Code No. MCA 105 **L T C**

Paper: Discrete Mathematics **3 1 4**

INSTRUCTIONS TO PAPER SETTERS:

1. Question No. 1 should be compulsory and cover the entire syllabus. There should be 10 questions of short answer type of 2 marks each, having at least 2 questions from each unit.
2. Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions to evaluate analytical/technical skills of candidate. However, student may be asked to attempt only 1 question from each unit. Each question should be 10 marks including subparts, if any.

OBJECTIVES: *This course covered the mathematical topics most directly related to computer science. Learning Outcome of this course is to prepare students to take courses related with Data Structure, Algorithm analysis and Cryptography. This course develops ability to write independent mathematical Proofs.*

PRE-REQUISITE:

- Basic Mathematics

UNIT – I

Formal Logic: Statement, Symbolic Representation and Tautologies, Quantifiers, Predicates and validity, Normal forms. Propositional Logic, Predicate Logic. Direct Proof, Proof by Contraposition, Proof by exhaustive cases and proof by contradiction, principle of mathematical induction, principle of complete induction., pigeonhole principle, permutation and combination, pascal's triangles, binominal theorem. Sets, Subsets, power set, binary and unary operations on a set, set operations/set identities, fundamental counting principles, principle of inclusion and exclusion Relation, properties of binary relation, closures, partial ordering, equivalence relation, properties of function, composition of function, inverse. **[No. of Hrs: 12]**

UNIT – II

Lattices: sub lattices, direct product, definition of Boolean algebra, properties, isomorphic structures (in particulars, structures with binary operations) sub algebra, direct product and homomorphism, Boolean function, Boolean expression, representation & minimization of Boolean function. Principle of Well Ordering Recursive definitions, solution methods for linear, first-order recurrence relations with constant coefficients. **[No. of Hrs: 08]**

UNIT – III

GCD, LCM, Permutation function, composition of cycles. Fundamental Theorem of Arithmetic, primes, Congruence, Euler Phi function, Fermat's Little Theorem, Primality and Factoring, Simple Cryptosystems, RSA Cryptosystem. Groups, Group identity and uniqueness, inverse and its uniqueness, isomorphism and homomorphism, subgroups, Cosets and Lagrange's theorem, Permutation group and Cayley 's theorem (without proof), Error Correcting codes and groups, Normal subgroup and quotient groups. **[No. of Hrs: 12]**

UNIT – IV

Graph Terminology, Isomorphism, Isomorphism as relations, Cut-Vertices, Planar graphs, Euler's formula (proof), four color problem and the chromatic number of a graph, Eu ler graphs, Hamiltonian graphs, five color theorem, Vertex Coloring, Edge Coloring. Trees terminology, in order, preorder & post order trees traversal algorithms, directed graphs, Computer representation of graphs. **[No. of Hrs: 10]**

TEXT BOOKS:

1. Kenneth Bogart Clifford and Stein Robert Drysdale, "Discrete Mathematics for computer science" Springer, 2006.
2. J. P. Tremblay and R. Manohar, "Discrete Mathematical Structure with Application to Computer Science", TMH, New Delhi, 2000.
3. David J. Hunter "Essentials of Discrete Mathematics" Johns and Bertlett, 2008.
4. Kolman, Busby and Ross "Discrete Mathematical Structures" PHI/Pearson., 6th Ed., 2009.
5. D. S. Malik and M. K. Sen, "Discrete Mathematical Structures", Cengage Publication, 2006.
6. Swapan Kumar Sarkar, "Discrete Mathematics", S. Chand, 4th Ed., 2006.
7. Kenneth H. Rosen, "Discrete Mathematics & Applications", TMH, 6th Ed., 2007.

REFERENCES:

1. C. L. Liu, "Elements of Discrete Mathematics", McGraw Hill Book Company, 2nd Ed., 1985.
2. Vinay Kumar, "Discrete Mathematics", BPB Publications, 1998.
3. G. Haggard, J. Schlipf and S. Whitesides, "Discrete Mathematics for Computer Science", Thomson Learning, 2006.
4. J. L. Hein, "Discrete Structures, Logic and Computabili ty", Narosa, 3rd Ed., 2009.
5. Neal Koblitz, "A course in number theory and cryptography ", Springer – Verlag, 2nd Ed., 2004.
6. V. Shoup, "A Computational Introduction to Number Theory and Algebra", CUP, 2nd Ed., 2008.
7. S. Santha, "Discrete Mathematics with Combinatorics and Graph Theory", Cengage Learning, 2009.
8. T. Sengadir, "Discrete Mathematics and Combinationatorics", Pearson, 2009.
9. David J. Hunter, "Essentials of Discrete Mathematics", Jones and Bartlett, 2010.
10. Narsingh Deo, "Graph Theory", PHI, 24th Indian Print, 2003.