18P164 (Pages: 2) Name: …………………….

Reg. No…………………...

FIRST SEMESTER M.Sc. DEGREE EXAMINATION, NOVEMBER 2018

(Regular/Supplementary/Improvement)

(CUCSS-PG)

CC15P ST1 C03 – ANALYTICAL TOOLS FOR STATISTICS - II

(Statistics)

(2015 Admission onwards)

Time: Three Hours Maximum: 36 Weightage

Part A

Answer ***all*** questions. Each question carries 1 weightage

1. Define Basis and Dimension.
2. Define subspaces.
3. Do the vectors $a_1 = (1, 0, 2)$, $a_2 = (2, 0, 1)$, $a_3 = (2, 1, 2)$ form a basis for R^3 ?
4. Define non-singularity of matrices.
5. Define rank of a matrix. What is the rank of a non-singular square matrix of order n.
6. Explain Minimal polynomial.
7. Define Eigen values and Eigen vectors.
8. What is signature?
9. If a matrix is symmetric, what is the nature of Eigen values?
10. State the properties of g-inverse.
11. Define positive definite and positive semi-definite matrices.
12. Describe Jordan canonical form of Matrices.

($12 \times 1 = 12$ Weightage)

Part B

Answer any ***eight*** questions. Each question carries 2 wightage

13. Check for linear independence and dependence of the following set of vectors $V_1 = (4, 1, 2, 1)$, $V_2 = (1, 4, 1, 2)$ and $V_3 = (0, 1, 2, 1)$
14. Find rank of $\begin{bmatrix} 2 & 1 & 1 \\ 2 & 1 & 2 \\ 1 & 1 & 2 \end{bmatrix}$
15. Define inner product space. Give example.
16. Show that geometric multiplicity cannot exceed algebraic multiplicity.

17. Describe the method of finding the inverse of a non singular matrix A by forming a partition of A.

18. Write a short note on Gram–Schmidt process.

19. Find Eigen values and Eigen vectors of $\begin{bmatrix} 1 & 1 & 2 \\ 1 & 0 & 2 \\ 2 & 4 & 4 \end{bmatrix}$

20. State and prove rank-nullity theorem.

21. Describe the method of finding g-inverse.

22. State and prove basis theorem.

23. If $\overline{A}$ is the g-inverse of A, show that $A\overline{A}A = \overline{A}$

24. Using Cayley –Hamilton theorem obtain the inverse of the matrix $\begin{bmatrix} 6 & -2 & 0 \\ -2 & 3 & 0 \\ 0 & 0 & 2 \end{bmatrix}$

($\mathbf{8 \times 2 = 16}$ **Weightage**)

Part C

Answer any ***two*** questions. Each question carries 4 weightage

25. a) Define Moore Penrose inverse of a matrix. Prove or disprove that it is unique.

    b) Define geometric and algebraic multiplicity. Find geometric and algebraic multiplicity of the matrix $A = \begin{bmatrix} 1 & 2 \\ 2 & 1 \end{bmatrix}$

26. a) Show that a set of non null vectors $\alpha_1, \alpha_2, \ldots, \alpha_n$ orthogonal in pairs is necessarily independent.

    b) Reduce the following matrix to its normal form and hence find its rank $\begin{bmatrix} 1 & 1 & 2 \\ 1 & 2 & 3 \\ 0 & -1 & -1 \end{bmatrix}$

27. a) Define quadratic forms, Illustrates different forms of them.

    b) Classify the following quadratic form as positive definite, positive semi-definite and indefinite $2x^2 + 2y^2 + 3z^2 - 4yz - 4zx + 2xy$.

28. a) Let $f = R^3 \rightarrow R^2$ be defined by $f(x, y, z) = (z - x, x + y)$. Show that f is linear mapping. Also find kernel of f

    b) Show that characteristic roots of a skew symmetric matrix are either zero or a pure imaginary number.

($\mathbf{2 \times 4 = 8}$ **Weightage**)

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