**Matrices LEARN SYNTHETIC DIVISION FOR SUM IN END SEM**

1. Elementary Row or column operation.
2. Row reduced echelon matrix.
3. Rank of a matrix, problems.
4. Finding inverse using elementary transformations.
5. Normal form of a matrix.
6. System of linear equations.
7. Verify system of consistency and solve if consistent.
8. For what values of x, y will the matrix have –
   1. Unique solution
   2. Infinitely many solutions
   3. No solution
9. Show that matrix is consistent only when condition. Assuming this condition, express x & y in terms of a, b, z.
10. Find the value of x for which system of equations as a non – trivial solution.
11. Solve completely
12. Find eigen values & vectors of the following matrices.
13. Diagonalise the given matrix
14. Verify Cayley Hamilton Theorem for the matrix.
15. Find inverse of the matrix using Cayley Hamilton Theorem.
16. Find adjoint of the matrix.
17. Results on Eigen Vectors & values.
18. Cayley Hamilton Theorem ~ Statement & proof.

**Vector Spaces**

1. Examples, proofs.
2. Theorem 1.
3. Sub – space of a vector space.
4. Necessary & sufficient condition for a vector space.
5. Theorem 2.
6. P. T intersection of 2 sub – spaces of the vector space is again a sub space of the vector space.
7. P. T union of any 2 sub – spaces of a vector space need not be a sub – space.
8. Linear combination of vectors.
9. Express the vector as a linear combination of vectors.
10. Find whether the vector is a linear span.
11. Verify whether the vector is in a linear span where S = something.
12. Find k so that the vector is a linear combination of the following vectors.
13. Let S = set of vectors be a vector space over field F. Then P.T the set L[S] of all linear combination of finite number of elements of S is a subspace of vector space V over field F & is a smallest subspace of V containing S.
14. Linearly independent.
15. Linearly dependent.
16. P.T the set {(1,0,0), (0,1,0), (0,0,1)} is Linearly Independent in R^3.
17. Theorem ~ *A set of vectors {x1,y1,z2},{x2,y2,z2},{x3,y3,z3} is L.D in R^3 iff it’s determinant = 0.*
18. Check whether vectors are LD or not
19. Verify whether the set is L.D or not.
20. P.T the ring of Gaussian Integers is a vector space.
21. Theorem ~ *A set of non zero vectors is L.D iff one of the vectors ‘Vk’ can be expressed as a Linear combination of preceeding vectors.*
22. Basis & Dimension of a Vector Space
23. Finite dimensional Vector Space
24. P.T the set forms a basis of v3®.
25. Does the set of vectors form a basis? ***REFER N.B FOR QUESTIONS***
26. If m vectors spans a vector space V(F) and r vectors are L.I in V; P.T m >=r.
27. P.T any 2 basis of a finite dimensional vector space have same number of elements. ***DELOITTE WORK?***
28. Find the basis and dimension of the subspace spanned by the vectors of V3® ***REFER N.B***
29. ***REFER N.B***
30. Theorem
31. Theorem
32. In an n – dimensional vector space; prove any n linearly independent vectors of an n – dimensional vector space form a basis of the vector space.
33. P.T any L.I set can be extended to a basis, any L.I set is a part of a basis.
34. P.T S = {x. |x| } is L.I in R.
35. If α, β, gamma are vectors which are L.I in a vector space over field F. P.T α + β, β + gamma; gamma + α are L.I in V.
36. **Result =** If V & W be two f.d.vspace …..
37. **Result =** If A,B are any 2 subspaces of a f.d.v.s ‘V’; then P.T dim(A+B) = dim(A) + dim(B) – dim(A intersection B)
38. **Proof**
39. **Question**
40. **Proof**
41. ***Question***
42. ***P.T*** every subset of a L.D set is L.D
43. ***P.T*** every subset of a L.I set is L.I
44. ***P.T*** that a set of vectors containing a zero vector is always L.D in a vector space
45. ***P.T*** a set containing a single non – zero vector is Linearly Independent.

**Linear Transformations**

1. **P.T** T is a linear transformation.
2. **Proof** T is a L.T : T(x,y,z) = (x-y,y+z)
3. **P.T** T is a L.T : T(x,y,z) = (x+y,x-y,x+y+z)
4. **P.T T** is a L.T : T(x,y) =
5. **Theorem**
6. **Theorem**
7. **Question**
8. **Question**
9. **Question**
10. **Question**
11. Let T: U -> V be a L.T. P.T –
    1. Range space R(T) is a subspace of V.
    2. Null space N(T) is a subspace of U.