KANDI RAJ COLLEGE

DEPARTMENT OF PHYSICS

Semester – I **Stream : Honours (Core)**

Internal Evaluation

PAPER CODE: PHY-HCC-T-01 (Mathematical Physics-I) **FULL MARKS: 10**

Answer any five questions 5X2 =10

1. Suppose $\phi(x,y,z) = 3x^2y - y^2z^2$. Find $\vec{\nabla}\ \phi$ at the point (1,-2,-1).
2. Find the area A of the parallelogram with sides $\mathbf{a} = \mathbf{i} + 2\mathbf{j} + 3\mathbf{k}$ and $\mathbf{b} = 4\mathbf{i} + 5\mathbf{j} + 6\mathbf{k}$.
3. Show that the differential $xdy + 3\,ydx$ is inexact.
4. Find $\vec{\nabla}\ \phi$, if $\phi = \ln|r|$.
5. Show that $\vec{\nabla}\ r^n = nr^{n-2}\mathbf{r}$.
6. Find the particular integral of the differential equation: $\frac{d^2x}{dt^2} + 5\frac{dx}{dt} + 6 = e^t$.
7. Find the complementary function of the differential equation: $(D^2+1)^3 y = 0$.

PAPER CODE: PHY-HCC-T-02 (Mechanics) ***FULL MARKS: 10***

Answer any ten of the following questions **10X1 = 10**

1. A bicycle in motion does not fall because one of the following is conserved –
   (i) linear momentum (ii) angular momentum (iii) kinetic energy (iv) potential enegy.
2. Moment of inertia of a solid sphere is—
   (i) $\frac{2}{3}M^2r^2$ (ii) $\frac{3}{2}Mr^2$ (iii) $\frac{2}{5}M^2r^2$ (ii) $\frac{2}{5}Mr^2$
3. Gravitational potential inside a spherical shell is –
   (i) Equal to that on the surface (ii) Greater than that on the surface (iii) Zero (iv) can not be determined
4. Some paste is thrown on a wall which sticks to it. The collision is---
   (i) perfectly elastic (ii) nearly elastic (iii) inelastic (iv) no collision.
5. Two photons approach each other . Their relative velocity will be—
   (i) Zero (ii) less than c (iii) more than c (iv) equal to c
6. If $\eta = 8\times10^{11}$ N/m^2 and Y = 20×10^{11} N/m^2 for iron , the Poisson's ratio will be---
   (i) -0.25 (ii) 1 (iii) 0 (iv)0.25
7. The dimension of viscosity is—
   (i)$[ML^{-1}T^{-1}]$ (ii)$[MLT^{-1}]$ (iii)$[ML^{-1}T]$ (iv)$[ML^{-2}T^{-2}]$
8. Which one of the following statemrnts is not true—
   (i) a central force may be attractive (ii) a central force may be repulsive (iii) a central force must be attractive
9. For a small displacements the restoring force is given by F = -**s**x , the reciprocal of **s** is called—
   (i) spring constant (ii) compliance (iii) displacement (iv) reactance
10. Two masses m_1=85 gm and m_2=200 gm are constrained to move with velocities u_1=6.48 cm/s and u_2=6.78 cm/s respectively in a horizontal plane, the velocity of centre of mass is –
    (i) -2.82 cm/s (ii) -28.2 cm/s (iii) -0.282 cm/s (iv)-282 cm/s.
11. Moment of inertia is a—
    (i) vector (ii) scalar (iii) tensor

PAPER CODE: PHY-HGE-T-01 **FULL MARKS: 10**

Answer any five questions. **(5×2=10)**

1. Derive an equation for the motion of a rocket moving in a straight line.
2. Write down the postulates of special theory of relativity.
3. State Kepler's laws of planetary motion.
4. How does global positioning system work?
5. Show that the equation $\psi(t) = A\cos(\omega t - \phi)$ of a particle executing SHM indicates that the time period of oscillation is $\frac{2\pi}{\omega}$.
6. Explain length contraction and time dilation in the context of special theory of relativity.
7. Prove that for a particle moving in a central force field the angular momentum is conserved.
8. Prove that the magnitude A of the vector **A** = A_1**i**+A_2**j**+A_3**k** is $A = \sqrt{A_1^2 + A_2^2 + A_3^2}$.
9. Obtain the differential equation of motion for a damped harmonic oscillator.
