

Roll No.

Total No. of Pages : 02

Total No. of Questions : 09

MCA (Sem.-1)
ADVANCED DATA STRUCTURES

Subject Code : PGCA-1952

M.Code : 79037

Date of Examination : 21-12-2023

Time : 3 Hrs.

Max. Marks : 70

INSTRUCTIONS TO CANDIDATES :

1. SECTION-A is COMPULSORY consisting of TEN questions carrying TWO marks each.
2. SECTION - B & C have FOUR questions each.
3. Attempt any FIVE questions from SECTION B & C carrying TEN marks each.
4. Select atleast TWO questions from SECTION - B & C.

SECTION-A

1) Write short notes on :

- a. What do you mean by amortized analysis?
- b. What is the worst case time complexity of merge sort?
- c. What are the characteristics of a good hash function?
- d. What is the worst case time complexity of counting sort algorithm?
- e. What are the four rotations of AVL tree?
- f. What is minimum spanning tree?
- g. What is maximum flow?
- h. What is string copy?
- i. How to concatenate two strings? Explain.
- j. What is the time complexity of Rabin Karp algorithm?



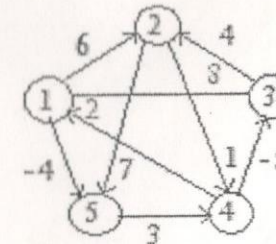
SECTION-B

2) Answer the following :

- a. Consider a hash table with 10 slots and the collisions are resolved by linear probing. The following keys are inserted in the order: 15, 2, 1, 5, 20, 31, 12, 21, 17 and 34. The hash function is $h(k) = k \bmod 10$. What is the resultant hash table?
- b. What is perfect hashing? Explain.
- 3) a. Show the red-black trees that result after successively 41, 38, 31, 12, 19, 8 into an initially empty red-black tree.
- b. Explain disjoint-set data structures using an example.
- 4) What is the difference between counting sort and bucket sort? Explain with an example.
- 5) What are the methods of amortized analysis? Explain in detail.

SECTION-C

- 6) How graphs are represented in memory? Explain in detail.
- 7) Apply all pairs shortest algorithm for constructing the shortest path for the following graph.



- 8) What is the good suffix rule in Boyer-Moore algorithm? Explain in detail with the help of an example.
- 9) What is prefix function in Knuth-Morris-Pratt algorithm? Explain in detail.

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Roll No.

Total No. of Pages : 02

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MCA (Sem.-1)
TECHNICAL COMMUNICATION

Subject Code : PGCA-1905

M.Code. : 79039

Date Examination : 29-12-2023

Time : 3 Hrs.

Max. Marks : 70

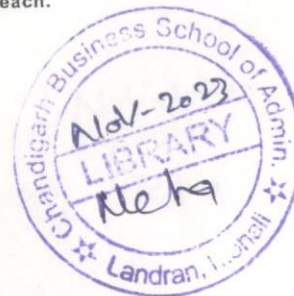
INSTRUCTIONS TO CANDIDATES :

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3. Attempt any FIVE questions from SECTION B & C carrying TEN marks each.
4. Select atleast TWO questions from SECTION - B & C.

SECTION-A

1. Write short notes on :

- a) Communication
- b) Advantages of listening skills
- c) 7C's of effective communication(only names)
- d) Coherence in writing
- e) Precis Writing
- f) Purpose of Indexing
- g) Body Language
- h) Types of Verbal Communication
- i) Newsletter
- j) Symposium.



SECTION-B

2. Communication- an Art or a Science. Discuss.
3. What are the barriers to communication? How to have an effective communication?
4. Write a Paragraph on 'Importance of Soft Skills'
5. Write a letter to a dealer asking for a discount on bulk order of computers.

SECTION-C

6. Write a memo from the Manager to the employees for their misconduct during an event.
7. Discuss the format of Technical Report.
8. What are the qualities required for an effective presentation?
9. What is an e-mail? Write a sample email explaining various components of e-mail.

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Roll No.

Total No. of Pages : 02

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MCA (Sem.-1)
ADVANCED DATABASE MANAGEMENT SYSTEM

Subject Code : PGCA-1953

M.Code : 79038

Date of Examination : 11-12-2023

Time : 3 Hrs.

Max. Marks : 70

INSTRUCTIONS TO CANDIDATES :

1. SECTION-A is COMPULSORY consisting of TEN questions carrying TWO marks each.
2. SECTION - B & C. have FOUR questions each.
3. Attempt any FIVE questions from SECTION B & C carrying TEN marks each.
4. Select atleast TWO questions from SECTION - B & C.

SECTION-A

1. Write short notes on :

- a) What do you understand by Data Independence? Name its types.
- b) Define Conceptual view and Physical view of DBMS.
- c) What are weak entities? How are they represented in DBMS?
- d) Define Multi-valued Dependency. Give an example.
- e) Define Relational Calculus.
- f) What do you understand by Document Type Definition?
- g) Distributed DBMS Commit Protocols.
- h) What do you understand by Spatial Databases and its types?
- i) Define Distributed Query Processing.
- j) Given the relation $R(ABCDEFGH)$ with the following functional dependencies.

$F: \{CH \rightarrow G, A \rightarrow BC, B \rightarrow CFH, E \rightarrow A, F \rightarrow EG\}$

List the all-possible candidate keys for the relation R.

SECTION-B

2. Explain about Database System Architecture with diagrams. Discuss its types.
3. a) What is meant by ER model? Explain the term relationship in ER model, Connectivity and Cardinality.
b) Discuss the types of relationship in ER model with suitable examples.
4. a) Find the highest normal form of a relation $R(V, W, X, Y, Z)$ with functional dependency set as :

$\{WX \rightarrow Y, VX \rightarrow WZ, W \rightarrow Z\}$

- b) State the difference between 3NF and BCNF with proper examples.
5. What is Concurrency? Discuss different concurrency control techniques.

SECTION-C

6. What is Parallel Database? Compare inter and intra query parallelism.
7. What do you understand by the concept of distributed database? Discuss the various commit protocols in DDBMS.
8. Define the term Big Data and No SQL databases. What are the different types of NoSQL Databases? Discuss open source databases.
9. What is temporality in the context of databases, and why is it important in data management? What is the difference between valid time and transaction time in temporal databases?

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MCA (Sem.-1)

DISCRETE STRUCTURES AND OPTIMIZATION

Subject Code : PGCA-1917

M.Code : 79035

Date of Examination : 14-12-2023

Time : 3 Hrs.

Max. Marks : 70

INSTRUCTIONS TO CANDIDATES :

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 2. SECTION - B & C. have **FOUR** questions each.
 3. Attempt any **FIVE** questions from SECTION B & C carrying **TEN** marks each.
 4. Select atleast **TWO** questions from SECTION - B & C.

SECTION-A

1. Write short notes on the following :

- a) What is the basic concept of set theory and how it is used in discrete mathematics?
- b) How does the study of combinatorial mathematics contribute in optimizing algorithms in computer science?
- c) What distinguishes fields, integral domains and rings in abstract algebra?
- d) What is the role of hashing functions in data structures?
- e) What are some practical instances where the pigeonhole principle is employed within combinatorial mathematics?
- f) Differentiate briefly between semigroups, monoids and groups.
- g) What is the significance of cosets and congruence relations in the context of group theory?
- h) Define isomorphism and homomorphism in graph theory.
- i) List the characteristics of Hamiltonian paths.
- j) What is the concept of Euler graphs and list their properties?

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SECTION-B

2. Imagine a scenario where the population of bacteria in a colony multiplies by 4 every hour.
 - a) How would you establish a recurrence relation for the number of bacteria after n hours?
 - b) If a colony begins with 50 bacteria and the population grows by a factor of 5 every hour, how many bacteria will be present in the colony after 8 hours?
3. Explain the practical applications of combinations and permutations. What is the minimum number of students needed in a discrete mathematics class to guarantee that at least three students receive the same grade, when there are four possible grades: A, B, C, and D?
4. Define Boolean Algebra, sub-algebras and Boolean rings. Given the Boolean function $F(A, B, C, D) = \sum(0, 2, 5, 7, 11, 13, 14, 15)$, employ the Karnaugh Map method to simplify the function F and represent the resulting expression.
5. Provide an overview of the key characteristics of rings and offer examples of different types of rings. Also, compare rings to other algebraic structures, such as groups and fields, highlighting their distinctive features.

SECTION-C

6. Describe the fundamental principles and characteristics of right cosets in the context of group theory. Calculate the number of right cosets of a subgroup H in a group G , given $|G| = 72$ and $|H| = 8$.
7. Delve into the concept and attributes of symmetric groups and provide concrete examples. Determine the order of a symmetric group S_{12} and identify any of its non-trivial subgroups.
8. Investigate the significance and practical applications of graph isomorphism in graph theory. Provide specific instances where graph isomorphism plays a crucial role in real-world problems.
9. Write an extensive explanation of the concept of planar graphs and their coloring properties in graph theory. Discuss the history and significance of the Four-Color Theorem and the current status of its proof, whether it remains a conjecture or has been proven.

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MCA (Sem.-1)
PROGRAMMING IN PYTHON
Subject Code : PGCA-1951
M. Code : 79036
Date of Examination : 16-12-2023

Time : 3 Hrs.

Max. Marks : 70

INSTRUCTIONS TO CANDIDATES :

1. SECTION-A is COMPULSORY consisting of TEN questions carrying TWO marks each.
2. SECTION - B & C. have FOUR questions each.
3. Attempt any FIVE questions from SECTION B & C carrying TEN marks each.
4. Select atleast TWO questions from SECTION - B & C.

SECTION-A

1. Write short notes on :
 - a) What is Python's main design philosophy?
 - b) How do you declare a variable in Python?
 - c) What is the purpose of the print() function in Python?
 - d) How can you comment a single line in Python?
 - e) What does the len() function do in Python?
 - f) How do you create a list in Python?
 - g) What does a Python set data structure contain?
 - h) How do you define a function in Python?
 - i) What is a module in Python?
 - j) How do you handle an exception in Python?

SECTION-B

2. What is the purpose of an indentation in Python code, and how is it different from other languages?
3. What are data types in Python and can you provide examples of each?
4. Describe the use of list, set and dictionary comprehensions in Python.
5. Write a program that finds the largest element in a list of numbers without using built-in functions like `max()`.

SECTION C

6. Discuss the concept of Object-Oriented Programming (OOP) in Python. How can you create and manipulate classes and objects in Python?
7. Write a Python program to find the factorial of a number using a recursive function.
8. Create a Python class representing a basic calculator with methods for addition, subtraction, multiplication and division.
9. Develop a Python script that calculates the area of various geometric shapes (e.g., circle, rectangle, triangle) based on user input.

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MCA (Sem.-1)

TECHNICAL COMMUNICATION

Subject Code : PGCA-1905

M.Code. : 79039

Date Examination : 18-05-2023

Time : 3 Hrs.

Max. Marks : 70

INSTRUCTIONS TO CANDIDATES :

1. SECTION-A is COMPULSORY consisting of TEN questions carrying TWO marks each.
2. SECTION - B & C. have FOUR questions each.
3. Attempt any FIVE questions from SECTION B & C carrying TEN marks each.
4. Select atleast TWO questions from SECTION - B & C.

SECTION-A

1. **Write short notes on :**
- a) What is the process of communication?
 - b) What is emotional barrier to communication?
 - c) Name the 7Cs.
 - d) What is grapevine?
 - e) What do you mean by communication flow?
 - f) What is a resume?
 - g) What is extempore?
 - h) What is index?
 - i) What is primary Bibliography?
 - j) What is plagiarism?



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SECTION-B

2. Define Communication. Discuss in detail, the functions of communication.
3. What do you mean by Networks? Explain the importance of networks.
4. Write a descriptive paragraph on Your Graduation Ceremony.
5. Write a precis of the following:

There is an enemy beneath our feet—an enemy more deadly for his complete impartiality. He recognizes no national boundaries and no political parties. Everyone in the world is threatened by him. The enemy is the Earth itself. When an earthquake strikes, the world trembles. The power of a quake is greater than anything man himself can produce. But today scientists are directing a great deal of their effort into finding some way of combating earthquakes and perhaps at some time shortly, mankind will have discovered a means of protecting itself from earthquakes. An earthquake strikes without warning. When it does, its power is immense. If it strikes a modern city, the damage it causes is as great as if it has struck a primitive village. Gas mains burst, explosions are caused and fires are started. Underground railways are wrecked. Buildings collapse, bridges fall, dams burst and gaping crevices appear in busy streets.

SECTION-C

6. Draft a newsletter for your college activities this month, include at least five activities.
7. Write a memo for the accounts branch reprimanding them to prepare the accounts ledger in a proper and flawless manner.
8. Enumerate and explain the effective presentation techniques.
9. What are the basic essentials of Group discussion? Also discuss the don'ts of Group discussion.

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MCA (Sem.-1)

ADVANCED DATABASE MANAGEMENT SYSTEM

Subject Code : PGCA-1953

M.Code : 79038

Date of Examination : 22-05-2023

Time : 3 Hrs.

Max. Marks : 70

INSTRUCTIONS TO CANDIDATES :

1. SECTION-A is COMPULSORY consisting of TEN questions carrying TWO marks each.
2. SECTION - B & C. have FOUR questions each.
3. Attempt any FIVE questions from SECTION B & C carrying TEN marks each.
4. Select atleast TWO questions from SECTION - B & C.

SECTION-A

- 1) **Write short notes on :**
- a) Data Independence
 - b) Cardinality of Relation
 - c) Referential Integrity Constraints
 - d) Relational Calculus
 - e) Cartesian Product
 - f) Intra query parallelism
 - g) Distributed Database Storage
 - h) NoSQL Databases
 - i) Document Type Definition (DTD)
 - j) Distributed DBMS Commit Protocols.



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SECTION-B

2. What is the purpose of database management system and its applications? Discuss in detail.
3. What is ER data model? Explain ER diagram with suitable example and their terminology.
4. What is the process of normalization? Explain type of normal forms and dependencies.
5. What is Concurrency? Discuss different concurrency control techniques.

SECTION-C

6. What are the types of parallel database? What is intra vs. inter parallelism?
7. What are the concepts of distributed databases? How queries are processed in DDBMS?
8. What is Big data and its types? Discuss open source NOSQL databases.
9. What are the types of XML databases? What is an XML schema type?



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MCA (Sem-1)
DISCRETE STRUCTURES AND OPTIMIZATION

Subject Code : PGCA-1917

M.Code : 79035

Date of Examination : 25-05-2023

Time : 3 Hrs.

Max. Marks : 70

INSTRUCTIONS TO CANDIDATES :

1. SECTION-A is COMPULSORY consisting of TEN questions carrying TWO marks each.
2. SECTION - B & C. have FOUR questions each.
3. Attempt any FIVE questions from SECTION B & C carrying TEN marks each.
4. Select atleast TWO questions from SECTION - B & C.

SECTION-A

1. Write briefly :

- a) If $f, g : R \rightarrow R$ be defined by $f(x) = x^2 + 2x + 2$, $g(x) = 2x - 3$. Find $f \circ g$, $g \circ f$.
- b) Find generating function for series $-5, 25, -125, \dots$
- c) Define B-Tree.
- d) Consider following relation on set $A = \{1, 2, 3\}$, $S = \text{Empty relation}$, $T = \text{Universal Relation}$. Determine whether or not each of above relation on A is an equivalence relation.
- e) Differentiate between POSET and equivalence relation.
- f) Prove that maximum number of edges in a simple graph having n vertices is $n(n-1)/2$.
- g) How many permutations of the letter ABCDEFGH contains the string ABC?
- h) How many edges are there in a tree having n vertices.
- i) Define kernel of a Homomorphism.
- j) Give an example of a relation which is both symmetric and anti symmetric.



SECTION-B

2. a) Let R be relation on the set of ordered pair of positive integers such that $(a, b), (c, d) \in R$ if and only if $a+d=b+c$. Show that R is an equivalence relation.
- b) Draw Hasse diagram for divisibility on D_{30} .
3. a) How many bit strings of length ten contains either three consecutive 0s or four consecutive 1s?
- b) What is the minimum number of students required in a discrete mathematics class to be sure that at least six will receive the same grade, if there are five possible grades A, B, C, D and F.
4. a) Construct circuits from NOT, AND gates and OR gates to produce these outputs.
i) $xyz + x'y'z'$
ii) $((x'+z)(y+z'))'$
- b) Let $(A, +, \cdot)$ be a ring such that $a \cdot a = a$ for all a in A . Show that $a + a = 0$ for all a , where 0 is the additive identity. Also show that operation is commutative.
5. Solve recurrence relation $a_n = 4a_{n-1} - 4a_{n-2} + (n+1)2^n$.

SECTION-C

6. Show that $\langle Z, + \rangle$ is a group.
7. a) State and prove Lagrange's theorem.
b) Prove that equality relation is a congruence relation on any algebra
8. a) State and prove Euler's theorem.
b) Show that every connected graph with n vertices has at least $n-1$ edges.
9. a) Draw all subgraphs of the graph with edges $(d, a), (d, c)$ and (d, b) .
b) Determine whether the graph with the edges $(a, b), (a, e), (b, c), (b, d), (b, e), (c, d), (d, e)$ has a Hamilton circuit.

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MCA (Sem-1)
DISCRETE STRUCTURES AND OPTIMIZATION

Subject Code : PGCA-1917

M.Code : 79035

Date of Examination : 25-05-2023

Time : 3 Hrs.

Max. Marks : 70

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SECTION-A

1. Write briefly :

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- b) Find generating function for series $-5, 25, -125, \dots$
- c) Define B-Tree.
- d) Consider following relation on set $A = \{1, 2, 3\}$, $S = \text{Empty relation}$, $T = \text{Universal Relation}$. Determine whether or not each of above relation on A is an equivalence relation.
- e) Differentiate between POSET and equivalence relation.
- f) Prove that maximum number of edges in a simple graph having n vertices is $n(n-1)/2$.
- g) How many permutations of the letter ABCDEFGH contains the string ABC?
- h) How many edges are there in a tree having n vertices.
- i) Define kernel of a Homomorphism.
- j) Give an example of a relation which is both symmetric and anti symmetric.



SECTION-B

2. a) Let R be relation on the set of ordered pair of positive integers such that $(a, b), (c, d) \in R$ if and only if $a+d=b+c$. Show that R is an equivalence relation.
- b) Draw Hasse diagram for divisibility on D_{30} .
3. a) How many bit strings of length ten contains either three consecutive 0s or four consecutive 1s?
- b) What is the minimum number of students required in a discrete mathematics class to be sure that at least six will receive the same grade, if there are five possible grades A, B, C, D and F.
4. a) Construct circuits from NOT, AND gates and OR gates to produce these outputs.
 - i) $x y z + x' y' z'$
 - ii) $((x'+z)(y+z'))'$
- b) Let $(A, +, \cdot)$ be a ring such that $a \cdot a = a$ for all a in A . Show that $a + a = 0$ for all a , where 0 is the additive identity. Also show that operation is commutative.

5. Solve recurrence relation $a_n = 4a_{n-1} - 4a_{n-2} + (n+1)2^n$.

SECTION-C

6. Show that $\langle Z, + \rangle$ is a group.
7. a) State and prove Lagrange's theorem.
- b) Prove that equality relation is a congruence relation on any algebra
8. a) State and prove Euler's theorem.
- b) Show that every connected graph with n vertices has at least $n-1$ edges.
9. a) Draw all subgraphs of the graph with edges $(d, a), (d, c)$ and (d, b) .
- b) Determine whether the graph with the edges $(a, b), (a, e), (b, c), (b, d), (b, e), (c, d), (d, e)$ has a Hamilton circuit.

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MCA (Sem.-1)
ADVANCED DATA STRUCTURES

Subject Code : PGCA-1952

M.Code : 79037

Date of Examination : 20-05-2023

Time : 3 Hrs.

Max. Marks : 70

INSTRUCTIONS TO CANDIDATES :

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2. SECTION - B & C have FOUR questions each.
3. Attempt any FIVE questions from SECTION B & C carrying TEN marks each.
4. Select atleast TWO questions from SECTION - B & C.

SECTION-A

1. Write short notes on :

- What is the importance of Red Black tree?
- Explain Rehashing methods.
- Draw the single rotation for AVL tree.
- List out the properties of Red-Black trees.
- What is the main advantage of hashing?
- What are the applications of minimal spanning trees?
- What are the properties of B-Trees?
- Name the various algorithms for string matching.
- What are the ways to represent a graph in the memory of a computer system?
- What is working principle of Quick sort?



SECTION-B

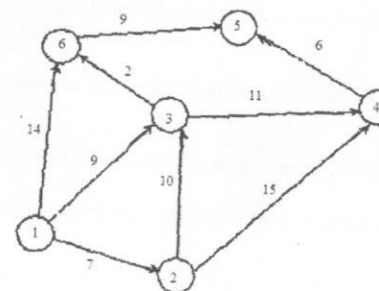
2. What is an AVL tree? What are the types of rotations that may be performed on a AVL tree?
3. Write the properties of BST, AVL tree, B-Tree and Red-black tree.
4. Develop a max heap from the following sequence of nodes and apply heap sort. Show all the intermediate steps.

10 36 12 18 54 50 73 51 43 23 44

5. What is the concept of Hashing? Explain various techniques used for hashing. How collisions are handled while addressing?

SECTION-C

6. Apply Dijkstra's algorithm on the following directed weighted graph with source 1.



7. Explain the Knuth-Morris-Pratt algorithm for string searching through an illustrative example.
8. Modify Dijkstra's algorithm to solve APSP problem.
9. What are minimal spanning trees? Compare the Kruskal's and Prim's algorithms for finding the Minimal Spanning tree from a graph.

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MCA (Sem.-1)
PROGRAMMING IN PYTHON

Subject Code : PGCA-1951

M. Code : 79036

Date of Examination : 16-05-2023

Time : 3 Hrs.

Max. Marks : 70

INSTRUCTIONS TO CANDIDATES :

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2. **SECTION - B & C.** have **FOUR** questions each.
3. Attempt any **FIVE** questions from **SECTION B & C** carrying **TEN** marks each.
4. Select atleast **TWO** questions from **SECTION - B & C.**

SECTION-A

1. **Write short notes :**

- a. List the limiting features of Python.
- b. Illustrate how multiple assignment is done.
- c. Differentiate between type casting and type coercion.
- d. What are the various logical operators available in Python?
- e. Explain the usage of break statement.
- f. How are strings
 - i) Concatenated and
 - ii) Appended?
- g. Demonstrate how lambda functions are used?
- h. How are files deleted?
- i. What do you mean by garbage collection?
- j. How are class attributes edited?



SECTION-B

2. "Python is a complete programming language." Discuss the features of Python that makes it a powerful language. What are the limitations of Python? Write about the history and development of Python over past years.
3. What are the different types of variables available in Python? Write a program to read two floating point numbers. Add these numbers and assign the result to an integer.
4. What are the various conditional branching statements used in Python? Write a program to find the greatest number from three numbers using if-elif-else statement.
5. Write a detailed note on dictionary. Discuss various functions and methods of dictionaries with the help of examples.

SECTION-C

6. What is the need of user-defined functions? How are functions defined? Write a program that adds two numbers using function.
7. Write a detailed note on exception handling. How are user-defined exceptions defined and used?
8. Discuss the object oriented features of Python. Explain the process of creation of classes.
9. Discuss how files are opened and closed in Python. Explain the various access modes.

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MCA (Sem.-1)
TECHNICAL COMMUNICATION

Subject Code : PGCA-1905

M.Code. : 79039

Date of Examination : 19-01-2023

Time : 3 Hrs.

Max. Marks : 70

INSTRUCTIONS TO CANDIDATES :

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2. SECTION - B & C have FOUR questions each.
3. Attempt any FIVE questions from SECTION B & C carrying TEN marks each.
4. Select atleast TWO questions from SECTION - B & C.

SECTION-A

1. Write short notes on :

- a) Net-etiquettes
- b) Barriers to Communication
- c) Listening vs Hearing
- d) Seminar
- e) GD
- f) Meeting & Conference
- g) Précis
- h) Communication Skills
- i) Newsletter
- j) Dissertation & Thesis.

SECTION-B

2. Explain the process of communication. What are the different types of Communication?
3. How to make a communication effective? What are its effective C's?
4. Write a Paragraph on 'Role of a Woman in the Society'.
5. Write a letter to a dealer asking for a quotation for office chairs.

SECTION-C

6. What is an interview? What should be done in order to project a positive Image for an Interview?
7. Discuss the basic structure of a technical report. How are technical reports different from general reports?
8. What is the difference between a Resume & a CV? Prepare a sample resume for the profile of a 'Software Developer'.
9. What is an e-mail? Write an email asking for one week leave from your boss.



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Roll No.

Total No. of Questions : 09

Total No. of Pages : 02

MCA (Sem.-1)
ADVANCED DATA STRUCTURES

Subject Code : PGCA-1952

M.Code : 79037

Date of Examination : 14-01-2023

Time : 3 Hrs.

Max. Marks : 70

INSTRUCTIONS TO CANDIDATES :

1. SECTION-A is COMPULSORY consisting of TEN questions carrying TWO marks each.
2. SECTION - B & C have FOUR questions each.
3. Attempt any FIVE questions from SECTION B & C carrying TEN marks each.
4. Select atleast TWO questions from SECTION - B & C.

SECTION-A

1. Answer briefly :

- a) Write the time complexity of merge sort algorithm.
- b) Explain the advantage of bucket sort.
- c) What are the disadvantages of open addressing?
- d) Explain the properties of Red-black tree.
- e) Explain string concatenation with the help of an example.
- f) What do you mean by single source shortest path algorithm?
- g) What do you mean by graph? Explain.
- h) What are the applications of disjoint set data structure?
- i) Explain Fibonacci heaps.
- j) List the applications of Minimum Spanning Tree (MST).

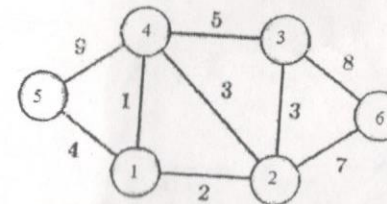


SECTION-B

2. Discuss the best case, worst case, average case and amortized time complexity of an algorithm.
3. Sort the following sequence of numbers in descending order using heap sort
42, 34, 75, 23, 21, 18, 90, 67, 78
4. a) What do you mean by a hash function? Give the properties of a good hash function.
b) What is collision? Explain the various techniques to resolve a collision with an example to each.
5. Consider the following sequence of keys (5, 16, 22, 45, 2, 10, 18, 30, 50, 12, 1). Construct the red-black tree T (initially tree is empty) by inserting the sequence of keys as above.

SECTION-C

6. Solve minimum spanning tree of the following graph using Kruskal's algorithm



7. How are graphs represented inside a computer's memory? Which method do you prefer and why? Explain in detail.
8. Explain Boyer-Moore algorithm along with an example.
9. How does Knuth Morris-Pratt (KMP) algorithm works? Explain along with an example.

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Roll No.

Total No. of Questions : 09

Total No. of Pages : 02

MCA (Sem.-1)
ADVANCED DATABASE MANAGEMENT SYSTEM

Subject Code : PGCA-1953

M.Code : 79038

Date of Examination : 17-01-2023

Time : 3 Hrs.

Max. Marks : 70

INSTRUCTIONS TO CANDIDATES :

1. SECTION-A is COMPULSORY consisting of TEN questions carrying TWO marks each.
2. SECTION - B & C. have FOUR questions each.
3. Attempt any FIVE questions from SECTION B & C carrying TEN marks each.
4. Select atleast TWO questions from SECTION - B & C.

SECTION-A

1) Write short notes on :

- a) DBMS Data Models
- b) ER Model
- c) Functional Dependencies
- d) Relational Calculus
- e) Concurrency Control
- f) Parallel Database
- g) Commit Protocols
- h) Temporal Hierarchies
- i) Spatial data structures
- j) XML Data Model.



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SECTION-B

- 2) What is data integrity? Explain the types of integrity constraints.
- 3) What are the advantages of normalized relations over the un-normalized relations?
- 4) Write a short note on :
 - a) Serializability
 - b) Recoverability.
- 5) Explain 1NF, 2NF and 3NF of normalization with example. What do you understand by multi version concurrency schemes?

SECTION-C

- 6) Explain Client-Server Architectures.
- 7) Explain XML Database. With example.
- 8) Write short notes on:
 - a) Temporal relationships
 - b) Data analytics in multidimensional database
 - c) Concurrency control.
- 9) Discuss the difference between intra query parallelism and intra operation parallelism.

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Total No. of Questions : 09

Total No. of Pages : 03

MCA (Sem.-1)
DISCRETE STRUCTURES AND OPTIMIZATION

Subject Code : PGCA1917

M.Code : 79035

Date of Examination : 10-01-2023

Time : 3 Hrs.

Max. Marks : 70

INSTRUCTIONS TO CANDIDATES :

1. SECTION-A is COMPULSORY consisting of TEN questions carrying TWO marks each.
2. SECTION - B & C. have FOUR questions each.
3. Attempt any FIVE questions from SECTION B & C carrying TEN marks each.
4. Select atleast TWO questions from SECTION - B & C.

SECTION-A

I. Write short notes on :

- a) Euclidean domain
- b) POSET
- c) Monoid
- d) Automorphism
- e) Application of pigeon hole principle
- f) Complemented Lattice
- g) Order of a group
- h) Commutative ring
- i) Define anti-symmetric relation with example
- j) State Euler's formula for connected planar graph.



SECTION-B

2. Let $A = \{1, 2, 4, 5, 7, 11, 13\}$. Define a relation R on A by writing $(x, y) \in R$ if and only if $(x-y)$ is a multiple of 3.
 - a) Show that R is an equivalence relation on A .
 - b) How many equivalence classes of R are there?
3. Convert the following Boolean expression into standard Sum of Products form:

a) $(\bar{A} + B + C)(\bar{B} + C + \bar{D})(A + \bar{B} + \bar{C} + D)$

- b) Reduce the equation using DeMorgans's law :

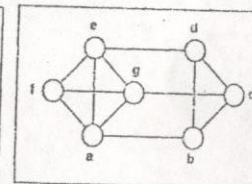
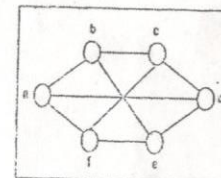
$$(\bar{A} + \bar{B})[\overline{A(B+C)}] + A(\bar{B} + \bar{C})$$

4. Among 50 patients admitted to a hospital, 25 are diagnosed with pneumonia, 30 with bronchitis, and 10 with both pneumonia and bronchitis. Determine:
 - a) The number of patients diagnosed with pneumonia or bronchitis (or both).
 - b) The number of patients not diagnosed with pneumonia or bronchitis.

Also draw the Venn diagram.
5. a) State partial order relation with suitable example.
- b) Show whether the relation $(x, y) \in R$, if, $x \geq y$ defined on the set of positive integers is a partial order relation.

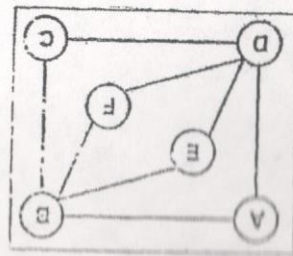
SECTION-C

6. State the clear difference between group, semigroup and monoid with suitable example.
7. Define abelian group with a suitable example. Let G be the set of real numbers and let $\times$ be the set of real numbers and let $a \times b = ab/2$. Show that $(G, \times)$ is an abelian group.
8. State the graph colouring problem and state how greedy algorithm has been used to find out the chromatic number. Find out the chromatic number of following graphs.



9.

Define euler graph and discuss its applications. Also describe the difference between Euler path and circuit. Find the Euler path and circuit in the following graph.



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MCA (Sem.-1)
PROGRAMMING IN PYTHON
Subject Code : PGCA-1951
M. Code : 79036
Date of Examination: 12-01-2023

Time : 3 Hrs.

Max. Marks : 70

INSTRUCTIONS TO CANDIDATES :

1. SECTION-A is COMPULSORY consisting of TEN questions carrying TWO marks each.
2. SECTION - B & C. have FOUR questions each.
3. Attempt any FIVE questions from SECTION B & C carrying TEN marks each.
4. Select atleast TWO questions from SECTION - B & C.

SECTION-A

1. Write short notes on/Fill in the blank :

- a) Application of python
- b) Scope of variables in python
- c) List vs. tuple
- d) Decorators in Python.
- e) Non-associative operator
- f) Python input and output function
- g) Python package.
- h) Define class in Python
- i) Constructors in python
- j) init method.



SECTION-B

2. a. Briefly describe the features of python language and how it is different from other languages?
b. How to set up path and environment variables in python?
3. What are mutable data types in python? Also, explain the differences between these mutable data types.
4. Briefly explain python control statements and why they are needed. Discuss various control statements used in Python.
5. Explain any four methods on each of the following storage collection types
 - a. file
 - b. set
 - c. dictionary with examples.

SECTION-C

6. a. What is python module and briefly explain the ways of importing a module?
b. Briefly explain any four string object methods.
7. Briefly explain the difference between pass by value and pass by reference with suitable example.
8. Briefly explain lambda function in python with suitable example. Also explain filter(), map() and reduce() functions.
9. Write a short note on :
 - a. Built in vs. user defined exceptions.
 - b. Garbage collection

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