Code No. 8230/CORE

# FACULTY OF SCIENCE

**M. Sc. II – Semester Examination, May / June 2019**

**Subject : Physics & Applied Electronics**

**Paper – I : Electromagnetic Theory**

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

**Note : Answer all questions from Part–A and Part–B. Each question carries 4 marks in Part–A and 12 marks in Part – B.**

## PART – A (8 x 4 = 32 Marks)
## (Short Answer Type)

1 What is meant by Gauge transformation? Explain.
2 Explain briefly about scalar and vector magnetic potentials.
3 Write the electromagnetic wave equation for a homogenous isotropic dielectric medium.
4 What is meant by attenuation?
5 What is Brewster's angle? Explain in detail.
6 State and explain the importance of Fresnel's relations.
7 Differentiate between uniaxial crystal and biaxial crystal.
8 What is centre-fed linear antenna? Explain it.

## PART – B (4 x 12 = 48 Marks)
## (Essay Answer Type)

9 (a) Obtain the Maxwell's equations in integral form. Explain the physical significance of Maxwell's equations.

**OR**

(b) State and prove poynting's theorem relating to the flow of energy at a point in space in an electromagnetic field.

10 (a) Discuss the propagation of plane electromagnetic waves in an isotropic dielectric medium. Show that electric and magnetic field vectors ( $\overline{E}$ and $\overline{H}$ ) are mutually perpendicular.

**OR**

(b) Explain the theory of propagation of electromagnetic waves in a conducting medium and explain which in high frequency circuit current flows only on surface of conductors.

11 (a) Obtain the boundary conditions satisfied by the electromagnetic field vectors E, D and H on the plane interface between two media.

**OR**

(b) Discuss metallic reflection and refraction. Find out an expression for the reflection power of a metallic surface.

12 (a) Obtain the expressions for Lienard Wiechert potentials of a moving point charge. Discuss what do you mean by the retarted time.

**OR**

(b) Derive expression for the inhomongeous wave equations of scalar and vector potentials.

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# FACULTY OF SCIENCE

**M. Sc. II – Semester Examination, May / June 2019**

**Subject : Physics & Applied Electronics**

**Paper – II : Statistical Mechanics**

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

**Note : Answer all questions from Part–A and Part–B. Each question carries 4 marks in Part–A and 12 marks in Part – B.**

## PART – A (8 x 4 = 32 Marks)
## (Short Answer Type)

1 Define phase space and give importance.
2 Explain the postulates of classical statistical mechanics.
3 Define partition function in canonical ensemble.
4 What are the postulates of quantum statistical mechanics?
5 Explain about phonons.
6 Explain about the super fluid phase of $^3He$.
7 Explain about thermionic emission.
8 What is Brownian motion? Explain.

## PART – B (4 x 12 = 48 Marks)
## (Essay Answer Type)

9 (a) Define an ensemble. Distinguish between three ensembles, namely microcanonical, canonical and grad canonical ensembles.

**OR**

(b) Obtain an expression for statistical entropy of classical ideal gas on the basis of microcanonical ensemble.

10 (a) Obtain an expression for Bose-Einstein distribution law.
(b) Explain equipartition energy.

**OR**

(c) Obtain rotational partition function for a gas of N diatomic molecules.
(d) Find its contribution to mean energy, entropy and specific heat.

11 (a) Explain the phenomenon of Bose-Einstein condensation. Show that the specific heat of Bose gas in the condensed phase is proportional to $T^{2/3}$.

**OR**

(b) Obtain the condition for the star to become a white dwarf.

12 (a) What do you phase transition? Explain about the phase transitions of first and second kind.

**OR**

(b) Explain how Bragg-William's approximation can be applied for ferromagnetic system.

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Code No. 8236/CORE

# FACULTY OF SCIENCE

**M. Sc. II – Semester Examination, May / June 2019**

**Subject : Physics & Applied Electronics**

**Paper – III : Quantum Mechanics – II**

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

**Note : Answer all questions from Part–A and Part–B. Each question carries 4 marks in Part–A and 12 marks in Part – B.**

## PART – A (8 x 4 = 32 Marks)
## (Short Answer Type)

1 Discuss the kinematics of scattering process using classical theory.
2 What is optical theorem? Write its significance.
3 Calculate energy eigen values corrected upto first order perturbation for a ground state helium (He) atom.
4 Explain the validity condition for WKB approximation.
5 What is Fermi's Golden rule and write its significance?
6 Discuss the electric dipole approximation.
7 What are Dirac's alpha and beta matrices ? Write their properties.
8 Explain the concept of negative energy states.

## PART – B (4 x 12 = 48 Marks)
## (Essay Answer Type)

9 (a) Discuss the scattering by a perfectly rigid sphere potential and derive for scattering cross-section for low and high energy conditions.

**OR**

(b) Explain the theory of scattering using Born approximation method and derive an expression for scattering cross-section.

10 (a) Discuss the time independent perturbation theory for a non-degenerate stationary system and obtain the corrected eigen functions and energy eigen values.

**OR**

(b) Outline the method of WKB approximation and write the connecting formulae across the classical turning points.

11 (a) Discuss the time dependent perturbation theory and obtain an equation for the probability of finding the particle in $m^{th}$ state.

**OR**

(b) Show that the first order effect of time dependent perturbation, varying sinusoidal in time, leads to the emission or absorption in energy. Find the transition rate for emission and absroption.

12 (a) Derive Kelin-Gorden relativistic equation for a free particle and write Klein Gardon equation in co-variant form. What are the inadequacies of Klien Gardon equations.

**OR**

(b) Write Dirac's relativistic equation and obtain free particle solutions. Write the Dirac's relativistic equation in covariant form.

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# FACULTY OF SCIENCE

## M. Sc. II – Semester Examination, May / June 2019

### Subject : Physics & Applied Electronics

### Paper – IV : Electronics

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

**Note : Answer all questions from Part–A and Part–B. Each question carries 4 marks in Part–A and 12 marks in Part – B.**

## PART – A (8 x 4 = 32 Marks)
## (Short Answer Type)

1 Discuss the basic principle of regulated power supply with block diagram.
2 Differentiate between the positive and negative feedback.
3 Mention the ideal operational amplifier characteristics.
4 With a neat diagram, explain the working of Logarithmic amplifier.
5 Solve $Y = \overline{A}\,\overline{B}\,\overline{C} + A\,\overline{B}\,\overline{C} + \overline{A}\,B\,\overline{C} + A\,B\,\overline{C}$
6 Explain the working of SR latch using NAND / NOR gate.
7 Discuss the different flags available in 8085 microprocessor.
8 Write an assembly language program for two 8-bit multiplication.

## PART – B (4 x 12 = 48 Marks)
## (Essay Answer Type)

9 (a) Define lien and load regulation. Explain how Zener diode is used as a voltage regulator.

**OR**

(b) Discuss the construction and working of Phase shift oscillator and drive the expression for the gain.

10 (a) Explain the working of Inverting and non-inverting amplifier, using Op-Amp with the suitable diagrams.

**OR**

(b) Discuss the operation of Astable Multivibrator with IC 555 and derive the expression for the time period.

11 (a) Distinguish between synchronous and asynchronous counters. Explain Mod-5 counter with neat diagram.

**OR**

(b) What is a shift Register? With a neat diagram of 4-bit shift register, explain its various modes of operations.

12 (a) With the functional diagram, explain the operation of 8085 microprocessor.

**OR**

(b) Discuss the logical and branch control instructions of 8085 microprocessor.

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