**PG–A–1474 MPHY–21X**

M.Sc. DEGREE EXAMINATION — JULY, 2022.

Physics

(CY 2020 and AY 2020 Batches onwards)

Second Year

QUANTUM MECHANICS

Time : 3 hours Maximum marks : 70

PART A — (5 × 5 = 25 marks)

Answer any FIVE questions out of Eight questions in 300 words.

(All questions carry equal marks)

1. Explain in detail about Hilbert spaces.

2. Show that there is no first order stark effect in ground state of an atom.

3. Show that (i) $\left(L^2, L\right) = 0$ and (ii) $\left(L_x L_y\right) - i\hbar L_z$ .

4. Derive an expression for scattering amplitude.

5. Obtain an expression for the ratio between spontaneous emission and stimulated emission.

6. State and explain Fermi Golder rule.

7. Explain any two properties of Clebsh Gordon coefficients.

8. Derive Hartree-Fock equation.

PART B — $(3 \times 15 = 45$ marks)

Answer any THREE questions out of Five questions in 1000 words.

(All questions carry equal marks)

9. What are equations of motion? Obtain an expression for equation of motion in Schroedinger picture.

10. Write down the principle of WKB approximation. Obtain an expression for WKB wave function.

11. Derive an expression for Klein Gordon equation in Hamiltonian form.

12. Obtain the expression for differential cross section for a spherically symmetric potential using Born approximation. Explain the validity of the first Born approximation.

13. Derive the expressions for Einstein's A and B coefficients.

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**PG-A-1475 MPHY-22X**

M.Sc. DEGREE EXAMINATION — JULY, 2022.

Physics

(CY 2020 and AY 2020 Batches onwards)

Second Year

CONDENSED MATTER PHYSICS

Time : 3 hours Maximum marks : 70

PART A — ($5 \times 5 = 25$ marks)

Answer any FIVE questions out of Eight Questions in 300 words.

All questions carry equal marks.

1. Write a note on lattice constant and density.

2. Classify the defects in solids.

3. Classify the conductors, semiconductors and insulators.

4. Explain the Meissner effect in type I and type II superconductors.

5. Define Polarization, dielectric constant and polaraizability.

6. Explain the quantum theory of paramagnetism.

7. Discuss the Hall effect and its uses.

8. Explain the London equation and coherence length.

PART B — ($3 \times 15 = 45$ marks)

Answer any THREE questions out of Five Questions in 1000 words.

All questions carry equal marks.

9. Explain the rotary crystal method of X ray diffraction.

10. Discuss the Kronig penny model.

11. Explain the BCS theory of superconductivity.

12. Derive the Claussius Mosotti relation.

13. Explain the Guoy's method with a neat diagram.

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**PG-A-1476** **MPHY-23X**

# P.G. DEGREE EXAMINATION – JULY 2022.

Physics

(From CY 2020 onwards)

Second Year

## SPECTROSCOPY

Time : 3 hours Maximum marks : 70

PART A — (5 × 5 = 25 marks)

Answer any FIVE questions out of Eight Questions in 300 words

All questions carry equal marks.

1. Write about Lande's 'g' factor.

2. Write the basic principles of FTIR spectroscopy.

3. Write a note on vibrational Raman spectra.

4. Write about splitting of nuclear energy level in a magnetic field.

5. Explain the hyperfine structure of ESR.

6. Write about symmetric top molecules.

7. Explain the quantum theory of Raman effect.

8. Write the general principle of NQR spectroscopy.

PART B — (3 × 15 = 45 marks)

Answer any THREE questions out of Five Questions in 1000 words.

All questions carry equal marks.

9. Explain the classical interpretation of Normal Zeeman effect.

10. Discuss the theory of IR rotation vibration spectra.

11. Explain the vibrational spectra of polyatomic molecules.

12. Explain the principle and working of high resolution NMR.

13. Explain the ESR spectrometer with a neat block diagram.

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**PG–A-1477 MPHY–24X**

P.G. DEGREE EXAMINATION — JULY 2022.

Physics

(From CY – 2020 onwards)

Second Year

LASER AND FIBER OPTICS

Time : 3 hours Maximum marks : 70

PART A — (5 × 5 = 25 marks)

Answer any FIVE questions each in 300 words.

1. Explain different properties of Laser light.

2. What is magneto optic effect? Mention its applications.

3. What are the fiber losses? What are the causes for losses in fiber?

4. Write the principle of LED? Mention few applications of it.

5. What are liquid crystals? What are the properties of liquid crystals?

6. Write a note on Laser pumping.

7. Define numerical aperture and acceptance angle.

8. Give an account on Mode locking.

PART B — (3 × 15 = 45 marks)

Answer any THREE questions each in 1000 words.

9. Describe Absorption and emission process in Lasers. Obtain relation between Einstein coefficients.

10. Explain double refraction at a boundary of a solid.

11. Explain the propagation of light through an optical fibre.

12. Write short notes on (a) Hetero junction laser (b) quantum well laser

13. Explain the architecture and working of plasma panel display.

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**PG–A-1478 MPHY–25X**

# P.G. DEGREE EXAMINATION — JULY 2022.

Physics

(From CY – 2020 onwards)

Second Year

NUMERICAL METHODS

Time : 3 hours Maximum marks : 70

SECTION A — ($5 \times 5 = 25$ marks)

Answer any FIVE questions. Each in 300 words.

1. Find the positive root of $3x - \sqrt{1+\sin x} = 0$ by iteration method if the root lies between 0.3 and 1.

2. Explain Gauss elimination method.

3. Discuss least square approximation method.

4. Write Gauss two point formula?

5. Write the merits and demerits of the Taylor method of solution.

6. Explain Interpolation formula for unequal intervals?

7. Explain about Adam – Moulton method?

8. Explain Newton-cote's formula for Numerical Integration and Trapezoidal rule.

SECTION B — ($3 \times 15 = 45$ marks)

Answer any FOUR questions. Each in 1000 words.

9. Find the positive root of $f(x)=x^3-2x-5=0$ by Newton-Raphson method. correct to four decimal places.

10. Briefly discuss about Gauss Jordon method for the solution of simultaneous equation?

11. Using Newton's forward Interpolation formula find the polynomial $f(x)$ satisfy the following data. hence evaluate $y$ at $x=5$.

| $x$ | 4 | 6 | 8 | 10 |
|---|---|---|---|---|
| $y$ | 1 | 3 | 8 | 10 |

12. Evaluate $\int_0^1 e^{-x}\,dx$ with 10 sub intervals by using trapezoidal and simpson's both rule.

13. Find the value $y(0.2)$ using Range – Kutta method for fourth order with $h$ = 0.1. given that $\frac{dy}{dx}=y-x$ at $y(0)=2$.

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