JBH-003-1171005 Seat No. ________

M. Sc. (Statistics) (Sem. I) (CBCS) Examination

December - 2019

MS - 105 : Mathematical Statistics

Faculty Code : 003
Subject Code : 1171005

Time : $2\frac{1}{2}$ Hours] [Total Marks : **70**

Instructions : (1) Attempt all questions.
(2) Each question carries equal marks.

1 Answer the following : (Any **Seven**) **14**

(1) Define with an example symmetric matrix.

(2) The diagonal element of a skew-symmetric matrix is ________

(3) A matrix in which all elements are zero is called ________

(4) Define :

(i) Singular Matrix

(ii) Non-singular Matrix.

(5) Define subspace of Vector space.

(6) Find rank of Identity Matrix.

(7) If $AB = BA = I$ then matrix B is called ________ of matrix A.

(8) Matrix of order n×n is known as ________ matrix.

(9) Find Inverse of matrix : $A = \begin{matrix} 1 & 2 \\ 3 & 0 \end{matrix}$

(10) Find the rank of given matrix :

$$A = \begin{matrix} 1 & 2 & 3 \\ 4 & 0 & 1 \\ 0 & 2 & 0 \end{matrix}$$

2 Answer the following : (Any **Two**) 14

(1) Prove that intersection of two subspaces of vector space is subspace.

(2) State and prove Caley - Hamilton theorem.

(3) Show that $\left\{\frac{2^n}{n!}\right\}$ is convergent.

3 Answer the following : 14

(1) Prove that A^{-1} is unique.

(2) If A and B are symmetric matrices and commutative $(AB = BA)$ then $A-1B$ and $A-1\,B-1$ are also symmetric.

OR

3 Answer the following : 14

(1) Let A and B are non-singular matrices then prove that $(AB)^{-1} = B^{-1}A^{-1}$

(2) Prove that characteristics root of a idempotent matrix are 0 and 1.

4 Answer the following : (Any **Two**) 14

(1) Check whether following sets are Linearly Independent or Dependent.

$A = \{(1,0,3),(2,0,1),(0,0,1)\}$

$B = \{(1,1,1),(2,0,1),(2,2,2)\}$

(2) If A^{-1} is a generalized inverse of A then prove that $AA^{-1}\,A = A$

(3) Define following terms

(i) Idempotent Matrix

(ii) Symmetric Matrix

(iii) Skew-symmetric Matrix

5 Answer the following : (Any **Two**) **14**

(1) Explain with an example Kronecker product

(2) Prove the rank of product of two matrices cannot exceed the rank of either matrix that is

(i) $R(AB) \leq R(A)$

(ii) $R(AB) \leq R(B)$

(3) Prove the rank of matrix does not change by pre-multiplication or postmultiplication of a non-singular matrix.

(4) Find $R(A)$ and A^{-1} (if exists), where,

$$A = \begin{matrix} 1 & 2 & 3 \\ 2 & 1 & 0 \\ 0 & 1 & 2 \end{matrix}$$