BRAINWARE UNIVERSITY

Term End Examination 2024-2025

Programme – B.Tech.(BT)-2024

Course Name – Applied Physics

Course Code - BBS00004

(Semester I)

Full Marks : 60

Time : 2:30 Hours

[The figure in the margin indicates full marks. Candidates are required to give their answers in their own words as far as practicable.]

Group-A

(Multiple Choice Type Question)   1 x 15=15

1. *Choose the correct alternative from the following :*

(i) Displacement is a _____.

    a) scalar quantity   b) vector quantity
    c) derived quantity   d) none of these

(ii) A force of 100 N is applied on a body of mass 50 kg. Calculate the acceleration of the body.

    a) 5000 ms^{-2} b) 150 ms^{-2}

    c) 50 ms^{-2} d) 2 ms^{-2}

(iii) A gun recoiling when fired is an example of _____.

    a) conservation of momentum   b) conservation of angular momentum
    c) conservation of energy   d) none of these

(iv) Potential energy and kinetic energy are types of _____ .

    a) electrical energy   b) magnetic energy
    c) thermal energy   d) mechanical energy

(v) What is the color of the output in the ruby laser?

    a) violet   b) blue
    c) red   d) green

(vi) In a fiber optic cable refractive index of the core is always _____ the refractive index of the cladding.

    a) less than   b) equal to
    c) greater than   d) none of these

(vii) Longitudinal strain is possible in the case of _____.

    a) gases   b) liquid

c) only solids

d) only gases and liquid

(viii) The rate of doing work is called _____.

    a) force

                            b) acceleration

    c) power

                            d) displacement

(ix) Rise of water in capillary tube is due to _____.

    a) viscosity

                            b) osmosis

    c) diffusion

                            d) surface tension

(x) The viscosity as a property of fluids indicates _____.

    a) variation of static pressure with height in liquid body

                            b) how well the liquid adheres to metal surface

    c) it is resistance to flow over the surface

                            d) variation of thermal conductivity with temperature

(xi) What is the phase difference between displacement and velocity for a particle executing simple harmonic motion?

    a) 0

                            b) $\pi/2$

    c) $-3\pi/4$

                            d) π

(xii) The nature of the wave front due to a point source of light is _____.

    a) spherical

                            b) plane

    c) cylindrical

                            d) none of these

(xiii) The center of the Newton's rings for the reflected system of a monochromatic source of light is _____.

    a) dark

                            b) bright

    c) partially dark

                            d) none of these

(xiv) SI unit of the power of a lens is _____.

    a) dioptre

                            b) cm

    c) metre

                            d) watt

(xv) With increasing forward bias to a p-n junction, the width of depletion layer _____.

    a) decreases

                            b) increases

    c) remains the same

                            d) intially increases then decreases

Group-B
(Short Answer Type Questions)

$3 \times 5 = 15$

2. Calculate the numerical aperture, the acceptance angle, and the critical angle of an optical fiber having refractive indices of 1.5 (core) and 1.45 (cladding). Consider the surrounding medium as air. (3)

3. Define surface tension and coefficient of viscosity. What are their S.I. units? (3)

4. A concave lens of focal length 20 cm produces an image half of the size of the real object. Find the distance of the real object. (3)

5. Determine the relation between linear velocity (v) and angular velocity (ω) of a moving particle. (3)

6. An object of mass 0.5 kg moving with a speed of 0.5 m/s on a horizontal smooth surface collides with a nearly weightless spring of force constant, k = 50 N/m. What is the maximum compression of the spring? (3)

OR

Deduce the expressions for the reaction forces on a man inside a lift while moving upward and   (3)
downward with a constant acceleration.

Group-C
(Long Answer Type Questions)   5 x 6=30

7. Show that the change in kinetic energy of a particle is equal to the work done on it by   (5)
    the net force.

8. Show that for a simple harmonic oscillator, total energy is conserved.   (5)

9. A constant retarding force of 50 N is applied to a body of mass 20 kg moving initially   (5)
    with a speed of 15 ms^{-1}. How long does the body take to stop?

10. Water rises upto height 1mm in a capillary tube of certain diameter. This capillary tube (5)
    is replaced by similar tube of half the diameter. What will be the height of water level
    for the second capillary tube?

11. Analyze the effect of increasing the slit width, increasing the slit separation and   (5)
    increasing the wavelength of light in a double-slit diffraction pattern.

12. A light of wavelength 3000 Å falls on a metal surface of work-function 2.28 eV.   (5)
    Calculate the maximum speed of the ejected photoelectrons.

OR

Deduce the relation between the various Einstein's coefficients of absorption and   (5)
emission of radiation.

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