"Education for knowledge , science and culture"

- Shikshanmaharshi Dr. Bapuji Salunkhe

Shri Swami Vivekanand Shikshan Sanstha's

VIVEKANAND COLLEGE (AUTONOMOUS), KOLHAPUR

B. Sc. Part – I (Computer science Entire) CBCS Syllabus with effect from June, 2018

Semester: I Mathematics -Paper- I

Maths GEC-1300 A

Discrete Mathematics & Algebra

Theory: 60 Hours (75 Lectures) credits -4

Secion – I

Unit –1: Counting Principle (9)

1.1 Set: Definition, Types of sets.

1.2 Counting : Addiion & Muliplication principle, Permuation & Combinaion

- 1.2.1 Cardinality of finite set
- 1.2.2 Cardinality of union of sets (Addition principle)
- 1.2.3 Principle of inclusion & exclusion, examples

1.3 Combinatorial Arguments

1.4 Pigeonhole Principle (Statement Only), Examples

Unit – 2: Recurrence relations (9)

2.1 Introduction

2.2 Linear Recurrence relation with constant coefficient

2.3 Homogeneous solutions

2.4 Particular & Total solutions

Unit – 3: Logic (11)

3.1 Propositions & Logical connectives : Definition, Types of Propositions, Truth values & Truth Tables, Tautology & Contradiction, Logical equivalence

3.2 Rules of inferences

3.3 Valid arguments & proofs

3.4 Methods of proofs : Direct & indirect

3.5 Duality of the statement,Predicates & Quantifiers

Unit – 4: Fuzzy Sets (8)

4.1 Introduction: Fuzzy numbers, Fuzzy set.

4.2 Classical logic

4.3 Applying truth values- continuous variable

4.4 Linguistic variables

4.5 Types of Fuzzy Logics

4.6 Advantages of Fuzzy Logic

4.7 Disadvantages of Fuzzy Logic

Section – II

Unit – 1: Relations (10)

1.1 Functions : Definition, Types of mapping, Injective, Surjecive & Bijecive functions, Inverse function, Composition of functions

1.2 Ordered pairs, Cartesian product

1.3 Relations, Types of relations, Equivalence relation, Partial ordering

1.4 Other types of relation : Irreflexive, Assymmetric

1.5 Digraphs of relations, matrix representation & composition of relations

1.6 Transitive closure, Warshall's algorithm

1.7 Equivalence class, Partition of a set

Unit – 2: Divisibility of integers **(10)**

2.1 Introduction
2.2 Divisibility : Division algorithm (Statement only)
2.3 Greatest Common Divisor (g.c.d.), Least Common Multiple (l.c.m.)
2.4 Euclidean algorithm (Statement only), divisibility Test 1)by 10 (i.e. by 2 & 5) 2)by 11
2.5 Prime numbers, Euclide's lemma, Fundamental theorem of Arithmetic (without proof)
2.6 Congruence relation & its properties
2.7 Fermat's theorem (Statement only), examples
2.8 Residue classes : definition, examples, addition modulo n, multiplication modulo n

Unit – 3: Boolean Algebra **(10)**

3.1 POSET : definition
3.2 Hasse diagram
3.3 Lattice: definition, principle of duality
3.4 Basic properties of algebraic systems defined by Lattice
3.5 Distributive & complemented lattice
3.6 Boolean Lattice & Boolean algebra
3.7 Boolean expression & Boolean functions
3.8 Disjunctive & Conjuctive normal forms & examples
3.9 Finite state machines

Unit – 4 Abstract Algebra **(8)**

4.1 Binary operation : definition
4.2 Semi group & Monoids : definition & examples
4.3 Group : definition & examples, simple properties of groups
4.4 Sub-group : definition & examples

Basic readings

1. Algebra Nirali Publication
2. Algebra & calculus Textbook of B.Sc. computer science, Vision Publication
3. Discrete Mathematics by S.R.Patil & others, Nirali Publication
4. Discrete Mathematics, Vision Publication
5. Elements of Discrete Mathematics by C.L.Liiu
6. Discrete Mathematics by Olympia Nicodemi
7. Algebra by Naik & Patil, Phadake Prakashan

Mathematics -Lab- I

Maths GEC-1300 A

Discrete Mathematics & Algebra

60 Hours (75 Lectures) credits 3.2

1. Recurrence relation
2. Advantages & Disadvantages of Fuzzy Logic
3. Combinational Arguments
4. Euclid's algorithm, division algorithm
5. Fermat's theorem on remainder
6. Warshall's algorithm
7. D.N.F. & C.N.F.
8. Hasse Diagram
9. Finite state machine, input tape, output tape
10. Proofs of valid arguments using laws of inferences

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Semester II Mathematics -Paper- I

Maths GEC-1300 B

Graph Theory & Calculus

Theory: 60 Hours (75 Lectures) credits -4

Section – I

Unit – I Graphs & operations on graphs (9)

1.1 Definition and elementary results
1.2 Types of graphs
1.3 Isomorphism
1.4 Matrix representation of graphs : Adjacency matrix and incidence matrix
1.5 Subgraphs and induced graphs
1.6 Complement of a graph, Self complementary graphs
1.7 Union, intersection of graphs, Ring sum of two graphs

Unit – II Connected Graphs (9)

2.1 Definitions : walk, trail, tour, path and circuit
2.2 Definitions of connected, disconnected graphs
2.3 Dijkstra's shortest path algorithm
2.4 Connectivity : Isthumus, cut-vertex, vertex connectivity and edge connectivity

Unit – III Tree Graphs (8)

3.1 Tree : Definition
  3.1.1 Theorem : A tree with n vertices has n-1 edges
  3.1.2 Theorem : A connected graph G with n vertices and n-1 edges is a tree
  3.1.3 Theorem : A graph with n vertices is a tree if and only if it is circuit free and has n-1 edges
  3.1.4 Theorem : A graph G is a tree if and only if it is minimally connected
3.2 Center of a tree
3.3 Spanning tree : Definition and examples
3.4 Fundamental circuit and cut – set : Definition
3.5 Binary trees and elementary results
3.6 Kruskal's algorithm

Unit – IV Directed Graphs (11)

4.1 Definition, types of directed graphs, vertices
4.2 Isomorphism of digraphs
4.3 Connectedness in digraphs
4.4 Euler digraph
4.5 Network and flows : Definition, examples
4.6 Maximal flow algorithm
4.7 Ford Fulkerson's Maximal flow network algorithm,: Examples

Section – II

Unit – I Sequences of real numbers (11)

1.1 Sequences of real numbers: definition, examples
1.2 Convergent, divergent, oscillatory sequences, definition & examples
1.3 Bounded sequence : definition & examples

1.4 Monotonic sequences, theorem on monotonic & bounded sequences(statement only)
1.5 Show that $\{(1+1/n)^n\}$ is convergent & its limit is 'e'.
1.6 Convergence of sequence $\{x^n\}$, where $x \in R, x > 0$.

Unit – II Series of real numbers (9)

2.1 Partial sums
2.2 Convergent, divergent series, definition & examples
2.3 Convergence of geometric series(with proof)
2.4 Comparison test & its limit form (for the series of positive term)
2.5 Convergence of p-series (with proof)
2.6 D'Alembert's ratio test (statement only) & examples
2.7 Root test (statement only) & examples

Unit – III Continuity & Mean Value Theorem (11)

3.1 Continuity of a function & its properties defined on [a,b] (properties without proof)
3.2 Differentiability, Differentiability implies continuity but not conversely
3.3 Rolle's theorem (with proof) & its geometric significance & examples
3.4 Lagrange's mean value theorem (with proof) & its geometric significance & examples
3.5 Cauchy's mean value theorem (with proof) & examples

Unit – IV Successive differentiation (7)

4.1 n^{th} derivatives of some standard functions
4.2 Leibnitz's theorem (with proof) & examples
4.3 L'Hospital's Rule(without proof) & examples
4.4 Taylor's & Maclaurin's theorems with Lagrange's & Cauchy's forms of remainders (without proof)
4.5 Taylor's & Maclaurin's series
4.6 Series expansion of $e^x, \sin x, \cos x, \log(1+x)$ etc.

Basic readings

1. Calculus , Nirali Publication
2. A text book of calculus and differential equations by Dinde H. T.

Reference Books:

1. Elements of Discrete Mathematics by C.L.Liu
2. Discrete Mahemaics by Olympia Nicodemi
3. Discrete Mathematical Structure for Computer Science by Alan Doer and K. Levasicur
4. Discrete and combinational Mathematics by R.M.Grassl
5. Discrete Mathematics by Kenneth Rosen, Tata Mc Graw Hill
6. Graph Theory with Applications to Computer Science and Engineering by Narsing Deo, Prentice Hall, India
7. A first step in graph theory by Raghunathan, Nimkar and Solapurkar
8. Discrete Mathematics by S.R.Pail and others, Nirali Prakashan

Mathematics -Lab- II

Maths GEC-1300 B

Graph Theory & Calculus

60 Hours (75 Lectures) credits 3.2

1. Kruskal's algorithm
2. Dijkstra's shortest path algorithm
3. Fundamental circuits & cutsets
4. Ford Fulkerson's maximal flow network
5. Rolle's theorem
6. Lagrange's mean value theorem
7. Cauchy's mean value theorem
8. Series expansion of $e^x, \sin x, \cos x, \log(1+x)$

9. L’Hospital’s Rule
10. Leibnitz’s Rule

Nature of Question Paper for all (Theory) papers U.G. Courses under Faculty of Science.

Nature of Question Paper ----- Total 80 Marks

Section-I

Q.No.1 Multiple Choice based objective type question 08 Marks

(Four options for each question be given)

Q.No. 2 Attempt any two of the following –long Answers (out of three) 16 Marks

Q.No. 3 Attempt any four of the following -Short Answers - (out of six) 16 Marks

Section-II

Q.No.4 Multiple Choice based objective type question 08 Marks

(Four options for each question be given)

Q.No.5 Attempt any two of the following –long Answers (out of three) 16 Marks

Q.No. 6 Attempt any four of the following -Short Answers - (out of six) 16 Marks