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## MID TERM EXAMINATIONS – December 2023

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|---|---|---|---|---|---|
| Programme | : | **B.Tech.** | Semester | : | ***Fall Inter II 2023-24*** |
| Course Title/ Course Code | : | **Engineering Physics / PHY1001** | Slot | : | ***D21+D22+D23+D24+D25*** |
| Time | : | **1 ½ hours** | Max. Marks | : | **50** |

**Answer all the Questions**

| Q.No. | Sub. Sec. | Question Description | Marks |
|---|---|---|---|
| 1 | | The universe is operating under the influence of four fundamental forces which are in nature. Explain these forces, and discuss their interaction domains. | 10 |
| 2 | (a) | Explain how Newton's laws of motion are not valid in non-inertial frame of reference with examples? | 5 |
| | (b) | Two particles of masses 1.0 kg and 2.0 kg are placed at a separation of 50 cm. Assuming that the only forces acting on the particles are their mutual gravitation, find the initial accelerations of the two particles. | 5 |
| 3 | | Derive an equation that describes the time-dependent behaviour of a moving particle in quantum mechanics. | 10 |
| 4 | (a) | Calculate the de-Broglie wavelength associated with a proton moving with a velocity equal to $\frac{1}{20}$ velocity of light. | 5 |
| | (b) | Find the minimum energy of an electron moving in one dimension in an infinitely high potential box of width 1 $A^o$. (Mass of the electron is $9.11 \times 10^{-31}\ kg$ and $h = 6.63 \times 10^{-34} J/s$) | 5 |
| 5 | (a) | Explain how do the surface plasmons responsible for the change in the optical properties of the material at the nanoscale? Explain briefly in terms of size and shape effect. | 7 |
| | (b) | Why is a high surface area to volume ratio important in nanoparticles? | 3 |

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