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| **Unit I: Set Theory, Relation, Function, Theorem Proving Techniques (10L)** | | **References** |
| **Session 1-2:** | Definition of sets, countable and uncountable sets, Venn Diagrams, proofs of some general identities on sets | T1: 4.1 - 4.10  T2: 2.1 – 2.2 |
| **Session 3-4:** | Definition, types of relation, composition of relations, Pictorial representation of relation, Equivalence relation, Partial order relation, Job-Scheduling problem | T1: 7.1 – 7.7  T2: 7.1, 7.3, 7.5,7.6 |
| **Session 5-6:** | Definition, type of functions, one to one, into and onto function, inverse function, composition of functions, recursively defined functions, pigeonhole principle. | T1: 8.1 – 8.6  T2: 2.3 – 2.4, 5.2 |
| **Session 7:** | Mathematical induction, Proof by contradiction. | T2: 4.1 |
| **Session 8-10:** | Introduction to Recurrence Relation and Recursive algorithms, linear recurrence relations with constant coefficients, Homogeneous solutions, Particular solutions, Total solutions, Generating functions, Solution by method of generating functions. | T1: 11.1 – 11.7  T2: 6.1 - 6.2, 6.4 |
| **Unit II: Vector Algebra (8L)** | |  |
| **Session 11-12:** | Vector Space, Subspaces, spanning set, basis and dimensions | T1: 19.1- 19.4  T3: 4.1 – 4.5 |
| **Session 13-14:** | Linear transformations- definition and properties, Kernel and image of a linear transformation | T1: 19.5  T3: 8.1, 8.4 |
| **Session 15-16:** | Rank-Nullity Theorem, Matrices of composite linear transformation | T1: 19.5  T3: 4.8 – 4.10, 8.3 |
| **Session 17-18:** | Inverse of a linear transformation and Isomorphism. | T1: 19.5  T3: 8.2 -8.3 |
| **Unit III: Graphs - I (9L)** | |  |
| **Session 19-20:** | Graph Theory and Applications, Types of graphs, Properties of Graph | T1: 14.1 – 14.5  T2: 8.1 – 8.2 |
| **Session 21-22:** | Sub graphs, Digraphs and Isomorphism | T1: 14.6 – 14.7, T2: 8.3 |
| **Session 23-24:** | Paths, Circuits, Walks, Cut Sets, Cut Vertices, Euler and Hamiltonian graphs | T1: 14.8 – 14.9  T2: 8.4 – 8.5 |
| **Session 25:** | Shortest Path Problem in weighted graph, Dijkstra’s algorithm | T1: 14.10  T2: 8.6 |
| **Session 26:** | Graph vertex coloring, Welch-Powell Algorithm | T1: 15.1 – 15.2, T2: 8.8 |
| **Session 27:** | Chromatic Number and Polynomial, Decomposition Theorem | T1: 15.2 – 15.3, T2: 8.8 |
|  | **Unit IV: Graphs -II (9L)** |  |
| **Session 28-29:** | Trees- Terminology and Representation, Types of trees | T1: 16.1 – 16.2  T2: 9.1 |
| **Session 30-33:** | Spanning Trees (Prim’s and Kruskal’s Algorithms), Counting spanning tree, Cayley’s Theorem. | T1: 16.3  T2: 9.4 -9.5 |
| **Session 34-36:** | Network flows, Maximum Flow in a Transport Network: The Ford–Fulkerson Algorithm, Max-flow Min-cut Theorem. | T1: 15.8 |

**Text Books:**

T1. Swapan Kumar Sarkar, A Textbook of Discrete Mathematics, S. Chand & Company Pvt. Ltd. ISBN:

81-219-2232-1.

T2. Discrete Mathematics and Its applications by Kenneth Rosen, McGraw Hill Publications.

ISBN: 81-219- 0893-0.

T3. Elementary Linear Algebra, 9th Edition by Howard Anton & Chris Rorres, published by Wiley

Publication.

T4. S. Lipschutz and M. Lipson, Discrete Mathematics, Tata Mcgraw Hill Professional, ISBN:

978-1-25-906253-7.

T5. Graph Theory with its Applications, Nar Singh Deo, PHI. ISBN: 81-7409-195-5.

1. <http://www.alas.matf.bg.ac.rs/~mi10164/Materijali/DS.pdf>
2. <http://mcgrawhilleducation.pdn.ipublishcentral.com/pdfreader/discrete-mathematics-its-applications>