No. of Printed Pages : 5

BAS-001

B.Tech. AEROSPACE ENGINEERING (BTAE)

Term-End Examination

00293

December, 2016

BAS-001 : APPLIED PHYSICS

Time : 3 hours *Maximum Marks : 70*

Note : *Attempt **six** questions in all. Question no. **1** is **compulsory**. Use of scientific calculator is permitted.*

Physical Constants :

$c = 3 \times 10^8\ ms^{-1}$, $h = 6{\cdot}6 \times 10^{-34}$ J.s

$e = 1{\cdot}6 \times 10^{-19}$ C; $m_e = 9{\cdot}11 \times 10^{-31}$ kg;

$m_p = 1{\cdot}67 \times 10^{-27}$ kg; 1 amu = 931 MeV.

1. Attempt any ***five*** questions of the following : *5×4=20*

(a) A 44·5 N weight is suspended by a helical spring having a constant K = 890 N/m. Neglecting the mass of the spring, find the period τ for small amplitudes of vertical vibration.

(b) In what time after its motion begins will a particle oscillating according to the equation

$$y = 7 \sin 0{\cdot}5\,\pi t$$

move from the mean position to maximum displacement ?

(c) Light travelling in air strikes a glass plate at a glancing angle of 33°. While striking the glass plate, some part of the beam is reflected and some part is refracted. If the refracted and reflected beams make an angle 90°, with each other, then

(i) what is the refractive index of the glass ?

(ii) what is the critical angle of the glass ?

(d) The velocity of a particle increases by 1%. What is the percentage of its momentum, if $\frac{v}{c} = 0{\cdot}7$?

(e) Photoelectric threshold of silver is $\lambda = 3800$ Å. Ultraviolet light of $\lambda = 2600$ Å is incident on silver surface.

Calculate

(i) the value of work function in joules and in eV.

(ii) the maximum kinetic energy of the emitted photoelectrons.

(iii) the maximum velocity of the photoelectrons.

(f) The total energy of an electron in the first excited state of the hydrogen atom is about – 3·4 eV. What is the potential energy of the electron in this state ?

2. (a) A particle is vibrating in a SHM with an amplitude of 4 cm. At what displacement from the equilibrium position is its energy half potential and half kinetic ?

(b) The acceleration due to gravity on the surface of the moon is 1·7 ms^{-2}. What is the time period of a simple pendulum on the Moon, if its time period on the Earth is 3·5 seconds ? *5+5*

3. (a) A beam of light consisting of two wavelengths 6500 Å and 5200 Å is used to obtain interference fringes in a Young's double slit experiment. The distance between the slits is 2 mm and the distance between the plane of the slits and the screen is 120 cm.

(i) Find the distance of the third bright fringe on the screen from the central maximum for the wavelength 6500 Å.

(ii) What is the least distance from the central maximum, when the bright fringes due to both the wavelengths coincide ?

(b) A simple harmonic motion is represented by

$$x(t) = 10 \sin (20\,t + 0{\cdot}5).$$

Compute its amplitude, angular frequency, time period, and initial phase, if displacement is measured in metres and time in seconds. *5+5*

4. (a) Discuss in brief Helium-Neon laser and give some of its practical applications.

(b) Newton's rings are observed normally in reflected light of wavelength $5{\cdot}9 \times 10^{-5}$ cm. The diameter of the 10^{th} dark ring is 0·5 cm. Find the radius of the curvature of the lens and the thickness of the film. *5+5*

5. (a) A nucleus X, initially at rest, undergoes alpha-decay according to the equation

$$^{A}_{92}X \longrightarrow {}^{228}_{Z}Y + \alpha.$$

Find the value of A and Z in the above process.

(b) For a given medium, the polarizing angle is 60°. What will be the critical angle for this medium ? *5+5*

6. (a) Two coherent sources, whose intensity ratio is 81 : 1, produce interference fringes on a screen. Calculate the ratio of intensity of maximum and minimum in the fringe system.

(b) Determine the speed of sound waves in water and find the wavelength of a wave having frequency of 242 Hz.

Take $\beta_{water} = 2 \times 10^9$ Pa. 5+5

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

(b) Compute the shortest wavelength produced in an X-ray tube operated at 0·5 mV. 5+5