Unit No 1

1. Write a python program for addition subtraction multiplication of complex numbers 4+2j and 3-6j.
2. Define : Galois Field, Dot Product, convex combination, span,
3. Write a python program to find conjugate of complex number.
4. Are the following vectors are linearly dependent $v_1=(3, 2, 7)$, $v_2=(2,4,1)$ and $v_3=(1,-2,6)$
5. Check whether the vectors are linearly dependent v1=(1, –2, 1), v2=(2, 1, –2) and v3=(7, –4, 1)
6. Express in polar and exponential form $1 + i\sqrt{3}$
7. Find the square root of complex number 8 – 6i
8. Find the square root of complex number –5 + 12i
9. Find the Square root of 21 – 20i, where $i= \sqrt{-1}$
10. Express [(3 + 2i)/(2 + i)(1 – 3i)] in the form x + iy
11. Solve the following system by backward substitution method
    $1x_1-3x_2-2x_3=7$, $2x_2+4x_3 = 4$, $-10x_3 = 12$
12. Write a python program to solve system of linear equations given below
    $1x_1-3x_2-2x_3=7$, $2x_2+4x_3 = 4$, $-10x_3 = 12$
13. Determine whether v1=(2, 2, 2), v2=(0, 0, 3) and v3=(0, 1, 1) span vector space R^3.
14. Show that vectors v1=(1, 0, 1), v2=(2, 1, 4) and v3=(1, 1, 3) do not span
    vector space.
15. Write a python Program for rotating a complex number Z = 2+3i by 180^o.
16. Write a Python program to rotate a complex no by 90^0, 180^0 and 270^0
17. Which of the following is a set of generators of R^3
    i) {(4, 0,0), (0,0,2)} ii) {(1, 0,0), (0,1,0), (0,0,1)}
18. Express the following as a linear combination of v1=(–2, 1, 3), v2=(3, 1, –1) and v3=(–1, –2, 1) with w= (6, –2, 5)

Unit No 2

1. Define : Identity matrix, Symmetric Matrix, Null Space, Inner Product, Outer Product, Forest, Spanning Subgraph, Spanning Subgraph, cycle, path, Basis, Row rank of Matrix, Column rank of Matrix.
2. Prove that, For any vector v belongs to $v \in V$; there is exactly one representation of v in terms of the basis vectors. If $a_1, a_2, \ldots, a_n$ be a basis for a vectorspace V.
3. Find the co-ordinate representation of v=[1,3,5,3] in terms of a1=[1,1,0,0] in terms of a_1 = [1,1,0,0], a_2=[0,1,1,0], a_3=[0,0,1,1]
4. Find the co-ordinate representation of v=[0,0,0,1] in terms of the vectors [1,1,0,1], [0,1,0,1] and [1,1,0,0] in GF(2)
5. Write a program in python to multiply two matrices using nested loops.
6. Write python code to print diagonal matrix with diagonal elements [1,2,3,4]
7. Find the null space of matrix A = [[1 5 6]
    [2 6 8]
    [3 4 7]]
8. Write dot product definition of matrix-vector multiplication with an example.
9. Write dot product definition of vector-matrix multiplication with an example.
10. Write a python code to check whether a given matrix M=[[1,3,5], [3,2,4],[5,4,1]]

is a symmetric matrix.

11. Find the dimension of the vector space spanned by the vectors (1, 1, –2, 0, –1), (1, 2, 0, –4, 1), (0, 1, 3, –3, 2), (2, 3, 0, –2, 0) and also find the basis.

12. Check whether the set of functions are Linearly independent? $2 - x + 4x^2, 3 + 6x + 2x^2, 2 + 10x - 4x^2$.
13. Write a python program to enter a matrix and check if it is invertible. if invertible exists then find inverse.
14. Show that vector {(1, 2, 1), (2, 1, 0), (1, –1, 2)} of R^3 form a basis of R^3

Unit No 3

1. Solve the following system using Gaussian elimination method. v - w = 3 ; -2u + 4v - w = 1 ; -2u + 5v -4w = -2
2. Solve the following system using Gaussian elimination method. x + y + z = 1 ; x + 2y + 2z = 1 ; x + 2y + 3z = 1
3. Solve the following system using Gaussian elimination method. 4y - 3 z = 3 ; -x + 7y - 5z = 4 ; -x + 8y - 6z = 5
4. Express the following as a linear combination of v_1=(–2, 1, 3), v_2=(3, 1, –1) and v_3=(–1, –2, 1) with w= (6, –2, 5)
5. Find eigen Values and eigen vectors of 8 –8 –2 A = 4 –3 –2 3 –4 1
6. Check whether the following set {(1,1,0), (0,1,1), (1,1,1)} is linearly Independent or not.
7. Find eigen values and eigen vectors of [3 −1 1 −1 3 −1 1 −1 3]
8. Write a python program to convert a 2 × 2 matrix to row echelon form.
9. Construct an orthonormal basis of R^2 by Gram Schmitt Process S = {(3, 1), (4, 2)} .
10. Find eigen Values and eigen vectors of 8 –8 –2 A = 4 –3 –2 3 –4 1
11. Find eigen Values and eigen vectors of A = [12 -51 2 -11]
12. Construct an orthonormal basis of R^2 by Gram Schmitt Process S = {(3, 1), (4, 2)}
13. Convert the following matrix in echelon form : [1 0 1 2 -1 3 4 3 2]
14. Write a python program for prime factorization of integer given by user.
15. Write a python program to find orthogonal projection u on v.
16. Find the projection of u on v : a. u =[1 1] v=[1 0] b. u= [0 1] v=[√2/2, √2/2]
17. Construct an orthogonal set of generators for subspace of R^4 whose generators are v_1, v_2, v_3. v_1=(1, 1, 1, 1) v_2=(1, 2, 4, 5) v_3=(1, -3, -4, -2)

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