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BAS-001

00655

B.TECH. IN AEROSPACE ENGINEERING (BTAE)

Term-End Examination

June, 2012

BAS-001 : APPLIED PHYSICS

Time : 3 hours *Maximum Marks : 70*

Note : *Question No. 1 is* ***Compulsory****. Attempt* ***any five*** *from the rest. Use of calculator is permitted.*

Physical constants (with symbols having usual meaning):-

$C=3\times10^{8}ms^{-1}$, $h=6.627\times10^{-34}$J. s, $e=1.6\times10^{-19}$C, $g=9.8ms^{-2}$ $m_e=9.11\times10^{-31}kg$, $m_p=1.67\times10^{-27}kg$.
1 amu = 931 Mev.

1. (a) Write down the equation of a simple harmonic motion with an amplitude of 10 cm, a period of 4s and an initial phase of 30°. **15x3=45**

(b) What is meant by 'beats' ?

(c) A wave frequency 100 vibrations per second has a wavelength of 320 cm. Find its velocity of propagation.

(d) Show that in case of a stationary wave, all particles vibrate in phase with one another in between two adjacent nodes but they are in opposite phase with the particles between the next pair of nodes.

(e) Two straight narrow slits 0.3 mm apart are illuminated by a monochromatic source of wavelength 5900°A. Fringes are obtained at a distance of 30 cm from the slit. Find the width of the fringes.

(f) What is meant by the statement that - 'A beam of light is plane polarised' ?

(g) An Electron beam is accelerated through a potential of 3.6kV. Estimate the wavelength of the beam.

(h) State the postulate of Niel's Bohr which explains the concept of stationary orbits.

(i) What is the expanded form of 'LASER' ?

(j) What is the difference between Fresnel and Fraunhofer diffraction ?

(k) State the postulates of the special theory of relativity.

(l) Write down the Galilean transformation Equations.

(m) How fast must an electron move in order that its mass is equal to twice its rest mass ?

(n) Express the energy equivalent of 1g of substance in joule.

(o) What are the values of L,S and J for the hydrogen atom ?

2. The equation of motion of a particle executing SHM is $x = A \sin(\omega t + \phi)$. If the values of initial displacement and velocity of the particle are respectively 3cm and 6cms^{-1} in the positive x-direction, find A and ϕ, given that, w = 2 rads^{-1}. 5

3. A wave is propagating along the negative direction of x-axis with vibrations along the y-axis. Its amplitude frequency and wave length are respectively 10 cm, 500Hz and 100 cm. Write down the equation of the wave. 5

4. Two linear SHMs of equal amplitudes and frequencies, w and 2w are impressed on a particle along the axes of x and y respectively. If the initial phase difference between them is $\pi/2$, find the resultant path followed by the particle. 5

5. A wedge - shaped film of air is illuminated by a monochromatic beam of light of wavelength, 4655 °A. The distance between two consecutive fringes is 0.12cm when viewed vertically. Calculate the wedge angle. 5

6. Calculate the wavelength of the emitted radiation when the hydrogen atom is excited from its ground state (n = 1) where its energy level is -21.8×10^{-19}J to the higher level (n = 2) of energy -5.4×10^{-19}J. and then falls back to the ground state. 5

7. State Brewster's law of polarisation by reflection, and show that the polarising angle for glass ($\mu = 1.5$) is nearly 57°. 5

8. The states of electrons in an atom are defined by the quantum numbers n, l, m, s. For a particular 'n' value, there are $(n-1)$ values of l. For a particular 'l' value, there are $(2l+1)$ values of m, each with two possible values of s. Show that the total number of states for a particular 'n' value is $2n^2$. 5

9. A metre stick is at rest in the laboratory frame. It lies in the $x-y$ plane, making an angle 30° with the x-axis. What angle does the metre stick make with the x'- axis. of a reference frame moving at $v = 0.8c$ in the x-direction ? 5