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Reg. No. : .....

Name : .....

Second Semester M.Sc. Degree Examination, September 2022

Physics

PH 223 : COMPUTER SCIENCE AND NUMERICAL TECHNIQUES

(2020 Admission Onwards)

Time : 3 Hours Max. Marks : 75

PART – A

Answer any **five** questions. Each question carries **3** marks.

1. Explain the terms: bit, word and address bus.
2. What is a list in Python? Discuss any two methods or functions for fist operations.
3. How is microcontroller5 different from microprocessor?
4. What is the difference between structure and class in C++?
5. How data is read from and written to files in C++?
6. Write forward, backward and central difference formula for the first order derivative.
7. Derive Simpson's 1/3 rule from general quadrature formula.
8. Explain how Schrodinger equation (one dimensional) is numerically solved.

(5 × 3 = 15 Marks)

P.T.O.

PART– B

Answer any **three** questions. Each question carries **15** marks.

9. (a) Explain the addressing modes in 8085 microprocessor.

   (b) Explain the different registers in 8085 microprocessor.

10. (a) Discuss various topologies.

    (b) Explain OSI model for computer networks.

11. (a) Discuss how multidimensional arrays are represented in C++ and how it is stored in memory.

    (b) Write a program to print the upper and lower triangles of an $N \times N$ matrix.

12. (a) How are files declared in C++? Explain the basic file operations.

    (b) Explain how arrays are passed as arguments of functions.

13. (a) Explain how Laplace's equation in two dimensions is numerically solved.

    (b) Derive Newton's backward difference interpolation formula.

14. (a) Discuss in brief Euler's method of solving ordinary differential equations.

    (b) Derive Lagrange interpolation formula.

($3 \times 15 = 45$ Marks)

PART – C

Answer any **three** questions. Each question carries **5** marks.

15. Differentiate RAM and ROM.

16. Explain Pin diagram in 8085 microprocessor.

17. Write a C++ program that implements the bisection method for finding the roots of a nonlinear equation.

18. Write a C++ program to find the factorial of an integer.

19. The velocity of a car running on straight road in the intervals of two minutes is given below

Time (Minutes)	0	2	4	6	8	10	12
Velocity (In Km/hr)	0	22	30	27	18	7	0

Apply Simpson's rule to find the distance covered by the car.

20. Derive Gauss's backward formula of interpolation.

($3 \times 5 = 15$ Marks)

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Reg. No. : .....

Name : .....

Second Semester M.Sc. Degree Examination, September 2022

Physics

PH 221 : MODERN OPTICS AND ELECTROMAGNETIC THEORY

(2020 Admission Onwards)

Time : 3 Hours Max. Marks : 75

PART – A

Answer any **five** questions. **Each** carries **3** marks.

1. Distinguish between Fresnel and Fraunhofer diffraction.
2. Give an account of third harmonic generation of non-linear optics.
3. Explain the propagation of EM waves through linear media.
4. What are vector and scalar potentials?
5. Obtain the expression for power radiated by an arbitrary charge.
6. Discuss the significance of Smith chart.
7. Write a short note on rectangular waveguides.
8. What are antenna arrays?

(5 × 3 = 15 Marks)

P.T.O.

PART – B

Answer **any three** questions. **Each** carries **15** marks.

9. (a) Demonstrate the first experiment to show the existence of second harmonic generation.

   (b) Elaborate the concept of phase matching.

OR

10. (a) Write a note on Raman Nath diffraction and Bragg diffraction.

    (b) How will you demonstrate the occurrence of interference with multibeam?

11. Explain the electric dipole radiation. Obtain the expressions for the fields due to oscillating electric dipole and deduce the power radiation.

OR

12. Discuss the propagation of electromagnetic waves in conductors and derive an expression for skin depth.

13. (a) List the advantages of waveguides over transmission lines.

    (b) Explain the propagation of waves through waveguides.

OR

14. (a) Explain the radiation from Hertzian dipole.

    (b) Explain EIRP and Friis equations of antenna.

(3 × 15 = 45 Marks)

PART – C

Answer **any three** questions. **Each** carries **5** marks.

15. A distortion less line has $Z_0 = 60\Omega$, $\alpha = 20mNp/m, u = 0.6c$, where c is the speed of light in vacuum. Find R and L at 100 MHz.

16. An electric field of strength $10\mu V/m$ is to be measured at an observation point $\theta = \pi/2{,}500\,km$ from a half-wave (resonant) dipole antenna operating in air at $50MHz.$ find the average power radiated by the antenna.

17. In a rectangular waveguide for which $a = 1.5\,cm$, $b = 0.8\,cm$, $\sigma = 0.\mu = \mu_0.$ and $\in = 4 \in_0$, $H_x = 2\sin\left(\frac{\pi x}{a}\right)\cos\left(\frac{3\pi y}{b}\right)\sin(\pi \times 10^{11}t - \beta z)A/m.$ Determine

    (a) The mode of operation

    (b) The cut off frequency

    (c) The phase constant β

18. Obtain gauge transformation conditions.

19. A beam of X-rays of wavelength 0.071 nm is diffracted by (110) plane of rock salt with lattice constant of 0.28 nm. Find the glancing angle for the second-order diffraction.

20. Obtain the expression for energy and momentum in electromagnetic waves.

(3 × 5 = 15 Marks)

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Name : .....

Second Semester M.Sc. Degree Examination, September 2022

Physics

PH 222 : THERMODYNAMICS, STATISTICAL PHYSICS AND BASIC QUANTUM MECHANICS

(2020 Admission Onwards)

Time : 3 Hours Max. Marks : 75

SECTION – A

Answer any **five** questions. **Each** question carries **3** marks.

1. What do you meant by partition function?
2. Explain is Nernst's Theorem and explain its importance.
3. What do you meant by statistical equilibrium?
4. What is Gibbs function and prove that Gibbs function decrease during isothermal isobaric process and is equal to the net work obtained.
5. Write the most probable distributions in Maxwell Boltzman statistics, Bose Einstein Statitics and Fermi dirac Statistics.
6. Explain quantum mechanical tunneling.
7. Write a short note on Dirac notation.
8. Briefly explain Schrödinger representation or Schrödinger picture.

(5 × 3 = 15 Marks)

SECTION – B

Answer **any three** questions. **Each** question carries **15** marks.

9. Derive Maxwell's thermodynamic relations and hence derive Clausius Clapeyron equation.

OR

10. Derive an expression for the distribution of speeds of particles in a classical gas.

11. Explain Fermi dirac statistics and distribution law.

OR

12. Discuss Bose Einstein Condensation.

13. Solve linear harmonic oscillator problem using Schrödinger method.

OR

14. Discuss particle moving in a spherically symmetrical potential.

(3 × 15 = 45 Marks)

SECTION – C

Answer **any three** of the following questions. **Each** question carries **5** marks.

15. With the help of Maxwell's relations, show that $TdS = C_v dT + T\left(\frac{\partial p}{\partial T}\right)_V dV$ And $TdS = C_p dT - T\left(\frac{\partial V}{\partial T}\right)_P dP$

16. Derive the co-relation of partition function Z with entropy S for ideal gas obeying classical statistics.

17. Prove that for Maxwell Boltzman statistics, the total energy E = (3/2) RT.

18. Derive Richardson Dushman equation of thermionic emission.

19. Show that the zero point energy of ½ $\hbar\omega$ of a linear harmonic oscillator is a manifestation of the uncertainty principle.

20. Show that operator can be expressed in matrix form.

(3 × 5 = 15 Marks)