DIT UNIVERSITY DEHRADUN
B.TECH (CSE)   MID TERM EXAMINATION, ODD SEM 2022-23 (SEM I)
Roll No.

Subject Name: Engineering Physics

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

Note: All questions are compulsory. No student is allowed to leave the examination hall before the completion of the exam.

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Q.1) **Attempt all Parts :**
(a) A particle executes simple harmonic motion given by the equation
$$x = 10 \, Sin\left(10t - \frac{\pi}{6}\right)$$
where x is measured in metres, time in seconds and phase angle in radians. Calculate (i) frequency, (ii) time period, (iii) maximum displacement and (iv) velocity at time t = 1 sec.
(b) Write down the differential equation of forced oscillations and discuss the forces that comes in existence in case of forced oscillations.
(c) Starting from the displacement of a simple harmonic motion, derive the expression for kinetic energy and potential energy.
(d) Using the expression of displacement of a plane progressive wave, obtain the expression for wave equation.
[4 x 2.5= 10]

Q.2) **Attempt all Parts :**
(a) Write down the equation for a wave travelling along the negative Z direction and having an amplitude 0.01 m, frequency 550 Hz and speed 330 m/sec. How would the equation change if the wave with the same parameters was travelling along the positive Z direction? Justify your answer.
(b) What are coherent sources? Explain with the help of examples the broad methods to produce coherent sources.
(c) A light of wavelength 6000 Å 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 m away.
(d) Differentiate between longitudinal and transverse wave. Give examples of each.
[4 x 2.5= 10]

Q.3) **Attempt any Two Parts :**
(a) What is damping? Discuss all the three cases of damped oscillations.
(b) Derive the expression for velocity of a transverse wave along a string. Further, deduce the frequency of the fundamental note.
(c) In Newton's Ring arrangement with a film observed with light of wavelength 6000 A°, the difference of square of diameters of successive rings are 0.125 cm^2. What will happen to this quantity if (i) wavelength of light is changed to 4500 A°, (ii) liquid of refractive index 1.33 is introduce between lens and plate, (iii) the radius of curvature of convex surface of the plano-convex lens is doubled.
[2 x 5= 10]

Q.4) **Attempt any Two Parts :**
(a) What are Newton's rings? Show that the diameter of dark rings in reflected light is proportional to the square root of natural numbers.
(b) Obtain the maxima and minima conditions of reflected case for interference in plane parallel thin films.
(c) For a particle vibrating simple harmonically the displacement is 8 cm at the instant the velocity is 6 cm/sec and the displacement is 6 cm at the instant the velocity is 8 cm/sec. Calculate (i) amplitude, (ii) frequency and (iii) time period.
[2 x 5= 10]

Q.5) **Attempt any Two Parts :**
(a) Draw a ray diagram for single slit Fraunhofer diffraction and derive the expression of intensity for it.
(b) Obtain the differential equation for simple harmonic motion and solve it to obtain the expression for displacement, velocity and acceleration.
(c) A double slit of separation 1.5 mm is illuminated by white light (between 4000 – 8000 Å). On a screen 120 cm away colored interference pattern is formed. If a pinhole is made on this screen at a distance of 3.0 mm from the central white fringe, what wavelengths will be absent in the transmitted light?
[2 x 5= 10]

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