Registration No: | | | | | | | | | | |

Total Number of Pages: 02

B.TECH
15BS1102

1st Semester Regular Examination 2015-16
PHYSICS - I
BRANCH: ALL
Time: 3 Hours
Max Marks: 100
Q.CODE: T827

Answer Part-A which is compulsory and any four from Part-B.
The figures in the right hand margin indicate marks.

Part – A (Answer all the questions)

Q1 Select the correct answer: **(2 x 10)**

a) The maximum velocity of a particle executing SHM represented by $x=A\sin\omega t$ at time t occurs at (i)x=0; (ii)x=A; (iii)x=-A; (iv)x=A/2

b) Example of weakly damped harmonic oscillator is
(i)Dead beat galvanometer; (ii)Tangent Galvanometer; (iii)Balistic galvanometer;
(iv)Discharge of a charged capacitor through a resistance

c) In a newtons ring experiment the diameter of the 5th and 15th dark rings are .336cm and .590cm respectively. If the radius of curvature of the curved surface of the plano-convex lens used be 100cm the wavelength of light used is: (i)5879×10^{-8}cm; (ii)4657×10^{-7}cm; (iii)6547×10^{-9}cm; (iv)7683×10^{-8}cm

d) In a single slit diffraction the ratio of intensity of the first secondary maximum to the central maximum is: (i)1/28; (ii)1/22; (iii)1/121; (iv)1/5

e) If on rotating the analyzer the emergent light does not change in intensity ,then it is: (i)either plane polarized or partially polarized; (ii)either unpolarised or circularly polarized; (iii)either partially polarized or elliptically polarized; (iv)only circularly polarized.

f) The Gauss's divergence theorem connects
(i)line integral to volume integral; (ii)surface integral to volume integral;
(iii)volume integral to line integral; (iv)line integral to surface integral

g) Penetration depth is defined as the
(i) depth up to which electric field intensity decreses to 37% of its value on surface
(ii)depth up to which magnetic field intensity decreses to 37% of its value on surface
(iii)depth up to which electromagnetic power decreses to 37% of its value on surface
(iv)depth up to which electromagnetic power reduces to 63% of its value on surface

h) Rayleigh-Jeans law is correct only in the
(i)low wavelength region of black bodt radiation spectrum; (ii)High wavelength region; (iii)entire wavelength region; (iv)None of these

i) At stopping potential the photo current becomes
(i)infinite; (ii)constant; (iii)zero; (iv)none of these

j) De Broglie wavelength associated with a 15kV electron is
(i)10Å; (ii)0.01Å; (iii)1Å; (iv)100Å

Q2 Answer the following questions: ***Short answer type*** **(2 x 10)**

a) What properties of the medium are essential for the production of SHM?

b) What are damped vibrations? Does the principle of conservation of energy hold good in case of damped vibration? Explain.

c) What happens if instead of monochromatic light white light is used in Newton's ring experiment.

d) Give the difference between double slit diffraction pattern and double slit interference pattern.

e) Define positive and negative crystal in connection with double refraction of light.

f) Write the Maxwell equations in integral form.

g) What is Compton scattering?

h) The position of an electron is located within 10^{-10}m.Find the uncertainty in its momentum.

i) The minimum energy of a particle trapped in a one dimentional potential well is 4×10^{-18}J.What are the next three energy?

j) What are eigen function and eigen values?

Part – B (Answer any four questions)

Q3 a) The differential equation of a forced vibration.Starting from the solution of the equation for forced vibration explain the phenomenon of amplitude and velocity resonance. What is sharpness of resonance? **(10)**

b) The amplitude of a forced oscillator at frequencies ω_1=400/s and ω_2=600/s are equal. What is the value of resonant frequency? **(5)**

Q4 a) Give the theory of Newton's ring and how from their study the wavelength of monochromatic light can be determined?Explain why the central fringe is dark?How can it be made white? **(10)**

b) What is a biprism? How can the wavelength of monochromatic light be measured with the help of a fresnel's bi-prism? Give the theory of the method and the arrangement of the apparatus. **(5)**

Q5 a) Explain the action of a diffraction grating and describe how to use it to measure the wavelength of light. What is meant by resolving power of a grating? **(10)**

b) Light of wavelength 5000Å and 5200Åfalls normally on a plain transmission grating having 5000lines/cm.If a lens of 200 cm focal length is used to form spectrum on a screen find the distance between two lines in first order. **(5)**

Q6 a) Explain the phenomenon of double refraction in a calcite crystal. Give the construction and working of half wave plate and quarter wave plate. **(10)**

b) Two Nicol prisms are crossed to each other. Now one of them is rotated through 60^0.What percentage of incident unpolarised light will pass through the system. **(5)**

Q7 a) Define Poynting vector. Explain its physical significance. Deduce Poynting theorem for the flow of energy in an electromagnetic field. **(10)**

b) Derive electromagnetic wave equations in conducting medium and discuss its solutions. **(5)**

Q8 a) State and explain Heisenberg uncertainty principle. Illustrate with an example. Use uncertainty principle to show that electron cannot stay in the nucleus. **(10)**

b) Prove that electromagnetic waves are transverse in nature. **(5)**

Q9 a) Write the Schrodingers equation for a in an infinitely deep one dimensional potential well and find expressions for the wave function and energy of the particle.Show that the expectation value of the momentum of a particle confined to a one dimensional potential well is zero. **(10)**

b) What is tunnel effect? Write down the Schrodingers equation for a particle approaching a potential barrier of finite height and width. Show that there is a finite probability of the particle to tunnel through the barrier. **(5)**