**2<sup>nd</sup> Semester Back Examination 2018-19**
**PHYSICS**
**BRANCH : AUTO, CHEM, CIVIL, CSE, ECE, EEE,**
**ELECTRICAL, ETC, FAT, IEE, IT, MECH, MME, PE**
**Max Marks : 100**
**Time: 3 Hours**
**Q.CODE : F529**
**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)**   What is oscillatory motion? Mention the characteristics of this type of motion.
   **b)**   What is interference? Can longitudinal waves exhibits interference?
   **c)**   What is the condition for the destructive interference in terms of phase difference between the two interfering waves?
   **d)**   Distinguish between a zone plate and a convex lens.
   **e)**   What is polarization of light?
   **f)**   What is double refraction? Name two crystals which exhibit double refraction.
   **g)**   Define gradient of a scalar field. Is it a vector or a scalar?
   **h)**   Evaluate curl A, where A = ixy + jyz + kxz.
   **i)**   What is Compton effect? Write expression for Compton shift.
   **j)**   State de-Broglie hypothesis for matter wave.

**Part- II**

**Q2**     **Only Focused-Short Answer Type Questions- (Answer Any Eight out of Twelve)**     **(6 x 8)**
   **a)**   Setup the differential equation for a one-dimensional simple harmonic oscillator. Write the general solution. Show that the total energy of the oscillator is constant in time.
   **b)**   What is wave motion? Distinguish between wave velocity and group velocity.
   **c)**   Show analytically that circular fringes are produced in Young's two source arrangement if the screen is placed longitudinally with respect to the two sources.
   **d)**   Describe the construction of a biprism. Describe the experimental arrangement for determination of wavelength of monochromatic light using biprism.
   **e)**   Show that the Fresnel's half period zones have the same area.
   **f)**   What is zone plate? Show that is has multiple focii.
   **g)**   What is half wave plate?  Why is it so named? Can it be used as half plate for all colors of light?Explain.
   **h)**   Give the construction of Nicol prism. Explain how it produces polarized light.
   **i)**   Distinguish between conduction current and displacement current.
   **j)**   A vector field is given by A = i2xy + j x$^2$y + kxyz. Find the divergence and curl of the vector at the point (1, 1, -1).
   **k)**   What is the expectation value? A particle moving along x-axis has the wave function,

$$\psi(x) \quad = bx \text{ between } x=0 \text{ and } x=1$$
$$= 0 \text{ elsewhere}$$

Find the expectation value $\langle x \rangle$ of the particles position.

   **l)**   The wave function for certain particle is given as $\psi = Cos^2 x$ for $-\frac{\pi}{2} < x < \frac{\pi}{2}$.
Normalise the wave function in the given range.

**Part-III**

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

**Q3**  Setup the differential equation for a one-dimensional oscillator, subjected to a damping force proportional to velocity and an external periodic force. Derive the condition of resonance. How does the maximum amplitude at resonance depend on the damping constant? **(16)**

**Q4**  What is diffraction? Differentiate between Fresnel and Fraunhofer type of diffraction. Find the condition for the principal maximum and secondary maximum in the single slit diffraction pattern. **(16)**

**Q5**  Derive the Maxwell's electromagnetic equations in differential form in a medium in the presence of charge and currents. Identify and state the laws of electromagnetism with which these equations are associated. **(16)**

**Q6**  Derive the time independent and time dependent Schrodinger's equation for one dimensional system and hence find out the energy of a free particle? **(16)**