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

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B.Tech
PAP2A101

2nd Semester Regular Examination 2016-17
APPLIED PHYSICS
BRANCH(S): ALL
Time: 3 Hours
Max Marks: 100
Q.CODE: Z463

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 **Answer the following questions: multiple type or dash fill up type** **(2 x 10)**

a) The principle of virtual work tells about_____.
b) The principle of action defines_____.
c) Resonance is _____.
d) If there will be constructive interference then _____ should be the path difference between two coherent waves.
e) The spin of Fermions are_____.
f) Bragg's law is _____.
g) The physical significance of Gauss law of magneto statics is _____.
h) Forbidden bands are_____.
i) Quantum mechanical operators of momentum is _____and for kinetic energy is_____.
j) Pair production is an example of _____.

Q2 **Answer the following questions: *Short answer type*** **(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) Two straight and narrow parallel slits 1mm apart are illuminated by monochromatic light. Fringes are formed on the screen held at a distance of 100cm from the slits are 0.50mm apart. What is the wavelength of light?
c) The lattice constant of a crystalline material with cubic lattice is found to be $4.35A^0$. calculate the spacing of (110) planes.
d) $\vec{B} = 2x^2\hat{\imath} + 3yz\hat{\jmath} + a\hat{k}$. Find out 'a', if $\vec{B}$ is irotational.
e) State Stokes theorem and write the mathematical expression for it.
f) State modified Ampere's circuital law.
g) Write the Eigen value equation. Define the terms used.
h) How is the wave function related to probability.
i) A particle has wave function $\Psi = \frac{1}{\sqrt{2}}\Psi_1 + \frac{1}{\sqrt{3}}\Psi_3 + \frac{1}{\sqrt{8}}\Psi_3$. Find the expectation value of energy for the particle in the given state.
j) Draw the characteric curve of Black body.

Part – B (Answer any four questions)

Q3 **a)** Write the expression for D 'Alembert's principle and Lagragian equation of motion for conservative system. Define each term. **(5)**

b) Derive the expression for damped oscillation and discuss (i) Under damped (ii) Critically damped and (iii) Over damped oscillations. **(6)**

c) A harmonic wave is represented by the wave function $\Psi(x,t) = (3cm)\sin(0.6x - 2.2t + \pi)$, where x is in cm and t is in s. Determine the amplitude, frequency, wavelength, phase velocity and phase constant of the wave. **(4)**

Q4 **a)** Write about Michelson Interferometer and calculate the wavelength of monochromatic light using it. **(7)**

b) Differentiate between Zone plate and convex lens. **(4)**

c) Differentiate between Fresnel and Fraunhofer diffraction. **(4)**

Q5 **a)** What do you mean by miller indices? Write down the procedure to find out the miller indices of the planes(5,7,9). **(5)**

b) On the basis of band theory, distinguish between conductors, semiconductors and insulators. **(5)**

c) Write about the basic characteristics of optical fiber and its application in communication system. **(5)**

Q6 **a)** Write down the differences between Bosons and Fermions. **(5)**

b) What is Laser ? Write its basic principle and application. **(5)**

c) Explain the construction and working of He-Ne laser. **(5)**

Q7 **a)** Define divergence of a vector field. write its physical significance. Find out the divergence and curl of the given vector field $\vec{V} = (xyz)\hat{\imath} + (3x^2y)\hat{\jmath} + (xz^2 - y^2z)\hat{k}$ at (2, -1, 1) **(6)**

b) Derive steady state equation for electric and magnetic field. **(6)**

c) Differentiate between conduction current and displacement current. **(3)**

Q8 **a)** A parallel plate capacitor having circular plates of radius 6.5cm is being charged. Calculate the displacement current if the rate of change of electric field between the plates is $3.6X10^{10}$ V/m.s. **(4)**

b) Write down the differential and integral forms of Maxwell's equations. **(4)**

c) State and explain Heisenberg's uncertainty principle. using the uncertainty principle, prove that electron can not exist inside the nucleus. **(7)**

Q9 **a)** Derive Schrodinger time dependent and time independent equation. **(5)**

b) write down the expression for Compton shift. In Compton scattering by electrons, the incident photons have wavelength 0.5nm. calculate the wavelength of scattered radiation if they are viewed at an angle 45^0 to the direction of incidence. **(5)**

c) Find out Planck's constant from Einstein's photoelectric equation. **(5)**