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

Total Number of Pages : 02 **B.Tech**
PAP1A102

1st Semester Back Examination 2019-20
APPLIED PHYSICS
BRANCH : AEIE, AERO, AUTO, BIOMED, BIOTECH, CHEM, CIVIL, CSE, ECE, EEE, EIE, ELECTRICAL, ENV, ETC, FAT, IEE, IT, MANUFAC, MANUTECH, MECH, METTA, MINERAL, MINING, MME, PE, PLASTIC, PT, TEXTILE
Max Marks : 100
Time : 3 Hours
Q.CODE : HB632

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) State D. Alembert's principle.
b) Graphically show the displacement-time curves for under-damped, over-damped and critically damped motion.
c) What do you mean by diffraction? Write down the type of diffraction.
d) Distinguish between conduction current and displacement current.
e) Write down Maxwell's electromagnetic equations in integral form.
f) What do you mean by population inversion?
g) On which principle does fibre optics work?
h) Write down SI unit of Poynting vector.
i) What is pair production? Write down one example.
j) At ɵ = __ , the Compton shift in maximum.

Part-II

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

a) What are generalized co-ordinates? Obtain equation of motion for given Lagrangian $L = \frac{mv^2}{2} - \frac{kx^2}{2}$, where v=dx/dt is the velocity of the particle.
b) Two pendulums of mass 50g each are suspended by massless rigid rods of length 0.98m. The two masses are coupled by a massless spring of force constant k=150 dyne/cm. Determine the normal mode frequencies of the coupled oscillator.
c) Write down the similarities and differences between a zone plane and convex lens.
d) Write about Michelson interferometer and calculate the wave length of monochromatic light using it.
e) Prove that the curl of gradient of a scalar field is zero and divergence of curl of a vector field is zero.
f) Write down the difference between Basons and Fermions.
g) Prove thatFCC lattice is the reciprocal of BCC lattice and vice-versa.
h) Write down the difference between spontaneous emission and stimulated emission of radiation.
i) Derive steady state equation for electric and magnetic field.
j) Write down the advantages of fibre optics cables over conventional cables. Define numerical aperture.
k) The wave function of a system is given by $Y(x) = \frac{1}{\sqrt{2}}\Phi_1(x) + \frac{1}{\sqrt{3}}\Phi_2(x) + \frac{1}{\sqrt{6}}\Phi_3(x)$. What is the probability that the system is to be found in the state Φ_3 (x).
l) Calculates the expectation value of x-component of momentum of a free particle in a box of length l, $\psi = \sqrt{\frac{2}{l}}[\sin\left(\frac{n\pi x}{l}\right)]$

Part-III

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

Q3 **a)** Set up the differential equation of motion for forced oscillation and derive the condition of resonance. **(6)**

b) Prove with necessary diagram that the diameters of the dark rings, in Newton's ring experiment, as obtained by reflected light are proportional to square root of natural numbers. **(6)**

c) In a Newton's ring system, the diameters of the 5^{th} and 10^{th} dark rings are 0.122cm and 0.150cm respectively. What is the diameter of the 15^{th} ring? **(4)**

Q4 **a)** What do you mean by miller indices? Write down the procedure to find out the miller indices of the plane (5, 7,9). **(6)**

b) Write down the difference between step index fibre and graded index fibre **(4)**

c) On the basis of band theory, distinguish between conductors, semiconductors and insulators. **(6)**

Q5 **a)** Write in detail construction, principle and working of He-Ne laser. What are the advantages of He-Ne laser over ruby laser **(12)**

b) State Gauss divergence theorem. Using the theorem prove that the volume of the sphere is $4/3\ \pi r^3$. **(4)**

Q6 **a)** What is Photoelectric effect? Explain Einstein's explanation about it. **(4)**

b) Using Heisenberg's uncertainty principle prove that the energy of the one dimensional harmonic oscillator cannot be zero. **(6)**

c) Derive time independent and time dependent Schrodinger equation **(6)**