# Indian Institute of Information Technology Ranchi

**Department of Electronics & Communication Engineering/Computer Science & Engineering**

**B. Tech End Semester Examination – Autumn Semester 2022-23**

| | |
|---|---|
| **Semester:** Autumn Semester (1st) | **Course Instructor:** Dr. Rohit Kandulna/Dr. S.K. Singh |
| **Course Code:** PH-1001 | **Course Name:** Engineering Physics |
| **QUESTION PAPER** | |
| **Duration: 3 hrs.** | **Max Marks: 100** |

**Instructions:**

(1). Number in [ ] indicates marks.
(2). Any missing data can be assumed suitably.
(3). Symbols have their usual meaning.
(4) Out of six (06) questions, answer any **five (05)**.

## Section A

| | | | |
|---|---|---|---|
| 1 | (a) | What is Poynting's vector? State and prove the Poynting's theorem? | [15] |
| | (b) | If earth receives 2 cal $min^{-1}$ $cm^{-2}$ solar energy. What is the amplitude of electric and magnetic field of radiation? | [5] |
| 2 | (a) | Find the energy eigen value and eigen function of the particle in one-dimensional box of length 'a'. | [15] |
| | (b) | What is wave function? Discuss the properties of wave function? | [5] |
| 3 | (a) | Derive the Electromagnetic wave equation in terms of velocity of light. | [10] |
| | (b) | Define Heisenberg uncertainty principle? Explain the followings using Heisenberg uncertainty principle:<br>(i) Non-existence of electron inside the nucleus.<br>(ii) Size of elementary cell in phase space. | [10] |

## Section B

| | | | |
|---|---|---|---|
| 4 | (a) | Establish the relation $E=mc^2$. | [10] |
| | (b) | Write the postulates of Einstein's special theory of relativity and derive the expression for length contraction? | [10] |
| 5 | (a) | Explain the working of He-Ne LASER. | [10] |
| | (b) | Derive the relation between Einstein's A and B coefficients. | [10] |
| 6 | (a) | Write short notes on<br>(i) Connector and coupler in optical fiber<br>(ii) Dispersion in optical fiber<br>(iii) Step index and graded index fiber<br>(iv) Losses in optical fiber | [16] |
| | (b) | Derive the expression for numerical aperture in optical fiber signal transmission. | [4] |