B. Sc. Semester I (Honours) Examination, 2020 (CBCS)

Subject: Physics

Paper: CC-I

Time: 2 Hours **Full Marks: 40**

Candidates are required to give their answers in their own words as far as practicable.

Answer any eight of the following questions (all questions carry equal marks): 5×8=40

1. Find the equation of the line of intersection of the planes 2x -3y + 4z = 2 and x + y – 2z = 3.
2. Evaluate $\iint \boldsymbol{A}.\boldsymbol{n}ds$, where **A** = (x + y^2) **i** – 2x **j** + 2yz **k** and S is the surface of the plane 2x + y + 2z = 6 in the first octant and **n** is the unit normal to S.
3. Verify Stoke's theorem for the vector field **F** = **i** (2x – y) + **j** yz^2 – **k** y^2z over the upper half of the sphere $x^2 + y^2 + z^2 = 16$
4. Solve the differential equation : $D^2y + y = \sec(x)$ where D = d/dx
5. Determine the expression for $\boldsymbol{\nabla} X A$ in curvilinear co-ordinates and write the expression in spherical co-ordinates.
6. In a bombing exercise, there is 50% chance that any bomb will strike a target. Two direct hits are needed to destroy the target completely. How many bombs are to be dropped to give 99% chance of completely destroying the target? (given that 2^{11} = 2048). Write the conditions for applicability of the distribution function which will be used to solve the problem.
7. Prove that (a) $\frac{1}{2\pi}\int_{-\infty}^{\infty} e^{ipx}\,dp = \delta(x)$; (b) Prove that δ(x) = δ(-x)
8. Divide 24 into three parts such that the continued product of the first, square of the second and the cube of the third will be minimum?
9. A spherical ice piece is falling freely under gravity and in each instant the mass increases by λ times of its surface area. Determine the velocity and position of the ice piece at any instant of time.
10. What do you mean by exact differential? Determine whether $(2xy^2 + 3y\cos 3x)dx + (2x^2y + \sin 3x)dy$ is an exact differential. If so, find the function.