LOYOLA COLLEGE (AUTONOMOUS), CHENNAI – 600 034

B.Sc. DEGREE EXAMINATION – **STATISTICS**

THIRD SEMESTER – **NOVEMBER 2016**

ST 3506 – MATRIX AND LINEAR ALGEBRA

Date: 04-11-2016 Dept. No. Max. : 100 Marks

Time: 09:00-12:00

PART – A

Answer ALL the questions. **(10 x 2 =20 marks)**

1. Define a matrix and give an example?
2. If A = $\begin{bmatrix} i & 1 \\ 1 & -1 \end{bmatrix}$ then find A^2.
3. If P = $\begin{bmatrix} a & b \\ c & d \end{bmatrix}$ then find inverse of P.
4. Prove that if AB=AC, then B= C, where A is nonsingular.
5. Define vector space.
6. What is meant by linear dependence of vectors?
7. Define image of a transformation.
8. When a transformation is said to be onto?
9. Find the characteristic root of the matrix A = $\begin{bmatrix} 1 & 2 \\ 1 & 0 \end{bmatrix}$.
10. Define orthogonal matrix.

PART - B

Answer any FIVE questions. **(5 x 8 =40 marks)**

11. If A = $\begin{bmatrix} 1 & 1-i4 \\ 1+i4 & 2 \end{bmatrix}$ then show that 'A' is hermitian.
12. Prove that $(AB)^T = B^T A^T$.
13. Examine the linear independence of vectors [1, 2, –3], [1, –3, 2], [2, –1, 5].
14. Obtain that in a vector space V_n, a vector is a linear combination of vectors iff they are independent.
15. Check the consistency of the following equations:

    $5x+3y+7y=4,\ 3x+26y+2z=9$ and $7x+2y+10z=5.$
16. Explain the properties of linear transformation.
17. Show that characteristic roots of A and A^T are identical.
18. State the properties of determinants.

PART – C

Answer any TWO questions. **(2 x 20 =20 marks)**

19. Show that determinant of the Matrix

$$A=\begin{bmatrix} 4 & 5 & 6 & x \\ 5 & 6 & 7 & y \\ 6 & 7 & 8 & z \\ x & y & z & 0 \end{bmatrix} = (x-2y+z)^2.$$

20. Find the rank of the matrix $\begin{bmatrix} 8 & 1 & 3 & 6 \\ 0 & 3 & 2 & 2 \\ -8 & -1 & -3 & 4 \end{bmatrix}$.

21. a. Define basis and dimension of a subspace.

b. Show the vectors X_1 = (1,2,3), X_2 = (2,-2,0) form a linearly independent set.

c. Prove that rank of the sum of two matrices cannot exceed the sum of their ranks.

(6 +7+7)

22. Find the characteristic roots of the matrix A = $\begin{pmatrix} 1 & 4 \\ 2 & 3 \end{pmatrix}$ and verify Cayley-Hamilton for this matrix. Find the inverse of the matrix A using the characteristic equation. Also obtain the characteristic vectors.

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