**Roll No.** | | | | | | | | | | | | **Total No. of Pages : 02**

**Total No. of Questions : 09**

**B.Sc. (Non-Medical) (2018 & Onwards) (Sem.–1)**

# MATHEMATICAL PHYSICS

**Subject Code : BSNM-103-18**

**M.Code : 75744**

**Date of Examination : 17-01-2023**

**Time : 3 Hrs.** **Max. Marks : 50**

**INSTRUCTIONS TO CANDIDATES :**

1. **SECTION-A is COMPULSORY consisting of TEN questions carrying ONE marks each.**
2. **SECTION-B contains FIVE questions carrying FIVE marks each and students have to attempt any FOUR questions.**
3. **SECTION-C contains THREE questions carrying TEN marks each and students have to attempt any TWO questions.**

## SECTION-A

**1. Write briefly :**

a) Find the order and degree of the differential $x^2y'' + xy' + 3y = 5x$.

b) Check whether the equation is exact $(1 + x^2)dy + 2xydx = 0$.

c) Define surface integral of vector field.

d) What do you mean by solenoidal vector field? Give one example.

e) Define scalar field. Give one example.

f) What is plane polar coordinate system?

g) Write any two vector identities.

h) Define Gauss' divergence theorem.

i) Define flux of a vector field.

j) Write Laplace equation in Cartesian and spherical coordinates.

## SECTION-B

2. Using Lagrange's method (of multipliers) find the shortest distance from the point (1, 2, 2) to the sphere $x^2 + y^2 = 36$.

3. If $A = 4i - 5j - 4k$, $B = 2i - 10j - 7k$ and $C = 5i + 7j - 4k$. Deduce the values of

   a) $(A \times B).C$ b) $A \times (B \times C)$.

4. State and prove Stake"s Theorem.

5. What is Dirac Delta function? Show that $x\,\delta(x) = 0$.

6. Show that a conservative field is the gradient of a scalar field and curl of such a field is zero.

## SECTION-C

7 Explain Uniqueness and Existence theorem for initial value problem.

8. Discuss Green's theorem in a plane. Evaluate $\int_c (x^2 ydx + x^2 dy)$ using Green's theorem,. where C is the boundary described counter clockwise of the triangle with vertices (0, 0), (1, 0), (1, 1).

9. Starting from the principles, derive an expression for divergence of a vector in orthogonal curvilinear coordinates.

**NOTE : Disclosure of Identity by writing Mobile No. or Making of passing request on any page of Answer Sheet will lead to UMC against the Student**.