



PAPER ID-411095

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Subject Code: KAS201

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BTECH
(SEM II) THEORY EXAMINATION 2023-24
PHYSICS

TIME: 3 HRS**M.MARKS: 100**

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

SECTION A**1. Attempt all questions in brief.****2 x 10 = 20**

Q no.	Question	Marks	CO
a.	Write the postulates of special theory of relativity.	02	1
b.	What are the massless particles?	02	1
c.	What do you understand by displacement current?	02	2
d.	Define skin depth.	02	2
e.	State Wien's displacement law.	02	3
f.	Deduce an expression for the wavelength of matter waves.	02	3
g.	Why two independent sources cannot be coherent?	02	4
h.	What do you understand by the resolving power of an optical instrument?	02	4
i.	Describe the basic principle of an optical fibre.	02	5
j.	What are the main components of laser?	02	5

SECTION B**2. Attempt any three of the following:****3 x 10 = 30**

Q no.	Question	Marks	CO
a.	Deduce the relativistic velocity addition theorem. Show that it is consistent with Einstein's second postulate.	10	1
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 2m from lamp.	10	2
c.	What is de-Broglie hypothesis? Find the least energy of an electron moving in one dimension in an infinitely high potential box of width 1×10^{-10} m. (Mass of electron is 9.1×10^{-31} kg and $h = 6.63 \times 10^{-34}$ J-s)	10	3
d.	Explain the phenomenon of interference in thin films due to reflected light.	10	4
e.	What are Einstein's coefficients? Obtain a relation between them.	10	5

SECTION C**3. Attempt any one part of the following:****1 x 10 = 10**

Q no.	Question	Marks	CO
a.	Deduce necessary expression for time-dilation. Show that time-dilation is a real effect.	10	1
b.	Deduce Einstein's mass-energy relation $E = mc^2$. Give some evidence showing its validity.	10	1

4. Attempt any one part of the following:**1 x 10 = 10**

Q no.	Question	Marks	CO
a.	Derive electromagnetic wave equation in free space and prove that electromagnetic wave travels with speed of light in free space.	10	2
b.	State and deduce Poynting theorem for the flow of energy in an	10	2



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	Electromagnetic field. If the magnitude of H in a plane wave is 1 amp/meter, find the magnitude of E for plane wave in free space.		
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5. Attempt any one part of the following:**1 x 10 = 10**

Q no.	Question	Marks	CO
a.	Derive Schrodinger time-independent wave equation. Write the physical significance of a wave function also.	10	3
b.	What is Compton effect? Derive an expression for Compton shift.	10	3

6. Attempt any one part of the following:**1 x 10 = 10**

Q no.	Question	Marks	CO
a.	Derive an expression for the dark and the bright rings observed in Newton's ring experiment. How can this experiment be used to find out the wavelength of unknown light?	10	4
b.	Discuss Fraunhofer's single slit diffraction and show that the relative intensities of successive maximum are nearly 1:1/22 : 1/62 : 1/121:....	10	4

7. Attempt any one part of the following:**1 x 10 = 10**

Q no.	Question	Marks	CO
a.	Explain acceptance angle and acceptance cone of an optical fibre. What do you mean by numerical aperture? Derive expressions for them.	10	5
b.	Describe the principle and working of Ruby laser system with the help of neat diagram.	10	5