

Roll No. \_\_\_\_\_

**M. Sc (Physics) – 4<sup>th</sup> SEMESTER**  
**SPECIAL EXAMINATION, AUGUST-2018**  
**Electrodynamics & Plasma Physics - 09020409**

**TIME: 03: 00 Hrs.**

**Max. Marks: 80**

**INSTRUCTIONS:**

1. Write Roll No. on the Question Paper.
2. Candidate should ensure that they have been provided with the correct question paper. Complaints in this regard, if any, should be made within 15 minutes of the commencement of the exam. No complaint(s) will be entertained thereafter;
3. Attempt **FIVE (05)** questions in all.
4. Students are required to attempt **at least one question** from each **SECTION**. All question carry equal marks.
5. Draw diagram whenever required.

**SECTION – A**

- Q1 (a)** Discuss the non-uniqueness of electrodynamic potentials and gauge transformation. **(8)**
- (b)** Derive Poisson and Laplace equations in Cartesian co-ordinates. Also give solution of Laplace equation. **(8)**
- Q2 (a)** State and Prove Green's Theorem.
- (b)** Derive an expression for electrostatic energy and energy density in free space and in a dielectric.

**SECTION – B**

- Q3 (a)** Calculate the magnitude, position of image charge and potential when spherical conductor near point charge is at zero potential or earthed. **(8)**
- (b)** Calculate the surface density at a point P when insulated conducting sphere is kept near a point charge. **(8)**
- Q4** Discuss the case when a conducting sphere is placed in a uniform electrostatic field. **(16)**

**SECTION – C**

- Q5 (a)** Discuss the propagation of plane electromagnetic wave in isotropic dielectric (non conducting media). **(8)**
- (b)** Derive Fresnel's equations when incident wave is polarized with its vector **E** normal to the plane of incidence. **(8)**

- Q6 (a)** What are Lienard – Wiechert potentials? How do you get them from retarded potentials? **(8)**
- (b)** What are rectangular waveguides? Discuss the propagation of transverse electric wave in rectangular waveguide. **(8)**

**SECTION – D**

- Q7 (a)** By taking the moment of Boltzmann equation, obtain (i) equation of continuity and (ii) equation of motion of fluids. **(8)**
- (b)** What are Plasma oscillations? Differentiate between Alfvén and Magnetosonic waves. **(8)**
- Q8 (a)** Calculate the Debye Screening distance in Plasma. **(8)**
- (b)** What is Pinch effect? What are instabilities associated with this effect? **(8)**

Roll No. \_\_\_\_\_

**M. Sc (Physics) – 3<sup>rd</sup> SEMESTER**  
**SPECIAL EXAMINATION, AUGUST-2018**  
**Computational Methods & Programming - 9020302**

**TIME: 03: 00 Hrs.**

**Max. Marks: 80**

**INSTRUCTIONS:**

1. Write Roll No. on the Question Paper.
2. Candidate should ensure that they have been provided with the correct question paper. Complaints in this regard, if any, should be made within 15 minutes of the commencement of the exam. No complaint(s) will be entertained thereafter;
3. Students are required to attempt **at least one question** from each unit. All question carry equal marks.
4. Draw diagram whenever required.

**UNIT-I**

**Q.1** Explain the following in brief in relation to Programming in C. **(4 X 4 =16)**

- a) Various data types available in C
- b) Operators used in C with an example of each.
- c) Structure in C
- d) File Operations

**Q.2** What is Statement? Distinguish between executable and non executable statements.  
Explain if and Switch statement and While, Do- while statement in C programming. **(16)**

**UNIT-II**

**Q.3 (a)** Give the theory of Bisection method to find the roots of an equation. **(08)**

**(b)** Show that the equation  $x^5 - 5x + 2 = 0$  has three real roots. Find the interval in which they lie **(08)**

**Q.4 (a)** Give the theory of Newton – Raphson method to find the roots of an equation. **(08)**

**(b)** Find a real root of the equation  $x^3 - 2x + 5 = 0$  by Newton - Raphson method, correct to three places of decimal.

**UNIT-III**

**Q.5 (a)** Give the theory of Gauss elimination method of solving simultaneous equations. **(08)**

**(b)** Solve the system of equations by Gauss elimination method. **(08)**

$$4x + y + 3z = 11$$

$$3x + 4y + 2z = 11$$

$$2x + 3y + z = 7$$

- Q.6 (a)** What do you mean by Eigen values and Eigen vectors of matrices? Explain them in brief by giving suitable examples. **(10)**
- (b)** What is pivoting condensation? Why it is used in triangulerization. **(06)**

**UNIT-IV**

- Q.7 (a)** Explain Simpson's one-third rules to find integration. **(08)**
- (b)** Explain Trapezoidal rule to find Integration. **(08)**
- Q.8 (a)** Give Euler's method for solution of differential equations. **(08)**
- (b)** Apply Runga-kutta method to solve ideal harmonic oscillations. **(08)**

Roll No. \_\_\_\_\_

**M. Sc (Physics) – 3<sup>rd</sup> SEMESTER**  
**SPECIAL EXAMINATION, AUGUST-2018**  
**Condensed Matter Physics – I, 09020303**

**TIME: 03: 00 Hrs.**

**Max. Marks: 80**

**INSTRUCTIONS:**

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2. Candidate should ensure that they have been provided with the correct question paper. Complaints in this regard, if any, should be made within 15 minutes of the commencement of the exam. No complaint(s) will be entertained thereafter;
3. Attempt **FIVE (05)** questions in all.
4. Students are required to attempt **at least one question** from each **SECTION**. All question carry equal marks.
5. Draw diagram whenever required.

**SECTION – A**

- Q1 (a)** Derive equation of motion of an electron in an energy band. (8)
- (b) What are direct and indirect band gap semiconductors? Differentiate between them giving suitable examples. (8)
- Q2 (a)** Discuss De Haas-van Alphen Effect. (8)
- (b) Discuss the formation of Fermi surfaces for nearly free electrons. (8)

**SECTION – B**

- Q3 (a)** Derive dispersion relations for electromagnetic waves. (8)
- (b) Discuss the electrostatic screening in plasma. (8)
- Q4 (a)** What is Mott Metal – insulator transition. Discuss in detail. (8)
- (b) Derive Kramers – Kronig relation. (8)

**SECTION – C**

- Q5** Determine local electric field at an atom and also derive Clausius – Mossotti relation. (16)
- Q6** Discuss the Landau theory of phase transition. (16)

**SECTION – D**

- Q7 (a)** Discuss Langevin theory of diamagnetism. (8)
- (b) Explain quantum theory of paramagnetism. (8)
- Q8 (a)** Discuss the singlet triplet (exchange) splitting in Heitler – London approximation. (8)
- (b) What are magnons? Derive Bloch  $T^{3/2}$  law. (8)