Registration no: | | | | | | | | | | |

Total Number of Pages: 02

B.TECH
BS1102

1st Semester Back Examination 2015-16
PHYSICS- I
BRANCH(S): ALL
Time: 3 Hours
Max Marks: 70
Q.CODE: T828

Answer Question No.1 which is compulsory and any five from the rest.
The figures in the right hand margin indicate marks.

Q1 Answer the following questions: **(2 x 10)**

a) The time period of simple harmonic oscillator is 4 s. It is subjected to a damping force proportional to its speed with damping coefficient $0.1 sec^{-1}$. Find the time period and logarithmic decrement of damped oscillation.

b) What do you mean by sharpness of resonance and sharp resonance in forced harmonic oscillation?

c) Distinguish between the interference produced due to division of amplitude and division of wave front .

d) Define absent spectra ?

e) How do you separate a unpolarised light from circularly polarized light ?

f) If $\nabla^2\phi = 0$ then prove that grad ϕ is solenoidal.

g) What is the physical significance of curl of a vector field?

h) Distinguish between conduction current and displacement current.

i) What is black body radiation?

j) Write down the time independent Schrodinger equation for a free particle of mass m.

Q2 a) Set up the differential equation of motion for the oscillator subjected to a damping force proportional to its velocity & solve for its displacement. Graphically show the displacement-time curves for under-damped, over-damped and critically damped motions. **(7)**

b) The maximum amplitude of forced damped oscillator is 2.5 cm . What will be the maximum amplitude if damping constant and magnitude of driving force are doubled ? **(3)**

Q3 a) In Fraunhofer diffraction due to single slit, obtain the conditions for principal maximum, secondary maxima and minima. Show the distribution of intensity in this diffraction pattern. **(6)**

b) In Newton's rings experiment in the laboratory, sources of light having two wavelengths $6000A^0$ & $4500A^0$ are used. It is found that n^{th} dark ring due to $6000A^0$ coincides with the $(n+1)^{th}$ dark ring due to $4500A^0$. Calculate the radius of n^{th} dark ring due to $6000A^0$ if radius of curvature of the lens is 120cm. **(4)**

Q4 a) Explain Brewster's law. A light is incident on a partially transparent medium at polarizing angle. Show that the reflected and transmitted rays are mutually perpendicular to each other. (5)

b) Explain how the wavelength of monochromatic light is determined using Newton's ring arrangement. (5)

Q5 a) State Ampere's circuital law and obtain the differential form. (4)

b) A parallel plate capacitor having circular plates of radius 5.5cm is being charged. Calculate the displacement current if the rate of change of electric field between the plates is 1.5×10^{10} V/m.s. (3)

c) State Gauss divergence theorem and using the theorem proof the volume of the sphere is $\frac{4}{3}\pi r^3$. (3)

Q6 a) Derive telegraph equations and reduce the equation in a charge free non conducting medium. (6)

b) The maximum value of electric field in an electromagnetic wave, in vacuum, is 800V/m. Find the maximum value of magnetic intensity and the average value of pointing vector. (4)

Q7 a) Explain Compton scattering then get the expression for Compton shift. (6)

b) Using Heisenberg's uncertainty principle, show the non-existence of electron inside the nucleus. (4)

Q8 a) Set up the Schrodinger's wave equation for particles of mass m each crossing a potential step (Consider the energy 'E' of the particle > V_0), (6)
$V(x) = 0$ for $x < 0$
$= V_0$ for $x \geq 0$ from left. Obtain the solution. Indicate the reflected and transmitted part in it.

b) A particle is confined to move along a line of length 'L' cm. Find the expectation value of the particle's position $\langle x \rangle$, if its normalized wave function is given by (4)

$$\psi = \sqrt{\frac{2}{L}} \sin \frac{n\pi x}{L}.$$