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PGIS-246 A-21

M.A./M.Sc. I Semester (CBCS) Degree Examination

STATISTICS

Linear Algebra

Paper : HCT - 1.1

Time : 3 Hours **Maximum Marks : 80**

Instructions to Candidates:

Answer any **Six** questions from Part - A and **Five** questions from Part - B.

PART - A (6×5=30)

1. In case of dependence, find the linear relationship among vectors.
2. Show that $x_1, x_2, ...x_k, (k \geq 2)$ be k vectors each of order n×1 is a subspace.
3. Prove that eigen values of a Hermitian matrix are real.
4. Prove that the inverse of non - singular matrix is unique.
5. Show that x = py is a length preserving transformation if and only if p is a unitary matrix.
6. Let $A_{n \times n}$ be any square matrix, then Prove that R(A) = n, iff $|A| \neq 0$.
7. Describe Frame's method of obtaining inverse of a non - singular matrix.
8. Let λ be a characteristic root then prove that every non - null column of adj $(\lambda I - A)$ is a characteristics vector corresponding to λ.

PART - B (5×10=50)

9. Obtain orthogonal vector using (1,0,1), (-1,1,0) and (-3,2,0).
10. a) Obtain the basis for subspace spanned by $X_1 = (1,2,3), X_2 = (2,3,4), X_3 = (3,4,5), X_4 (4,5,6)$ **(5+5)**

    b) Let M_1 and M_2 be any two subspaces having the null vector as the only common vector then prove that dim $(M_1 \cup M_2) = \dim(M_1) + \dim(M_2)$.

11. a) Define Skew Hermitian matrix. Prove that a skew Hermitian matrix reduces to a real skew symmetric matrix if all the elements are real. **(5+5)**

b) A and B are two square matrices of order n×n prove that $R(AB) \geq R(A) + R(B) - n$.

12. a) Find inverse of Matrix $A = \begin{bmatrix} 1 & 1 & 1 \\ 1 & 2 & 1 \\ 1 & 2 & 0 \end{bmatrix}$ by partition method. **(5+5)**

b) Obtain g - inverse of given matrix $A = \begin{bmatrix} 1 & -1 & 1 & -1 \\ -1 & 1 & -1 & 0 \\ 0 & 0 & 0 & -1 \end{bmatrix}$.

13. Find characteristic root and corresponding vector of a given matrix $A = \begin{bmatrix} 8 & -6 & 2 \\ -6 & 7 & -4 \\ 2 & -4 & 3 \end{bmatrix}$.

14. a) Prove that the system AX = 0 has (n-r) linear independent solution, where n is the number of columns in A and r is its rank. **(5+5)**

b) Show for any characteristic root of λ, G.M. $(\lambda) \leq A.M.(\lambda)$.

15. For what value of η the following system is consistent?

$x + y + z = 1 : x + 2y + z = \eta : x + 4y + 10z = \eta^2$

16. State and prove Sylvester's law of inertia.

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M.A./M.Sc. I Semester Degree Examination

STATISTICS

Statistical Process control and Reliability Analysis

Paper - SCT - 1.1(a)

Time : 3 Hours **Maximum Marks : 80**

Instructions to Candidates:

Answer any **Six** questions from Part - A and **Five** questions from Part - B.

PART - A (6×5=30)

1. State the problem of designing of a control chart.
2. Explain
   i. $3-\sigma$ control limits.
   ii. Probability limits.
3. Describe single sampling plan for attributes. Explain any one method of designing this plan.
4. Explain the need for chain sampling plan and its operation.
5. Define DFR distribution. Show that pareto distribution is DFR.
6. Define renewal function with usual notation. Prove that

   $M(\text{t}) = \int_0^t (1 + M(t-x)dF(x)$.
7. Write a note on proportion Hazard model.
8. Define parallel system. Obtain the reliability function of this system if component life times are iid exponential random variables.

PART - B (5×10=50)

9. Explain the objectives, basis of construction and inference with respect to $\overline{X}$ and S charts.
10. Discuss the main control charts for attributes.
11. Define ASN and AOQ. Obtain them for double sampling plan.
12. Describe CSP - 1. Determine its constants.

13. Explain the terms :

a) i. Integrated hazard function and

ii. Residual life time

b) Obtain Hazard rate and integrated hazard function for weibull distribution.

14. Obtain UMVUE of reliability function when life times of n - components have exponential distribution with mean Q.

15. Test the reliability hypothesis

$H_0 : R(t) = R_0(t)$ against

$H_1 : R(t) = R_1(t)(< R_0(t))$ when the life testing experiment is carry out until all components fail assuming exponential distribution.

16. Write short notes on.

i. Proportional hazard models

ii. Age replacement policy.