

KATWA COLLEGE
SEM-I HONOURS
INTERNAL ASSESSMENT EXAMINATION-2021
SUBJECT: PHYSICS
PAPER: CC-I
DATE: 17.01.2022

Time: 1h

FM-10

Answer Scripts PDF Send to this email ID: examrelated2021@gmail.com

Answer any five questions:

- a) A particle moves so that its position vector is given by $\vec{r} = \cos\omega t \hat{i} + \sin\omega t \hat{j}$ where ω is a constant. Show that $\vec{r} \times \vec{v} = a$ constant vector.
- b) Prove that $\vec{\nabla}\phi$ is a vector perpendicular to the surface $\phi(x, y, z) = c$, where c is a constant.
- c) If \vec{r} is the position vector of a point then show that the $\text{div}(r^4\vec{r}) = 7r^4$.
- d) If a force $\vec{F} = 2x^2y\hat{i} + 3xy\hat{j}$ displaces a particle in the xy plane from $(0,0)$ to $(1,4)$ along a curve $y=4x^2$. Find the work done.
- e) If $f(x, y) = 0$ and $\phi(y, z) = 0$. Show that $\frac{\partial f}{\partial y} \frac{\partial \phi}{\partial z} \frac{dz}{dx} = \frac{\partial f \partial \phi}{\partial x \partial y}$.
- f) Solve the differential equation $(2xy + e^y) dx + (x^2 + xe^y) dy = 0$.
- g) Expand $\log_e x$ in powers of $(x-1)$ and hence evaluate $\log_e(1.1)$ correct to 4 decimal places.