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Reg. No. : .....

Name : .....

First Semester M.Sc. Degree Examination, April 2024

Computer Science

CS 511 : MATHEMATICAL FOUNDATIONS OF COMPUTER SCIENCE

(2021 Admission Onwards)

Time : 3 Hours Max. Marks : 75

PART – A

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

1. Given A = {2, 5, 6}, B = {3, 4, 2}, C = {1, 3, 4}, find A – B and B – A. Show that A – B ≠ B – A and A – C = A.

2. State Pigeonhole principle.

3. Write short note on symmetric and skew symmetric matrix.

4. Find the rank of the matrix $\begin{pmatrix} 5 & 3 & 0 \\ 1 & 2 & -4 \\ -2 & -4 & 8 \end{pmatrix}$.

5. Prove $(P \rightarrow Q) \leftrightarrow (\neg P \vee Q)$.

6. Prove that $R \wedge (P \vee Q)$ is a valid conclusion from the premises $P \vee Q$, $Q \rightarrow R$, $P \rightarrow M$ and 7M.

7. What is bipartite graph? Give example.

P.T.O.

8. Define Monoid with an example.

9. What are the basic rules of probability?

(9 × 3 = 27 Marks)

PART – B

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

Module – I

10. Show that every equivalence relation on a set generates a unique partition of the set. The blocks of this partition correspond to the R-equivalence classes.

11. Let $< L, \leq >$ be a lattice in which $*$ and $\oplus$ denote the operations of meet and join respectively. For any $a, b \in L$, $a \leq b \leftrightarrow a * b = a \leftrightarrow a \oplus b = b$.

Module – II

12. Solve the following linear equations using Cramer's rule

$$x - y = 2$$
$$x + y + z = 4$$
$$x + y - z = 6$$

13. Solve the following equations using Gauss-Jordan Elimination method

$$2x + 3y - z = 5$$
$$3x + 2y + z = 10$$
$$x - 5y + 3z = 0$$

Module – III

14. Determine the PDNF of the expression $X \rightarrow ((X \rightarrow Y) \wedge \neg (\neg Y \vee X))$ without constructing the truth table.

15. Show that $[(p \rightarrow q) \wedge (q \rightarrow r)] \rightarrow (p \rightarrow r)$ is a tautology.

Module – IV

16. State and prove Euler's theorem.

17. Prove that a tree with a vertex of degree $k > 1$ has at least k pendant vertices. In particular, every tree on at least two vertices has at least two pendant vertices.

Module – V

18. State and prove the Lagrange's theorem.

19. Prove that if G is a cyclic group of order n, then for every divisor d of n there exists precisely one subgroup of order d.

Module – VI

20. In my town, it's rainy one third of the days. Given that it is rainy, there will be heavy traffic with probability 1/2 and given that it is not rainy, there will be heavy traffic with probability 1/4. If it's rainy and there is heavy traffic, I arrive late for work with probability 1/2. On the other hand, the probability of being late is reduced to 1/8 if it is not rainy and there is no heavy traffic. In other situations (rainy and no traffic, not rainy and traffic) the probability of being late is 0.25. You pick a random day.

    (a) What is the probability that it's not raining and there is heavy traffic and I am not late?

    (b) What is the probability that I am late?

    (c) Given that I arrived late at work, what is the probability that it rained that day?

21. Draw the scatter diagram for the following data and state the type of correlation between X and Y.

X	10	20	30	40	50
Y	70	140	210	280	350

(6 × 8 = 48 Marks)

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First Semester M.Sc. Degree Examination, April 2024

Computer Science

CS 513 – DATA STRUCTURES AND ALGORITHMS

(2021 Admission Onwards)

Time : 3 Hours Max Marks : 75

SECTION – A

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

1. Compare tuple and list data structures in Python.
2. Formulate a recursive function in python that finds factorial of a number.
3. Define class and object. Write the Python syntax to create them.
4. Make a short note on Layout mangers in Pyth...
5. How do you represent a circular linked list?
6. Give a brief note on Queue operations
7. Demonstrate the three kinds of graph representation.
8. What is the importance of asymptotic notation in data structures?
9. Comment on All pairs shortest path problem.

(9 × 3 = 27 Marks)

P.T.O.

SECTION – B

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

Module – I

10. Describe the usage of control structures with suitable examples.

OR

11. What is a module? Discuss how to create, import and locate modules.

Module – II

12. Explain how exception handling is performed in Python.

OR

13. Develop a GUI application with Tkinter widgets in Python.

Module – III

14. Write the algorithm for Selection sort. Illustrate the working of the algorithm on the following input : 29, 31, 25, 18, 32, 17

OR

15. Demonstrate the insertion and deletion operations in the doubly linked list.

Module – IV

16. Write the concept behind Binary Search Tree (BST). Construct a BST for the following values: 35, 17, 76, 85, 10, 50,12, 22, 47.

OR

17. Explain how insertion operation is performed in Red Black tree.

Module – V

18. Outline the metrics used to analyze the performance of an algorithm.

OR

19. Write an algorithm for Merge sort. Trace the working of the algorithm on the following input: 35, 28, 10, 24, 48, 87, 65, 41.

Module - VI

20. Illustrate the different stages in Hamiltonian cycles with examples.

OR

21. (a) Explain the algorithm for graph coloring **4**

    (b) Illustrate 0/1 Knaspack problem with an example **4**

(6 × 8 = 48 Marks)

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First Semester M.Sc. Degree Examination, April 2024

Computer Science

CS 512 : DISTRIBUTED OPERATING SYSETMS

(2021 Admission onwards)

Time : 3 Hours Max. Marks : 75

PART – A

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

1. Categorize the commonly used network topologies for constructing LANs.
2. What are the components of Distributed Computing Environment?
3. What is a message? Explain its structure.
4. What is thrashing? List the methods used to solve the thrashing problem in DSM.
5. Compare Static and dynamic load balancing algorithms.
6. Write the significance of distributed election algorithms.
7. What is fault tolerance?
8. List out the desirable features of a distributed file system.
9. Formulate the domain based protection model for access control.

(9 × 3 = 27 Marks)

P.T.O.

PART – B

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

Module – I

10. Describe the models used for building Distributed Operating System.

OR

11. Discuss the layers of protocol reference model in ATM.

Module – II

12. Explain the failure handling mechanism in distributed communication.

OR

13 Describe the encoding and decoding mechanism of message data.

Module – III

14. Make a note on the design and implementation issues of Distributed Shared Memory.

OR

15. Describe the phases of transaction in Distributed Operating System.

Module – IV

16. Give an account on deadlock prevention techniques.

OR

17. Illustrate the implementation of clock synchronization for event ordering.

Module – V

18. Describe the key decisions to be made in file-caching scheme for distributed systems.

OR

19. (a) Categorize the file models in Distributed Operating System. **4**

    (b) Give a brief account on file replication. **4**

Module – VI

20. Explain the Distributed Object oriented architecture with neat diagram

OR

21. Categorize the Key distribution approaches in cryptography.

(6 × 8 = 48 Marks)

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First Semester M.Sc. Degree Examination, April 2024

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. Recall the working principle of Random – scan display.
2. Write down the steps involved in window–to–viewport transformation.
3. Write the matrix for 3D translation.
4. What are the different types of fractals?
5. How keyboard interactions can be done in OpenGL ?
6. What are the geometric primitives in OpenGL?
7. What is Digital Image and its representation?
8. Illustrate the negative transformation in image processing.
9. What is average filter? Give an example.

(9 × 3 = 27 Marks)

P.T.O.

PART – B

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

Module – I

10. State and explain the different types of monitors.

OR

11. Write down the Bresenham's Line drawing algorithm. Explain the algorithm with endpoints(20, 10) and (30, 18).

Module – II

12. Elaborate the depth – sorting method for detecting visible surfaces.

OR

13. Describe the design of animation sequences with 3D transformations.

Module – III

14. Explain the implementation procedure for call back functions in OpenGL.

OR

15. Illustrate about input and interaction that can be done in OpenGL in detail.

Module – IV

16. Explain the implementation of basic transformations in OpenGL.

OR

17. Write an OpenGL program for spinning a square.

Module – V

18. Explain the fundamental steps in digital image processing with a diagram.

OR

19. Elaborate on the various applications of Digital Image Processing.

Module – VI

20. Describe the process of histogram specification in image processing.

OR

21. How will you enhance an image using arithmetic operations in image processing?

(6 × 8 = 48 Marks)