Registration No :

Total Number of Pages : 02

B.Tech
RPH1A001

1st Semester Regular/Back Examination 2019-20
PHYSICS
BRANCH : AEIE, AERO, AG, AUTO, BIOMED, BIOTECH, CHEM, CIVIL, CSE, CST, ECE, EEE,
EIE, ELECTRICAL, ELECTRICAL & C.E, ELECTRONICS & C.E, ENV, ETC, FASHION, FAT,
IEE, IT, ITE, MANUFAC, MANUTECH, MARINE, MECH, METTA, METTAMIN, MINERAL,
MINING, MME, PE, PLASTIC, PT, TEXTILE
Max Marks : 100
Time : 3 Hours
Q.CODE : HRB634
Answer Question No.1 (Part-1) which is compulsory, any EIGHT from Part-II and any TWO
from Part-III.
The figures in the right hand margin indicate marks.

Part-I

Q1   **Only Short Answer Type Questions (Answer All-10)**   (2 x 10)

a)   Two simple pendulum of mass 'm' and length 'l' each, are coupled by a spring of force
constant 'k'. Write the expression for frequency of normal modes of vibration of the
coupled system.

b)   A harmonic wave is represented by the wave function $\psi(x, t) = (3cm) \sin (0.6x - 2.2t + \pi)$. Determine the amplitude, frequency, wave length and phase velocity of the wave.

c)   What is the condition for Resonance?

d)   Write the Difference between interference and diffraction fringes.

e)   A silica glass optical fibre has a core refractive index of 1.500 and the cladding
refractive index of 1.450. Calculate critical angle for core-cladding interface and
numerical aperture (NA) of the fibre.

f)   What is population inversion?

g)   What is the difference between Crystalline and Amorphous Solid?

h)   State Ampere'scircuital law in integral and in differential form.

i)   Compute de Broglie wave length of a bike having mass 100kg and moving with speed
100 km/hour.

j)   Write down time independent Schrodinger's equation for a free particle of mass 'm'
moving in Y-axis.

Part-II

Q2   **Only Focused-Short Answer Type Questions- (Answer Any Eight out of Twelve)**   (6 x 8)

a)   Developed the equation for forced oscillation and discuss about frequency, phase,
amplitude, velocity of the forced oscillation.

b)   Show that the radii of Fresnel half period zones are proportional to the square root of
nature numbers.

c)   Write down the differences between spontaneous emission and stimulated emission of
radiation.

d)   Give differences between standing wave and progressive wave. Calculate the fringe
width of interference a pattern produced in Young's double slit experiment with two slits
10^{-3}m apart on a screen 1 m away. Wave length of light is 5893×10^{-8} cm.

e)   State the difference between mono mode and multi-modefibres. What is acceptance
angle?

f)   State Maxwell's equations in differential and integral forms both in the presence and
absence of free charges and currents.

g)   Define divergence of a vector field. Write its physical significances. Find out the
divergence and curl of the given vector field $\vec{v} = (xyz) \hat{i} + (3x^2y) \hat{j} + (xz^2 - y^2z)\hat{k}$ at (2,-1, 1).

h) Write the difference between Poynting vector and Poynting theorem.
i) What do you mean by miller indices? Write down the procedure to find out the miller indices. A certain orthorhombic crystal has axial units a: b: c of 0.424:1: 0.367. Find the miller indices of the crystal whose intercepts are 0.424:∞:0.123.
j) What do you mean by Fermi energy? Write down the differences between Fermions and Bosons.
k) What is Bragg's law? The minimum order of Bragg's reflection occurs at angle of 20^0 in the plane [212]. Find the wave length of X- rays if lattice constant is $3.615 A^0$.
l) What do you mean by Compton shift? In Compton effect, the incident photon has wavelength 2×10^{-10}m and angle of scattering $\theta = 90^0$. Calculate the wave length of the scattered photon.

Part-III
Only Long Answer Type Questions (Answer Any Two out of Four)

Q3 a) What is a Bi-prism? How can the wavelength of monochromatic light be measured with the help of a Fresnel's Bi-prism, explain it in details. (6)
b) Differentiate between Fresnel and Fraunhoffer diffraction. (4)
c) Write down the differences and similarities between Zone plate and similarities of convex lens. (6)

Q4 a) Describe in detail, the components, principle of operation and working of ruby laser. State the limitation of ruby laser. (10)
b) Write about the basic characteristics of optical fiber and its application in communication system. (6)

Q5 a) Derive wave equation for damped vibration and calculate the logarithmic decrement. (6)
b) What are the difference between conduction current and displacement current? The electric field inside the plate capacitor of area $2cm^2$ changes at the rate of 1.2×10^8V/m.s, Calculate the displacement current. (6)
c) State Gauss divergence theorem. Evaluate the surface integral for the vector function $\vec{f} = \hat{i}4xz - \hat{j}y^2 + \hat{k}yz$ over the surface S, where S is the surface of the unit cube bounded by x=0, x=1, y=0, y=1, z=0, z=1 planes, using Gauss divergence theorem. (4)

Q6 a) What do you mean by photoelectric effect? Find out Planck's constant from Einstein's photoelectric equation. (6)
b) Define Heisenberg's uncertainty principle. Prove that the ground state energy of the simple harmonic oscillator is non-zero (6)
c) A particle is confined to move along a line of length "L" cm. Find the expectation value of the particles position <x>, If the normalized wave function is $\psi = \sqrt{\frac{2}{l}}[\sin\left(\frac{n\pi x}{l}\right)]$. (4)