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| **DISCRETE MATHEMATICAL STRUCTURES**  **(Effective from the academic year 2018 -2019) SEMESTER – III** | | | | |
| **Course Code** | **18CS36** | **CIE Marks** | 40 | |
| **Number of Contact Hours/Week** | 3:0:0 | **SEE Marks** | 60 | |
| **Total Number of Contact Hours** | 40 | **Exam Hours** | 03 | |
| **CREDITS –3** | | | | |
| **Course Learning Objectives:** This course (18CS36) will enable students to: | | | | |
| * Provide theoretical foundations of computer science to perceive other courses in the programme. * Illustrate applications of discrete structures: logic, relations, functions, set theory and counting. * Describe different mathematical proof techniques, * Illustrate the importance of graph theory in computer science | | | | |
| **Module 1** | | | | **Contact Hours** |
| **Fundamentals of Logic**: Basic Connectives and Truth Tables, Logic Equivalence – The Laws of Logic, Logical Implication – Rules of Inference. Fundamentals of Logic contd.: The Use of Quantifiers, Quantifiers, Definitions and the Proofs of Theorems.  **Text book 1: Chapter2 RBT: L1, L2, L3** | | | | 08 |
| **Module 2** | | | |  |
| **Properties of the Integers**: The Well Ordering Principle – Mathematical Induction, **Fundamental Principles of Counting:** The Rules of Sum and Product, Permutations, Combinations – The Binomial Theorem, Combinations with Repetition.  **Text book 1: Chapter4 – 4.1, Chapter1 RBT: L1, L2, L3** | | | | 08 |
| **Module 3** | | | |  |
| **Relations and Functions**: Cartesian Products and Relations, Functions – Plain and One-to- One, Onto Functions. The Pigeon-hole Principle, Function Composition and Inverse Functions.  **Relations:** Properties of Relations, Computer Recognition – Zero-One Matrices and Directed Graphs, Partial Orders – Hasse Diagrams, Equivalence Relations and Partitions.  **Text book 1: Chapter5 , Chapter7 – 7.1 to 7.4 RBT: L1, L2, L3** | | | | 08 |
| **Module 4** | | | |  |
| **The Principle of Inclusion and Exclusion**: The Principle of Inclusion and Exclusion, Generalizations of the Principle, Derangements – Nothing is in its Right Place, Rook Polynomials.  **Recurrence Relations:** First Order Linear Recurrence Relation, The Second Order Linear Homogeneous Recurrence Relation with Constant Coefficients.  **Text book 1: Chapter8 – 8.1 to 8.4, Chapter10 – 10.1, 10.2 RBT: L1, L2, L3** | | | | 08 |
| **Module 5** | | | |  |
| **Introduction to Graph Theory**: Definitions and Examples, Sub graphs, Complements, and Graph Isomorphism,  **Trees**: Definitions, Properties, and Examples, Routed Trees, Trees and Sorting, Weighted Trees and Prefix Codes  **Text book 1: Chapter11 – 11.1 to 11.2 Chapter12 – 12.1 to 12.4 RBT: L1, L2, L3** | | | | 08 |
| **Course Outcomes:** The student will be able to : | | | | |
| * Use propositional and predicate logic in knowledge representation and truth verification. | | | | |

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| * Demonstrate the application of discrete structures in different fields of computer science. * Solve problems using recurrence relations and generating functions. * Application of different mathematical proofs techniques in proving theorems in the courses. * Compare graphs, trees and their applications. |
| **Question Paper Pattern:** |
| * The question paper will have ten questions. * Each full Question consisting of 20 marks * There will be 2 full questions (with a maximum of four sub questions) from each module. * Each full question will have sub questions covering all the topics under a module. * The students will have to answer 5 full questions, selecting one full question from each module. |
| **Textbooks:** |
| 1. Ralph P. Grimaldi: Discrete and Combinatorial Mathematics, 5th Edition, Pearson Education. 2004. |
| **Reference Books:** |
| 1. Basavaraj S Anami and Venakanna S Madalli: Discrete Mathematics – A Concept based approach, Universities Press, 2016 2. Kenneth H. Rosen: Discrete Mathematics and its Applications, 6th Edition, McGraw Hill, 2007. 3. Jayant Ganguly: A Treatise on Discrete Mathematical Structures, Sanguine-Pearson, 2010. 4. D.S. Malik and M.K. Sen: Discrete Mathematical Structures: Theory and Applications, Thomson, 2004. 5. Thomas Koshy: Discrete Mathematics with Applications, Elsevier, 2005, Reprint 2008. |