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

Total Number of Pages : 02

B.Tech
PAP2A101

2nd Semester Back Examination 2018-19
APPLIED PHYSICS
BRANCH : AEIE, AERO, AUTO, BIOTECH, CIVIL, CSE, ECE, EEE, EIE, ELECTRICAL, ETC, IT, MECH, MINERAL
Max Marks : 100
Time : 3 Hours
Q.CODE : F523

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) Define time period, frequency and amplitude of an oscillator.
b) What difference between interference fringes and diffraction fringes?
c) What are different types of diffraction?
d) State and explain D' Alembert's principle.
e) What are Brillouins Zones? How are these constructed?
f) If a scalar field f satisfies the relation $\nabla^2 f = 0$, show that $\vec{\nabla} f$ is both solenoidal and irrotational.
g) Write the Maxwell's electromagnetic equation in differential form, which follows from the concept of displacement current.
h) State Heisenberg's Uncertainty Principle?
i) What is photoelectric work function?
j) X-Rays of wave length 1Å undergoes Compton scattering through 90^0. Find the Compton Shift.

Part- II

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

a) What are generalised co-ordinates? Explain how the principle of virtual work and D'Alembert's principle help us in treating constrained motion.
b) The Lagrangian of a particle of mass m, exhibiting oscillation is given by $L = \frac{1}{2}m\dot{q}^2 - \frac{1}{2}kq^2$, with initial conditions that at $t = 0$, $q = q_0$ and $p = p_0$. Obtain equation of motion and its solution.
c) Derive the total energy of the driven oscillator subjected to an external periodic force.
d) Define coupled Oscillation. Formulate the differential equation for the coupled Oscillation and establish the normal mode equations.
e) What is a zone plate? Show that it has multiple focal length.
f) Discuss the Fraunhofer diffraction due to a single slit. Find condition of Principal maximum and minimum.
g) Prove that the FCC lattice is the reciprocal of the BCC lattice and vice versa.
h) Describe how the band theory of solids explains conductors, insulators and semiconductors with diagram.
i) Explain the working mechanism of a He – Ne laser. What are the advantages and limitations of a He-Ne laser?
j) State and explain Gauss divergence theorem. Explain its significance in electrostatics.
k) What is the meaning of wave function in quantum Mechanics? Mention its characteristics.
l) Show that an electron cannot be the constituent of an atomic nucleus using Heisenberg's uncertainty principle.

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Part-III

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

Q3 Set up the differential equation for a damped harmonic oscillator subjected to damping force proportional to velocity. Discuss the solution, Logarithmic Decrement and Quality factorfor under damping condition. **(16)**

Q4 What are Fresnel's half period zones? Explain all factors on which the intensity at a point due to Fresnel's half period zones depend? **(16)**

Q5 State the Maxwell's electromagnetic equations in a medium in presence of charges and currents. Obtain the differential form. Write down the physical significance of Maxwell's equation. **(16)**

Q6 What is black body radiation? Mention its general characteristics. State Planck's formula for black body radiation. Show that the Rayleigh-jeans formula and Wien's formula are limiting cases of this formula. **(16)**