R – 6285

Reg. No. : ....

Name : ....

First Semester M.Sc. Degree Examination, May 2023

Computer Science

CS 511 : MATHEMATICAL FOUNDATIONS OF COMPUTER SCIENCE

(2021 Admission Onwards)

Time : 3 Hours   Max. Marks : 75

SECTION – A

Answer **all** questions. **Each** question carries 3 marks.

1. Let S be a set of six positive integers whose maximum is at most 14. Show that the sums of the elements in all the nonempty subsets of S cannot all be distinct, using pigeonhole principle.

2. Define partially ordered set.

3. Give a non-trivial matrix A, which is self-inverse.

4. Symbolize the sentence: All animals can walk, by using quantifiers, predicates and logical connectives.

5. Prove that there is one and only one path between every pair of vertices in a tree, T.

6. Prove that a tree with n, $(n \geq 2)$ vertices has at least two vertices of degree one.

7. Define semi-group, monoid, group and subgroup.

8. Let G be an abelian group. A mapping $\phi: G \rightarrow G$ is defined as $\phi(x) = x^3$. Check whether ϕ is a homeomorphism or not.

9. Three of the 6 vertices of a regular hexagon are chosen at random. Find the probability that a triangle with three vertices is equilateral.

(9 × 3 = 27 Marks)

PART – B

Answer any **one** questions from **each** module. **Each** question carries **8** marks.

Module – I

10. A permutation X of $\{1,2,3,....n\}$ possess ith property if symbol in X is i. A permutation may possess $t(0 \le t \le n)$ properties.

    For example, if $n = 10$ then the permutation $\{7, 1, 2, 4, 5, 3, 8, 9, 6, 10\}$ possesses 3 properties namely 4th, 5th and 10th properties as i^{th} symbol is i for $i = 4, 5$, and 10 and the permutation $\{7, 1, 2, 5, 6, 4, 3, 9, 10, 8\}$ does not possess any property.

    By using the principle of inclusion exclusion, find the number permutations of $\{1,2,3,.....n\}$ which does not possess any of the n properties.

11. Explain the principle of Inclusion and Exclusion.

Module – II

12. Using elementary operations, find a given that matrix $M = \begin{bmatrix} a & 9 & -9 \\ -158 & -29 & 25 \\ 46 & 7 & -8 \end{bmatrix}$ is singular.

13. Find two distinct matrices A and B (i.e., $A \ne B$) such that

$$\begin{bmatrix} 1 & 0 & 0 & 2 \\ 0 & -1 & 1 & 4 \end{bmatrix} A = \begin{bmatrix} 1 & 0 & 0 & 2 \\ 0 & -1 & 1 & 4 \end{bmatrix} B = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$$

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Module – III

14. Without constructing truth table, prove the formula $(p \rightarrow q) \rightarrow (\sim q \rightarrow \sim p)$.

15. Without constructing truth table, prove the formula $(\sim p \wedge q) \rightarrow (\sim q \rightarrow p))$ by mentioning the properties used in each step.

Module – IV

16. Prove that the number of vertices of odd degree in a graph is always even.

17 Prove that a simple graph with n vertices must be connected if it has more than $[(n-1)(n-2)]/2$ edges.

Module – V

18. Let U_n denote the group of integers relatively prime to n under multiplication mod n. Using Lagrange's theorem, or otherwise, find the inverse of 8 in U_{19}. Also verify your result.

19. Construct the multiplication table of the permutation group on $\{1, 2, 3\}$.

Module – VI

20. A man alternatively throws a die and tosses a coin beginning with die. Find the probability that he will get a 6 on the die before he gets a head.

21. Two numbers are chosen at random without replacement from a set, which contains n positive numbers and $n + 1$ negative numbers and multiplied. What is the probability that the product is a positive number?

(6 × 8 = 48 Marks)

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Reg. No. : ....

Name : ....

First Semester M.Sc. Degree Examination, May 2023

Computer Science

CS 514 – COMPUTER GRAPHICS AND IMAGE PROCESSING

(2021 Admission Onwards)

Time : 3 Hours　　　　　　　　　　　　　　　　Max. Marks : 75

PART – A

Answer **ALL** questions. **Each** question carries **3** marks.

1. What is raster scan and random scan systems?

2. List the display devices in computer graphics.

3. Define the properties of Bezier curve.

4. How does animation work?

5. Give the structure of OpenGL.

6. Outline the steps of Vertex post–processing.

7. Give a note on rotation in OpenGL.

8. List down the types of images.

9. What is piecewise linear transformation?

(9 × 3 = 27 Marks)

P.T.O.

Answer any **one** questions from each module. Each question carries **8** marks.

Module – I

10. Describe the various applications of computer graphics.

OR

11. Explain Bresenhams Line Drawing algorithm in detail.

Module – II

12. Write short notes on Bezier curve and spline.

OR

13. What are the characteristics of fractals? Give its importance.

Module – III

14. Outline the features of OpenGL.

OR

15. Describe about the input devices in detail.

Module – IV

16. Discuss the steps taken by the OpenGL when rendering the objects.

OR

17. Write an OpenGL program to display a rectangle.

Module – V

18. Explain the concepts of sampling and quantization using simple example.

OR

19. Discuss the basic intensity transformations in detail.

Module – VI

20. Write short notes on spatial filtering.

OR

21. Describe about histogram equalization in image processing?

(6 × 8 = 48 Marks)

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First Semester M.Sc. Degree Examination, May 2023

Computer Science

CS 513 – DATA STRUCTURES AND ALGORITHMS

(2021 Admission Onwards)

Time : 3 Hours   Max. Marks . 75

PART – A

Answer all questions. Each question carries 3 marks.

1. Write short note on collections in Python.

2. Give details about control structure in python.

3. What is mean by class? How can we create class in Python?

4. Compare insertion sort and selection sort.

5. Write sort note on 'circularly list'.

6. In which ways the graph can be represented? Give examples.

7. Define algorithm. Give details about the representation of the algorithms.

8. What are the different conditions for the Big-Ω notation? Give example.

9. What is graph coloring? Give example.

(9 × 3 = 27 Marks)

PART – B

Answer any **one** questions from each module. Each question carries **8** marks.

Module – I

10. (a) Explain the usage of function in Python with suitable examples. (4)

(b) Write a Python program to construct the following pattern using nested loop.
(4)

```
          1
        1 2 1
      1 2 3 2 1
    1 2 3 4 3 2 1
  1 2 3 4 5 4 3 2 1
```

OR

11. (a) How modules are created in Python? Explain with the help of sample code.
(4)

(b) Write a Python function that checks whether the given number is prime or not. (4)

Module – II

12. Illustrate with suitable example to perform file handling in Python. (8)

OR

13. Explain how the packages are handled in Python. (8)

Module – III

14. Write an algorithm to do queue operations. (8)

OR

15. Explain the linear search with suitable example and algorithm. (8)

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Module – IV

16. (a) What is AVL tree? List out the features of AVL tree. (3)

    (b) How will you do the insertion and deletion In AVL tree? Explain with algorithm and examples. (5)

OR

17. (a) What is indexed sequential file? Give example. (2)

    (b) How the file organization is done in indexed sequential file? Explain. (6)

Module – V

18. Explain merge sort algorithm with example. (8)

OR

19. (a) What are the different methods used for analyzing an algorithm? Give details. (3)

    (b) How do we calculate the space complexity of an algorithm? Explain. (5)

Module – VI

20. Explain all pair shortest path algorithm with suitable example. (8)

OR

21. Explain 0/1 Knapsack problem with suitable example. (8)

(6 × 8 = 48 Marks)

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First Semester M.Sc. Degree Examination, May 2023

Computer Science

CS 512 – DISTRIBUTED OPERATING SYSTEMS

(2021 Admission Onwards)

Time : 3 Hours   Max. Marks : 75

PART – A

Answer **All** questions. **Each** question carries 3 marks.

1. What are the advantages of distributed operating system?

2. Write short notes on naming transparency.

3. What do you mean by clock synchronization?

4. List the modes of communication in distributed system.

5. Give the challenges of distributed shared memory.

6. State the rules followed by timestamp based ordering to enforce serializability.

7. What are the requirements of mutual exclusion?

8. List down the issues of distributed file systems.

9. Distinguish between persistent and transient objects.

(9 × 3 = 27 Marks)

PART – B

Module – I

10. What are the categories of distributed computing model? Explain the workstation server model in detail.

OR

11. List the issues in designing a distributed operating system.

Module – II

12. Explain the events in remote procedure call. Give its advantages and disadvantages.

OR

13. Describe about group communication in distributed system in detail.

Module – III

14. Illustrate the general architecture of distributed shared memory system with a neat diagram.

OR

15. What are the ACID properties of transaction? Explain atomic transactions.

Module – IV

16. Describe centralized algorithms for synchronization in distributed systems.

OR

17. What are the necessary conditions for a deadlock to occur? How will you handle deadlocks in distributed systems?

Module – V

18. Outline the types of file access models in detail.

OR

19. Distinguish between stateless server and stateful server.

Module – VI

20. Illustrate the object based architecture in distribute system with a neat diagram.

OR

21. What is encryption? Write short notes on Data Encryption Standard.

(6 × 8 = 48 Marks)