aktuonline.com

Printed Pages : 8

EAS101

(Following Paper ID and Roll No. to be filled in your Answer Book)

PAPER ID : 9602 Roll No.

B.Tech

(SEM I) ODD SEMESTER THEORY EXAMINATION 2009-10

ENGG.PHYSICS -I

Time : 2 Hours] *[Total Marks : 50*

Note : *(i) Attempt **all** questions.*

(ii) Marks of each question are shown against it.

SECTION - A

1 Attempt **all** parts. **10×1=10**

All parts carry **equal** marks.

(a) Decay of μ – meson supports :

(i) length contraction

(ii) time dilation

(iii) relativity of mass

(iv) relativity of energy.

(b) The kinetic energy of a particle is double of its rest mass energy. The dynamic mass of the particle in terms of its rest mass m_o is

(i) m_o

(ii) $2m_o$

(iii) $3m_o$

(iv) $1.5\ m_o$

(c) What happens, if monochromatic light used in Young's double slit experiment is replaced by white light ?

(i) The bright fringes become white

(ii) The central fringe is white and all other are coloured.

(iii) All fringes are coloured

(iv) No fringes are observed.

(d) In the diffraction pattern due to single slit of width d with incident light of wavelength λ with angle of diffraction θ, the condition for the first minimum is

(i) $\lambda \sin \theta = d$

(ii) $d \cos \theta = \lambda$

(iii) $d \sin \theta = \lambda$

(iv) $\lambda \cos \theta = d$

(e) If N be the total number of rulings on the grating, n the order of spectrum and λ, the wavelength of light used, then the resolving power of grating is given by

(i) Nn

(ii) $Nn\lambda$

(iii) $N\lambda/n$

(iv) N/n

(f) Polarised light can be produced by

(i) dispersion

(ii) scattering

(iii) interference

(iv) diffraction

(g) The property of rotating the plane of polarisation is known as

(i) optical activity

(ii) optical rotation

(iii) dichroism

(iv) specific rotation

(h) For stimulated emission to take place in an active medium, the condition is

(i) the production of population inversion in energy levels

(ii) sufficient number of atoms in ground state

(iii) coherent incident radiation on the medium

(iv) large volume of active medium

(i) High information carrying capability of optical fibers is measured with their

(i) low losses

(ii) high bandwidth

(iii) low costs

(iv) high efficiency

(j) Loss of light intensity in optical fiber is due to

(i) scattering

(ii) absorption

(iii) refraction

(iv) (i) and (ii).

SECTION - B

2 Attempt any **three** parts. All parts carry **equal** marks. **5×3=15**

(a) The mass of a moving electron is 11 times its rest mass. Find its kinetic energy and momentum.

(b) In an interference pattern, the amplitude of intensity variation is found to be 5% of the average intensity. Calculate the relative intensities of interfering sources.

(c) A light of wavelength 6000 $\mathring{A}$ falls normally on a straight slit of width 0.10 mm. Calculate the total angular width of the central maximum and also the linear width as observed on a screen placed 1 metre away.

(d) (i) Calculate the specific rotation if the plane of polarisation is turned through 26.4°, traversing 20 cm length of 20 per cent sugar solution.

(ii) Calculate the thickness of a halfwave plate of quartz for a wavelength of 5000 $\overset{o}{A}$. Here $\mu_e = 1.553$ and $\mu_o = 1.544$.

(e) The core and cladding refractive indices of a step index fiber are 1.60 and 1.44 respectively. An electromagnetic wave having a wavelength of 0.8 μ m is propogating through the fiber in guided mode through the core of the fiber. Find out maximum and minimum value of phase constant.

SECTION - C

Attempt **all** questions. All questions carry **equal** marks.

3 Attempt any **one** part of the following : **5×5=25**

(a) State the fundamental postulates of the special theory of relativity. Deduce the Lorentz transformation equations.

(b) Deduce the relativistic velocity addition theorem. Show that it is consistent with Einstein's second postulate.

4 Attempt any **one** part of the following :

(a) Explain the formation of interference fringes by means of biprism using monochromatic source of light. How wavelength is measured by biprism experiment ?

(b) What are Newton's rings ? Prove that in reflected light diameters of the bright rings are proportional to the square root of odd natural number.

5 Attempt any **one** part of the following :

(a) Give the theory of plane transmission grating and show how would you use it to determine the wavelength of light.

(b) Define the limit of resolution and resolving power. Derive an expression for the resolving power of a grating.

6 Attempt any **one** part of the following :

(a) Explain the phenomena of double refraction. Give the construction and theory of quarter wave plate and half wave plate.

(b) Discuss necessary condition to achieve laser action. Describe the construction and action of ruby laser.

7 Attempt any **one** part of the following :

(a) Explain single mode and multimode fiber. What are advantages of optical fiber over copper wire ?

(b) Discuss the phenomena of dispersion in optical fiber.

Physical Constants :

Planck's constant $h = 6.63 \times 10^{-34}$ J.s

Velocity of light $c = 3 \times 10^{8}$ m/s in free space

Rest mass of electron $m_e = 9.1 \times 10^{-31}$ kg.