Roll No: | | | | | | | | | | | | | |

**BTECH**
**(SEM I) THEORY EXAMINATION 2023-24**
**ENGINEERING PHYSICS**

**TIME: 3HRS** **M.MARKS: 70**

**Note: 1.** Attempt all Sections. If require any missing data; then choose suitably.

## SECTION A

**1. Attempt *all* questions in brief. 2 x 7 = 14**

| | |
|---|---|
| a. | Explain basic postulates of Plank's law of radiation. |
| b. | Write down the physical significance of Poynting vector? |
| c. | What happens if the slit is smaller than wavelength in diffraction pattern? |
| d. | What is metastable state? Discuss their role in laser action. |
| e. | What is vortex state of a superconductivity? |
| f. | What do you mean by scattering loss in optical fiber? |
| g. | Explain quantum confinement effect in nanomaterials? |

## SECTION B

**2. Attempt any *three* of the following: 7 x 3 = 21**

| | |
|---|---|
| a. | Calculate the Compton shift and kinetic energy of recoil electron if X-rays of wavelength $1.0A^0$ are scattered form a carbon block. The scattered radiation is viewed at $90^0$ to the incident beam. |
| b. | Assuming that all the energy from a 1000-Watt lamp is radiated uniformly; calculate the average values of the intensities of electric and magnetic fields of radiation at a distance of 2 m from the lamp. |
| c. | Newton's rings are observed normally in reflected light of wavelength 6000 $A^0$. The diameter of the $10^{th}$ dark ring is 0.50cm. Find the radius of curvature of lens and thickness of the film. |
| d. | Diffraction pattern of a single slit of width 0.5 cm is found by a lens of focal length 40 cm. calculate the distance between first dark and next bright fringe from the axis. Given wavelength $4890A^0$. |
| e. | Calculate the V- number for a fiber of core diameter 40μm & RI of 1.55 and 1.50 respectively for its core & cladding when a light of wavelength 1400nm is propagating. Also calculate the number of modes that the fiber can support for the propagation. |

## SECTION C

**3. Attempt any *one* part of the following: 7 x 1 = 7**

| | |
|---|---|
| a. | Distinguish between phase velocity and group velocity of a wave packet and establish the relation between them. |
| b. | Find an expression for the energy state eigen value and wave function of a particle in one dimensional box. |

**4. Attempt any *one* part of the following: 7 x 1 = 7**

| | |
|---|---|
| a. | What is Maxwell fourth equation modifying on the basic of displacement current. When an ideal capacitor is charged by a dc battery, no current flows. However, when an ac source is used, the current flows continuously. How does one explain this, based on the concept of displacement current? |
| b. | Derive the Poynting or work-energy theorem for the flow of energy in an electromagnetic field. Also give the physical interpretation. |

**5. Attempt any *one* part of the following: 7 x 1 = 7**

| | |
|---|---|
| a. | Discuss the phenomenon of interference of light due to parallel thin films and find the condition of maxima and minima. Show that the interference patterns of reflected and transmitted source of light are complementary. |
| b. | Discuss single slit Fraunhofer diffraction and show that the relative intensities of successive maximum are nearly 1: 1/22: 1/62: 1/121. |

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**6. Attempt any *one* part of the following: 7 x 1 = 7**

| | |
|---|---|
| a. | Explain acceptance angle and acceptance cone of optical fiber. Derive expression for them. |
| b. | Draw a neat diagram of He-Ne laser and describe its method of working? How is it superior to a Ruby laser? |

**7. Attempt any *one* part of the following: 7 x 1 = 7**

| | |
|---|---|
| a. | What is the difference between Type 1 and Type 2 semiconductors? Why type-2 superconductors are more important than type 1 superconductor? |
| b. | What is the purpose of Nanoscience? Discuss any one method (CVD/Sol-Gel) for the synthesis of nanomaterials. |