

Roll No. _____

B.Tech II Sem Back/Reback (UD) September 2023
PYL100 Engineering Physics
Admitted Batch: 2020

Time: 3 Hours

Maximum Marks: 100

PART A: Short answer question (up to 25 words) 10 x 2 marks = 20 marks.
All ten questions are compulsory.

PART B: Analytical/Problem Solving questions (up to 100 words) 6 x 5 marks = 30 marks. Candidates have to answer six questions out of eight.

PART C: Descriptive/ Analytical/Problem solving questions 5 x 10 marks = 50 marks. Candidates have to answer five questions out of seven.

The Following Code(s) are required:

1. _____ NIL _____ 2. _____ NIL _____

PART A

- ✓ 1. State Bragg's Law.
2. State Rayleigh's criterion of resolution.
- ✓ 3. Define Wave Particle duality.
- ✓ 4. What is the physical interpretation of wave-function?
- ✓ 5. Define Spatial and temporal coherence.
- ✓ 6. What is Metallic bonding?
7. What do you mean by "Q" factor for light?
- ✓ 8. Define Hall Effect.
9. What do you mean by pointing vector?
10. Write threshold conditions for laser action.

PART B

1. Deduce an expression for the resolving power of a grating.
2. Explain the formation of Newton's rings in reflected light. Prove that the diameters of dark rings are proportional to the square root of natural numbers?
3. What is Numerical Aperture (NA) of an optical fibre? What does the numerical aperture signify?
4. Derive the relation between Einstein's coefficients and discuss the result.
5. Calculate the conductivity of the intrinsic germanium at 300 K. Given $n_i = 2.4 \times 10^{19}/\text{m}^3$, $\mu_e = 0.39 \text{ m}^2\text{V}^{-1}\text{s}^{-1}$ and $\mu_p = 0.19 \text{ m}^2\text{V}^{-1}\text{s}^{-1}$.
6. Prove pointing theorem. Explain the term pointing vector.
7. A diffraction grating just resolves lines 4547.27 \AA and 4547.98 \AA in third order. Will it resolve lines 6437.48 \AA and 6437.95 \AA in the first order?
8. Give the construction and working of He-Ne laser. Draw necessary energy level diagrams.

PART C

1. Describe construction and workings of Michelson's Interferometer and explain how it is used to find the wavelength of monochromatic light.
2. Derive Schrödinger time dependent and independent wave equation.
3. Explain the term Visibility as a measure of coherence.
4. Explain the term Fermi Dirac distribution function and Fermi energy.
5. Show that the Hall coefficient is independent of the applied magnetic field and is inversely proportional to the current density and electronic charge. Mention the application of Hall Effect.
6. Derive Maxwell's equations in differential form.
7. Solve the Schrödinger equation for a free particle in one dimensional box and find the Eigen value and Eigen function of free particle.
