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- [6] Billy, E. Gillet, Introduction to Operations Research: A Computer Oriented Algorithmic Approach, TMH Edition, 1979.
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MATH-H-IDC-1-Th

Mathematics in Daily Life

Full marks: 75 (Theory: 50 and Tutorial: 25)
(45 classes)

Group A: Basics of Set Theory

[Marks: 4][4 classes]

- Concept and definition of sets, subsets and set operations (Union, Intersection, Complementation, Subtraction); Statements of basic laws of set algebra.
- Venn diagrams. Statement of the formula $n(A \cup B) = n(A) + n(B) - n(A \cap B)$ and its application in daily life.

Group B: Understanding Integers

[Marks: 20][18 classes]

- Statement and simple problems on First Principle of Mathematical Induction.

- Statement of Division algorithm; G.C.D. of two positive integers, Expression of G. C. D. of two integers x, y in the form $px + qy$ (p, q are integers), (Euclidean Algorithm without proof).
- Representation of a positive integer in Binary and decimal mode.
- Linear Diophantine equation in two variables: Statement of condition on the existence of integral solution, General / particular solution, Simple real life applications;
- Prime Integers. Some elementary properties of prime integers (only statement), Fundamental theorem of Arithmetic (only statement), Algorithm for Primality test.
- Congruence of Integers: Meaning of $a \equiv b \pmod{m}$, Statements of elementary properties of congruence; If $a \equiv b \pmod{m}$ then for any integer c , $(a + c) \equiv (b + c) \pmod{m}$, $(a - c) \equiv (b - c) \pmod{m}$, $ac \equiv bc \pmod{m}$, $a^n \equiv b^n \pmod{m}$ for natural numbers n ;
- Application of congruence of integers: Divisibility tests by 2, 3, 4, 5, 7, 9, 11, 13 (Statements of relevant results and problems only), Check Digits in International Standard Book Number (ISBN), Universal Product Code (UPC), VISA and MASTER card (Statements of relevant results and Problems only), Formation of Round Robin Tournament Table using congruence of integers(Technique and Problems only).

Group C: Mathematical logic

[Marks: 7][6 Classes]

- Proposition, propositional variables and propositional Logic;
- Logical Connectives: NOT (Negation), OR (Disjunction), AND (Conjunction), Exclusive OR(XOR), IMPLICATION(If p then q) and BI-IMPLICATION (If and only if) and their Truth Tables; Truth value

of a proposition, Truth tables of expressions involving more than one logical connective;

- Tautology, logical consequence, logical equivalence, contradiction;

Group D: Basics of Operations Research

[Marks: 9][8 classes]

- Idea of Linear Programming Problems: Objective function, decision variables, constraints.
- Formulation of daily life problems as an LPP (e.g. Carpenter problem, preparation of mixtures of chemicals, diet problems etc.);
- Solution of an LPP by graphical method.(only bounded region)
- Definition of Game, Examples from daily life Two person zero sum game, Strategy, Payoff, Saddle point, Solution of a game problem with saddle point (only elementary problems)

Group E: Financial Mathematics

[Marks: 10][9 classes]

- Time value of money:- Simple interest and Compound interest (Fundamental Formulae); Interest payable monthly, quarterly, annually; (Only problems).
- Ordinary Simple Annuities – Accumulated value and Discounted Value of an ordinary simple annuity – Idea of repayment of loans, Simple problems. (No formula derivation).
- Problems on Dividend calculation and Calculation of income tax on taxable income (old and new regime).

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- [2] David M. Burton; Elementary Number Theory, Universal Book Stall, 1989
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- [7] Paul R. Thie and G. E. Keough, An Introduction To Linear Programming and Game Theory; John Wiley & Sons, INC., Third Edition, 2008
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- [12] Bonnie Averbach and Orin Chein, Problem Solving Through Recreational Mathematics, Dover Publications, 1980.