from the wire.

Or

- (b) Derive an expression for the force on a current carrying conductor placed in a magnetic field.
- 13. (a) Derive Integral form and differential form of Faraday's law.

Or

- (b) What are Gauge transformation? Explain importance of Lorentz Gauge.
- 14. (a) Discuss the propagation of electromagnetic waves in ionosphere.

Or

- (b) Write a note on linear and circular polarization.
- 15. (a) Derive Jefimenko's equation.

Or

(b) What is anomalous dispersion and how it is explained on the basis of electromagnetic theory?

 $\mathbf{2}$

Part C (3 × 10 = 30)

Answer any **three** questions.

- 16. Write down Laplace's equation in spherical coordinates and obtain its solution.
- 17. Discuss the motion of charged particles in crossed electric and magnetic fields.
- 18. Establish Maxwell's electromagnetic wave equation.
- 19. Describe the propagation wave in a rectangular wave guide with perfectly conducting walls. Find it cut off wavelength and the magnetic field induction.
- 20. Explain Rayleigh scattering on the basis of theory of scattering of electro magnetic wave by bound electrons.

Sub. Code
7MPH2C4

M.Sc. DEGREE EXAMINATION, APRIL 2022.

Second Semester

Physics

QUANTUM MECHANICS – II

(CBCS – 2017 onwards)

Time : 3 Hours

Maximum : 75 Marks

Part A $(10 \times 2 = 20)$

Answer **all** questions.

- 1. How the orders of wave functions are combined in the perturbation theory?
- 2. What is meant by adiabatic approximation?
- 3. What is the basic difference between Coulombic potential and Yukawa potential?
- 4. Write down the wave function of the incident wave in the scattering process.
- 5. What is meant by induced emission?
- 6. Why the assembly of electrons are considered as oscillators in the case of radiation?
- 7. What is the difference between Pauli's spin matrices and Dirac's spin matrices?
- 8. What is the deficiency of the Klein-Gordon's equation?
- 9. Write down the classical field equation of Hamiltonian.
- 10. Write down the quantum field equation of Lagrangian.

Part B $(5 \times 5 = 25)$

Answer all questions, choosing either (a) or (b).

11. (a) Derive Schrodinger's time dependent perturbation theory.

Or

- (b) Discuss the change in the energy levels when the adiabatic approximation method is adopted.
- 12. (a) Discuss scattering by Yukawa potential.

Or

- (b) Solve the Schrodinger's equation for a scattering by Coulumbic potential.
- 13. (a) Calculate the rate of spontaneous transition of an excited state.

Or

- (b) What are Einstein's transition probabilities?
- 14. (a) Discuss briefly the occurrence of Zitterbewegung.

Or

- (b) Derive Dirac's electromagnetic field equation.
- 15. (a) Derive the Hamiltonian for a quantized Dirac field.

Or

(b) Compare and contrast Maxwell's field and Schrodinger's field.

 $\mathbf{2}$

Part C $(3 \times 10 = 30)$

Answer any **three** questions.

- 16. Apply the perturbation theory for the case of Stark effect in Hydrogen atom.
- 17. Derive the Born `s approximation and its validity in the low energy scattering.
- 18. Evaluate the relations between the various Einstein's coefficients.
- 19. Derive Dirac's Relativistic equation for a free particle.
- 20. Prove that the Classical Hamiltonian equation of motion for a field agree with the Lagrangian in a Cell approximation.

Sub. Code	
7MPH3C3	

M.Sc. DEGREE EXAMINATION, APRIL 2022.

Third Semester

Physics

ADVANCED ELECTRONICS

(CBCS – 2017 onwards)

Time : 3 Hours

Maximum : 75 Marks

Section A

 $(10 \times 2 = 20)$

Answer **all** questions.

- 1. What is varactor diode?
- 2. Why SCR cannot be used as a bidirectional switch.
- 3. What are the advantages of active filters over the passive filters?
- 4. Why integrators are preferred over differentiators in analog computers?
- 5. Differentiate between synchronous counter and ripple counter.
- 6. Write the functions of Shift Registers and List its types.
- 7. Give the pin connections of IC-555.
- 8. Why sample and hold circuit is used?
- 9. As related to AM, what is over modulation, under modulation and 100% modulation?
- 10. What is IMPATT?

Section B $(5 \times 5 = 25)$

Answer **all** questions, choosing either (a) or (b).

11. (a) Explain the operation of Photo transistor.

Or

- (b) Explain the construction, operation and V-I characteristics of UJT.
- 12. (a) Design an amplifier with a gain of -10 and input resistance equal to $10 k\Omega$.

 \mathbf{Or}

- (b) Construct the basic operational amplifier circuit for the mathematical operation of differentiation and explain in detail.
- 13. (a) Explain RS Flip-flop with truth table, logic symbol and logical circuit.

Or

- (b) Explain the working of 4-bit Serial-In-Parallel-Out (SIPO) shift resistor with logic circuit and truth table.
- 14. (a) Explain the working principle of ADC counter method.

 \mathbf{Or}

- (b) Explain the operation of crystal oscillator.
- 15. (a) Draw the frequency spectrum of FM and explain.

Or

(b) Write a note on pulse width modulation.

 $\mathbf{2}$

Section C $(3 \times 10 = 30)$

Answer any **three** questions.

- 16. Explain the operation of JFET and derive the drain and transfer characteristics.
- 17. Illustrate the operation of current to voltage and Voltage to current converter circuits.
- 18. Discuss Digital IC logic families and characteristics of basic gate in each family.
- 19. Draw the diagram of triangular wave generator using operational amplifier and find an expression for the frequency of oscillation.
- 20. Describe with the neat sketch the constructional details and principle of operation of a reflex klystron tube. With the help of Applegate diagram illustrate the phenomenon of bunching.

Sub. Code	
7MPHE3A	

M.Sc. DEGREE EXAMINATION, APRIL 2022.

Fourth Semester

Physics

Elective: NANOSCIENCE

(CBCS – 2017 onwards)

Time : 3 Hours

Maximum : 75 Marks

Part A $(10 \times 2 = 20)$

Answer **all** the questions.

- 1. Why transition metals are important in nanotechnology? Give example.
- 2. What are nanowires and nanoshells?
- 3. Mention the advantages of electro deposition.
- 4. What are the factors influencing the sol-gel method?
- 5. Mention the difference between C₆₀ and C₇₀.
- 6. What is protein molecule? Sketch the structure of amino acid.
- 7. How polarization technique is important in modern optics?
- 8. What is imaging?
- 9. Sketch the diagram of MOSFET and show that it is meant for switching operation.
- 10. What is lithography? Mention its different types.

Part B (5 × 5 = 25)

Answer **all** the questions, choosing either (a) or (b).

11. (a) Describe the scientific revolutions and important challenges in nanotechnology.

Or

- (b) Explain the arrangement of elements in periodic table.
- 12. (a) Explain the preparation of nanomaterials by chemical vapour deposition.

Or

- (b) Mention the various applications of Nanomaterials.
- 13. (a) Explain the method of formation of self assembled monolayer.

Or

- (b) Describe the molecular models of DNA structures.
- 14. (a) Write down the properties of light and explain how it is related with nanotechnology.

Or

- (b) Give a brief explanation of photonic crystals.
- 15. (a) Explain the invention of the transistor and integrated circuit.

Or

(b) Discuss the working function of optical lithography.

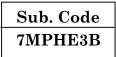
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Part C $(3 \times 10 = 30)$

Answer any **three** questions.

- 16. (a) Differentiate between and bottom-up approach. Explain how are they important in nanotechnology?
 - (b) Explain how does energy play a role in nanotechnology?
- 17. Describe the preparation of nanoparticles by ball milling method. Mention its advantages.
- 18. Mention and explain the different types of nano tubes with neat diagrams.
- 19. (a) Illustrate the behavior of a photon as both a particle and wave.
 - (b) Explain Photon trapping and plasmons.
- 20. Give a brief explanation on MEMS.

3



M.Sc. DEGREE EXAMINATION, APRIL 2022.

Fourth Semester

Physics

Elective: ANALYTICAL INSTRUMENTATION

(CBCS – 2017 onwards)

Time : 3 Hours

Maximum : 75 Marks

Part A $(10 \times 2 = 20)$

Answer **all** questions.

- 1. State Beer-Lambert's law.
- 2. What is absorption and interference filters?
- 3. Mention the various types of detectors used in IR spectroscopy.
- 4. Name the various sources of atomic emission spectrometer.
- 5. List out some X-ray detectors.
- 6. How will you achieve a narrow beam of X-rays?
- 7. Define Lande's splitting factor.
- 8. What are the six units of continuous wave NMR spectrometer?
- 9. What are the disadvantages of a total consumption as compared to a premix burner for atomic absorption use?
- 10. Name the types of emission spectra.

Part B $(5 \times 5 = 25)$

Answer all questions, choosing either (a) or (b).

11. (a) Explicate the role of filter in UV spectrophotometry.

Or

- (b) Explain the working principle of photomultiplier tube.
- 12. (a) Write a note pressed pellet technique.

 \mathbf{Or}

- (b) Explain the working principle of photographic detection.
- 13. (a) Explain the two methods of monochromatization of X-rays.

Or

- (b) Draw and explain X-ray fluorescence spectrophotometer.
- 14. (a) Describe the ESCA method.

Or

- (b) Describe the principle of NMR spectroscopy.
- 15. (a) Compare flame emission and atomic absorption spectroscopic techniques of analysis with respect to principle and method of analysis.

Or

2

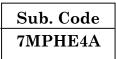
(b) Explain the principle of flame emission spectroscopy.

Part C $(3 \times 10 = 30)$

Answer any **three** questions.

- 16. With a neat diagram, explain the instrumentation system of visible spectrophotometer.
- 17. Explain the functions of various components in IR spectrophotometer with the help of a neat sketch of IR spectrophotometer.
- 18. With a neat diagram, explain the instrumentation set up for Laser Raman Spectrometer.
- 19. Draw a neat sketch of ESR Spectrometer and explain each component in it.
- 20. Explain the instrumentation and its applications of Fluorescence spectroscopy.

3



M.Sc. DEGREE EXAMINATION, APRIL 2022.

Fourth Semester

Physics

Elective: THERMODYNAMICS AND STATISTICAL PHYSICS

(CBCS – 2017 onwards)

Time : 3 Hours

Maximum : 75 Marks

Part A $(10 \times 2 = 20)$

Answer **all** the questions.

- 1. Correlate entropy with disorder. Will entropy decrease?
- 2. Give the expression of Helmholtz function 'F'. What is other name?
- 3. Write the Boltzmann's transport equation when collisions are taken into account.
- 4. Define mean free path.
- 5. What is phase space? What is its other name?
- 6. How does a micro canonical ensemble differ from a grand canonical ensemble?
- 7. Name the two quantum statistics.
- 8. Give the expression of B.E. statistics.
- 9. When lambda transition does occur?
- 10. When ideal F.D gas will be completely degenerate?

Part B (5 × 5 = 25)

Answer **all** questions, choosing either (a) or (b).

11. (a) Briefly the thermodynamic potentials.

Or

- (b) Obtain Vander Waal's equation of state.
- 12. (a) Write a note on conservation laws.

 \mathbf{Or}

- (b) Deduce diffusion equation on the basis of transport phenomena.
- 13. (a) Give an account on macro and micro states.

Or

- (b) Describe the principle of equipartition of energy.
- 14. (a) Obtain the expression of F.D statistics.

Or

- (b) Write a note on B.E. condensation.
- 15. (a) Write a note on Liquid Helium.

 \mathbf{Or}

(b) List the properties of an ideal Fermi gas.

Part C

 $(3 \times 10 = 30)$

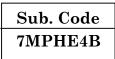
Answer any three questions.

- 16. Briefly the principle of phase transitions (both I and II orders)
- 17. Describe Boltzmann's H theorem.
- 18. State and prove Liouville's theorem.

 $\mathbf{2}$

- 19. Arrive sackur-Tetrode equation.
- 20. Write a note on pauli's paramagnetism.

3



M.Sc. DEGREE EXAMINATION, APRIL 2022

Fourth Semester

Physics

Elective : COMMUNICATION ELECTRONICS

(CBCS – 2017 onwards)

Time : 3 Hours

Maximum : 75 Marks

Part A $(10 \times 2 = 20)$

Answer **all** questions.

- 1. Define noise figure in communication.
- 2. What is the difference between VHF and UHF antenna?
- 3. Define pulse code modulation.
- 4. What do mean by shift keying?
- 5. What is IMPATT diode?
- 6. List out any two applications of RADAR.
- 7. Define an acceptance angle of an optical fiber.
- 8. Give two examples for optical sources and detectors.
- 9. What is an eclipse?
- 10. Mention the various multiple access scheme used in cellular communication?

Part B $(5 \times 5 = 25)$

Answer **all** questions, choosing either (a) or (b).

11. (a) Explain the theory of frequency modulation.

Or

- (b) How does microwave antenna work? Explain.
- 12. (a) Explain pulse width modulation technique.

 \mathbf{Or}

- (b) Write note on time division multiplexing.
- 13. (a) Explain construction and working of Gunn diode.

 \mathbf{Or}

- (b) Derive Radar range equation.
- 14. (a) Discuss the mechanism of attenuation dispersion and bending losses in optical fibre.

Or

- (b) Find the refractive index of the core and cladding if the NA is 0.3 and the relative refractive index difference is 8%.
- 15. (a) Explain various types of satellite orbits.

Or

(b) What is CDMA? Explain.

2

Part C $(3 \times 10 = 30)$

Answer any **three** questions.

- 16. Describe the theory of Hertzian dipole.
- 17. Explain the following
 - (a) Amplitude shift keying
 - (b) Frequency shift keying
 - (c) Differential and Quadra Polar shift keying
- 18. Describe the construction and working of Reflex Klystron.
- 19. Explain with a neat block diagram, the working of fiber optical communication system.
- 20. List the feature of GSM. Explain its architecture.

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M.Sc. DEGREE EXAMINATION, APRIL 2022

Fourth Semester

Physics

Elective : ENERGY AND ENVIRONMENTAL PHYSICS

(CBCS – 2017 onwards)

Time : 3 Hours

Maximum : 75 Marks

Part A $(10 \times 2 = 20)$

Answer **all** questions.

- 1. What do you understand by transport of energy?
- 2. List out the various components of air.
- 3. Define solar constant.
- 4. Write any two advantages of flat plate collector.
- 5. Differentiate biomass and biogas.
- 6. Point out any two advantages of fixed dome type plant.
- 7. What are fuel cells?
- 8. Give any two safety management steps in storage of hydrogen.
- 9. Outline puffs.
- 10. Recall the major sources of noise pollution.

Part B (5 × 5 = 25)

Answer **all** questions, choosing either (a) or (b).

11. (a) Explain the causes of greenhouse effect.

Or

- (b) Brief out Indian monsoon and elements of weather.
- 12. (a) How will you estimate the average solar radiation?

Or

- (b) Elaborate the physical principles of flat plate solar collector.
- 13. (a) List and explain the factors that affect bio-digestion.

 \mathbf{Or}

- (b) With a neat diagram, explain the continuous type biogas plant.
- 14. (a) Write a note on the uses of hydrogen as fuel.

Or

- (b) Describe the elementary concepts of hydride batteries.
- 15. (a) Give a brief note on waste disposal and heat island effect.

Or

(b) Elucidate land breeze and sea breeze.

 $\mathbf{2}$

Part C (3 × 10 = 30)

Answer any **three** questions.

- 16. Give a detailed note on (a) Raynold's transport theorem and (b) Radiation temperature of the earth.
- 17. Derive energy balance equation and collector efficiency to describe the performance of solar collector.
- 18. Explain in detail wet and dry processes in biomass conversion.
- 19. Enumerate the different types of fuel cells.
- 20. List out the factors that affect air pollution. Also discuss the purification and control measures of air pollution.

3

M.Sc. DEGREE EXAMINATION, APRIL 2022

Fourth Semester

Physics

Elective : MEDICAL PHYSICS

(CBCS – 2017 onwards)

Time : 3 Hours

Maximum : 75 Marks

 $(10 \times 2 = 20)$

Part A

Answer **all** guestions.

- 1. Name the different white blood cells and indicate the cell responsible for immune function.
- 2. What is the meant by electro retinogram?
- 3. Indicate the various categories of hearing loss.
- 4. Write the function of stethoscope.
- 5. Write the different elements of the eye.
- 6. Name the lenses used in light microscope for magnification of the image and indicate the maximum magnification.
- 7. Write the properties of X radiation.
- 8. Indicate the protection methods followed while working with X radiation.

- 9. Write the diastolic and systolic readings in normal and high blood pressure.
- 10. What is meant by pace maker?

Part B $(5 \times 5 = 25)$

Answer **all** questions choosing either (a) or (b).

11. (a) Discuss the electric signal from heart and brain.

Or

- (b) Write the measurement of lung volume.
- 12. (a) Discuss about deafness and testing of hearing.

 \mathbf{Or}

- (b) Describe the production of speech.
- 13. (a) Define laser. Describe the application of laser in medicine.

Or

- (b) Write the important components of a light microscope and explain their function.
- 14. (a) Discuss briefly about radiotherapy planning.

Or

- (b) Discuss briefly about digital radiography.
- 15. (a) Discuss major components of cardiovascular system.

Or

(b) Describe about defibrillator. Discuss the role of defibrillator in the treatment of cardiac disease.

 $\mathbf{2}$

Part C (3 × 10 = 30)

Answer any **three** questions.

- 16. Discuss the physics of alveoli, breathing mechanism and work of breathing.
- 17. Discuss the physics of ear and hearing.
- 18. Describe about color vision. Discuss about defective vision and its correction.
- 19. Discuss the production of X radiation and its mode of interaction with body.
- 20. State Bernoulli's principle and explain its use in blood flow measurements.

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