DOON UNIVERSITY, DEHRADUN
End Semester Examination, 1ˢᵗ Semester, 2023
Academic Year 2023-24 (Odd Semester)
School of Physical Science, Department Physics
Programme Name: B. Sc. Honors with Research Physics 1ˢᵗ Sem
Course Code: Mathematical Physics 1 (PHC-101)

Time Allowed 2.0 Hours　　　　　　　　　　　Maximum *Marks:　30*

Note: All questions are compulsory and marks are indicated in front of each section.

SECTION: A

(Very Short Answer Type Questions; 1×6 = 6)

Q1. State the order and degree of the differential equation $\frac{d^2y}{dx^2} + \frac{dy}{dx} - xy = 0$

A.　　order 2 degree 1
B.　　order 2 degree 2
C.　　order 1 degree 1
D.　　none of the above

Q2. Spherical co-ordinates of the system are

A.　　x, y, z
B.　　r, θ, φ
C.　　s, φ, z
D.　　r, θ, z

Q3. Variance for the Binomial probability distribution

A.　　npq
B.　　np
C.　　nq
D.　　pq

Q4. If p is the probability of success, then probability of failure q is

A.　　1+ p
B.　　1- p
C.　　2p
D.　　0

Q5. Write down the mathematical statement of Stoke's theorem.

Q6. If the mean and variance of a binomial distribution are 5 and 4 respectively then find the value of n.

SECTION: B

(Short Answer Type Questions; 3×4=12)

Q1. Prove that mean of Binomial distribution is greater than its variance.

Q2. A coin is tossed three times. Find the probability of the occurrence of heads.

Q3. If a vector field is $\vec{V} = xy^2\,\hat{\imath} + 2y\,x^2z\,\hat{\jmath} - 3yz^2\,\hat{k}$. Is this field is Irrotational?

SECTION: C

(Long Answer Type Questions; 2×6=12)

Q1. Define the Dirac delta function and write down the principle properties of the Dirac delta function.

Q2. Verify the Divergence theorem, given that $F = 4xz\,\hat{\imath} - y^2\hat{\jmath} + yz\,\hat{k}$ and S is the surface of the cube bounded by the planes $x = 0, x = 1, y = 0, y = 1, z = 0, z = 1$.