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B. TECH.
(SEM I) THEORY EXAMINATION 2022-23
ENGINEERING PHYSICS-I

Time: 3 Hours ***Total Marks: 70***

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

SECTION A

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

a) Is earth an inertial or non-inertial frame of reference? Explain briefly.
b) What do you understand by time dilation?
c) What is Bohr's quantization rule?
d) What is the Heisenberg uncertainty principle?
e) What do you understand by coherent sources?
f) Define spontaneous and stimulated emissions.
g) Differentiate between single and multi-mode optical fibers.

SECTION B

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

a) Show that $E^2 = m_o^2c^4 + p^2c^2$ where symbols have their usual meanings.
b) Calculate the de-Broglie wavelength of an α-particle accelerated through a potential difference of 200 volts.
c) Monochromatic light from a He-Ne laser (λ= 6328Å) is incident normally on a diffraction grating 6000 lines/cm. Find the angles at which one would observe the first and second-order maxima.
d) A quarter wave plate is meant for wavelength 5893 Å. Calculate the phase retardation that the plate will show for wavelength 4358Å.
e) The fraction change of refractive index between the core material and the cladding material of a fiber is 1%. If the refractive index of the core material is 1.46, calculate the numerical aperture and acceptance angle.

SECTION C

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

a) What is the variation of mass with velocity? Derive a suitable expression for it.
b) Derive the expression for the relativistic addition of velocities.

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

a) What are the assumptions of quantum mechanics? Derive the Wein's law with the help of Planck's radiation law.
b) What was the objective of conducting the Davisson-Germer experiment? Describe the

experiment and prove that electrons possess a wave nature.

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

a) Discuss the phenomenon of interference of light due to thin films and find the conditions of maxima and minima in reflected monochromatic light.
b) Obtain the expression for the intensity distribution due to Fraunhofer's diffraction at a single slit.

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

a) Describe the construction and working of a Nicol prism. Explain how it can be used as a polarizer and analyzer.
b) Draw a neat diagram of ruby laser. Describe its construction and working. What are the disadvantages of ruby laser?

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

a) What do you understand by an optical fiber? Derive the suitable expression for numerical aperture and acceptance angle.
b) Discuss the construction and reconstruction of an image on a hologram.