



**Q.4** (a) How Raman scattering is different from Rayleigh scattering? Explain Raman Spectrometer with its applications. (05)

(b) List atomization emission sources. Write advantages and disadvantages of Plasma Torch. (05)

**OR**

(b) Describe working of Photo-acoustic spectrometer with neat diagram. (05)

**Q.5** (a) With neat diagram explain ESR spectrometer. (05)

(b) Write a note on pH meter. (05)

**OR**

(b) Describe Quadrupole Mass Spectrometer. (05)

**Q.6** (a) Draw block diagram of Gas Chromatography. Explain function of column and types of columns in brief. (05)

(b) List different methods of Thermal Analysis and explain Differential Thermal Analysis (DTA). (05)

**OR**

(b) Discuss types of Electrophoresis techniques. (05)

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Seat No. \_\_\_\_\_

Enrolment No. \_\_\_\_\_

**THE CHARUTAR VIDYA MANDAL UNIVERSITY**  
**M. Sc. PHYSICS – SEMESTER 2**  
**APRIL 2023 EXAMINATION**

**Course Title: OPTICAL FIBERS AND DEVICES**

**Course Code: 201510202**

**Total Printed Pages : 2**

**Date: 19 / 04 / 2023**

**Time: 2:00 PM to 4:00 PM**

**Maximum Marks: 50**

**Instructions:**

- Attempt all questions.
- Numbers to the right indicate full marks for each question.
- Make suitable assumptions wherever necessary.

**Q.1 Answer the following multiple choice questions. (04)**

- (1) A junction between two conductors that have a linear current–voltage (I–V) curve as with Ohm's law. It is a low resistance junction provides current conduction from metal to semiconductor and vice versa.  
(a) Ohmic Contact (b) Rectifying contact (c) Insulation (d) all
- (2) The current generated in the absorption region per unit optical power incident to the region.  
(a) dark current (b) responsivity (c) noise (d) band gap
- (3) Which dispersion occurs if the index of refraction of the medium changes with wavelength?  
(a) Modal (b) Polarization (c) Wave guide (d) Material
- (4) The .....of a fibre is defined as the sine of the largest angle an incident ray can have for total internal reflectance in the core.  
(a) Numerical Aperture (b) Right angle (c) Cladding (d) Core

**Q.2 Answer in brief and to the Point ( 2 marks each) (06)**

- (1) Enlist the drawbacks of Nd YAG laser.
- (2) Germanium has an energy gap of 0.81eV. Find the cut-off wavelength of Ge Photodiode.
- (3) Give the reasons for Coupling efficiency reduction in optical fibre.

- Q.3** (a) Explain with neat figures the mechanism of photon emission from LED. List advantages of LED. (05)
- (b) Describe phenomena of stimulated emission and list LASER diode characteristics. (05)  
The total efficiency of an injection laser with GaAs active region is 18%. The voltage applied to the device is 3V and the band gap energy for GaAs is 1.43eV. Calculate the external power efficiency of the device.
- OR**
- (b) Draw neat diagram of Surface Emitting LED and explain it. (05)
- Q.4** (a) Explain Phototransistor, mention its merits – demerits and list its applications. (05)
- (b) Explain Avalanche photodiode and list its applications. (05)
- OR**
- (b) List the requirements of optical detectors. (05)  
For an InGaAs photodetector operating at 1550nm with responsivity of 0.90A/W. What is the NEP (noise equivalent power) in the thermal noise limited case if the load resistor is of 1000Ω and T = 300°K. Consider SNR=1 and Boltzmann constant =  $1.380649 \times 10^{-23} \text{ m}^2\text{kg.s}^{-2}\text{K}^{-1}$
- Q.5** (a) Give the basic principle of light transmission in optical fibre. Explain light propagation in optical fibres based on modes. (05)
- (b) Discuss Bending loss and Absorption loss in optical fibres. (05)
- OR**
- (b) What is fusion splicing? What are safety measures to handle optical fibres while repairing or manufacturing? (05)
- Q.6** (a) Describe Wavelength Division Multiplexing. List advantages and disadvantages of it. (05)
- (b) Explain optical power and loss testing system. (05)
- OR**
- (b) Describe Optical Time Domain Reflectometry (OTDR). What information OTDR provides? (05)

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Seat No. \_\_\_\_\_

Enrollment No. \_\_\_\_\_

**THE CHARUTAR VIDYA MANDAL UNIVERSITY**  
**MSC (PHYSICS) – SEMESTER II**  
**APRIL 2023 (REGULAR) EXAMINATION**

**Course Title: CLASSICAL AND QUANTUM MECHANICS**

**Course Code: 201510203**

**Total Printed Pages : 02**

**Date: 21/04/2023**

**Time: 02.00 pm to 04.00 pm**

**Maximum Marks: 50**

**Instructions:**

- Attempt all questions.
- Numbers to the right indicate full marks for each question.
- Make suitable assumptions wherever necessary.

- Q. 1**      **Answer the following multiple-choice questions.**      **(04)**
- (I)**      Lagrange equation is the equation of conservation of \_\_\_\_\_.  
(a) energy (b) momentum (c) both a and b (d) not energy nor momentum
- (II)**      Eigenvalues of a real symmetric matrix are always \_\_\_\_\_.  
(a) positive (b) negative (c) real (d) complex
- (III)**      State model representation is possible using \_\_\_\_\_.  
(a) Physical variables (b) Phase variables (c) Canonical state variables (d) All of the mentioned
- (IV)**      If  $E < V$  Schrodinger equation will be \_\_\_\_\_ spectrum.  
(a) continuous (b) discrete (c) mixed (d) sine
- Q.2**      **Answer in brief and to the Point. (3 questions of 2 marks each)**      **(06)**
- (I)**      What is Hamilton-Jacobi's theory in classical mechanics?
- (II)**      Define the Product of operators.
- (III)**      What is the difference between eigenvalues and spectrums?
- Q.3**      **(a)**      Discuss the canonical transformation and its harmonic oscillator.      **(05)**  
**(b)**      What is the justification for Noether's formula and theorem?      **(05)**  
Describe using an example.
- OR
- (b)**      Write a note on Poisson brackets and canonical invariants.      **(05)**
- Q.4**      **(a)**      Discuss and derive the Hamilton-Jacobi theory.      **(05)**  
**(b)**      Write a note on the Lagrangian formulation for a continuous      **(05)**  
system.
- OR
- (b)**      What is called a secular equation? Differentiate between      **(05)**  
eigenvector and eigenvalue with examples.

**Q.5 (a)** Discuss the equations of Schrodinger representation with (05) explanations.

**(b)** Discuss the self-adjointness and Hermiticity. (05)

**OR**

**(b)** Define Unitary transformations and their state. Also, the concept of parity. (05)

**Q.6 (a)** Discuss the quantum theory of angular momentum and its eigenvalues spectrum. (05)

**(b)** Discuss the Pauli matrices. What do you mean by Clebsch Gordan coefficients? (05)

**OR**

**(b)** Write a note on the matrix representation of angular momentum operators and spin angular momentum. (05)

**Note: 5 marks questions may be divided into sub-questions.**

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**THE CHARUTAR VIDYA MANDAL UNIVERSITY**  
**Master of Science (Physics) – SEMESTER-II**  
**April 2023 (REGULAR) EXAMINATION**

**Course Title: Magnetic and optical properties of condensed matter**

**Course Code: 201510208**

**Total Printed Pages: 02**

**Date: 25/04/2023**

**Time: 02.00 pm to 04.00 pm**

**Maximum Marks: 50**

**Instructions:**

- Attempt all questions.
- Numbers to the right indicate full marks for each question.
- Make suitable assumptions wherever necessary.

- Q.1 Answer the following multiple choice questions. (04)**
- (I) The absorbed energy re-emitted in form of Electromagnetic radiation. Phenomena is called-
- (A) Luminescence (C) light  
(B) Phosphors (D) None of these
- (II) Excitation occurs as a result of bombardment of electron is called .....
- (A) Cathodoluminescence (C) photoluminescence  
(B) Chemiluminescence (D) electroluminescence
- (III) The Isomer shift doesn't give information about-
- (A) Oxidation state (C) electronegativity  
(B) spin state (D) molecular symmetry
- (IV) Quasiparticle, collective excitation of the electron's spin structure is known as.....
- (A) phonon (C) photon  
(B) magnon (D) None of these
- Q.2 Answer in brief and to the Point (3 questions of 2 marks each) (06)**
- (I) Define activators  
(II) Define luminescence.  
(III) Define Susceptibility.
- Q.3 (a) What is luminescence? What are the types of it? Give a detail note on groups of luminescent crystalline solids. (05)**
- (b) What are sulphide phosphors? Explain the principle of it. (05)**
- OR**
- (b) What is electroluminescence? Explain the Gudden-Pohl effect. (05)**
- Q.4 (a) What is Mossbauer effect? Discuss the experimental setup and working. (05)**
- (b) Explain the Debye Waller factor and its temperature dependency on Mossbauer effect. (05)**

**OR**

- (b) Explain the doppler broadening, isomer shift and quadrupole splitting in detail. (05)
- Q.5** (a) Give a detail note on propagation of light in conducting media. (05)  
(b) What are dielectric materials? Explain the polarizability and its dependency of frequency. (05)
- OR**
- (b) Explain the photovoltaic cell, its characteristic and applications in detail. (05)
- Q.6** (a) Give a detail note on temperature dependence of saturation magnetization. (05)  
(b) Compare the Curie temperature and susceptibility for all types of magnetic materials with appropriate figure. (05)
- OR**
- (b) Explain the concept of Nuclear Magnetic Resonance (NMR) in detail. (05)

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