(DMCS 01)

M.Sc. DEGREE EXAMINATION,
NOVEMBER 2021.

COMPUTER SCIENCE

First Year

DATA STRUCTURES

Time : Three hours Maximum : 70 marks

SECTION A — (3 × 15 = 45 marks)

Answer any THREE questions from the following.

1. (a) Explain the operations of Circular queue with an example.

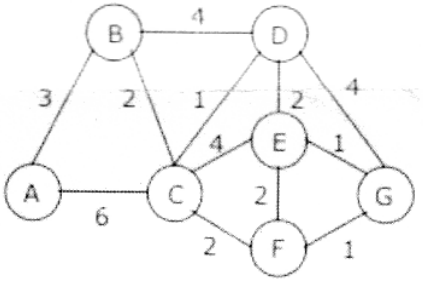
   (b) Write an algorithm to reversing a Single Linked List.

2. Discuss about collision resolution techniques with suitable example.

3. What is meant by B — tree indexing? Explain different operations on B — tree.

4. Give an algorithm for quick sort and explain its time complexity. Trace the algorithm for the following data: 65, 70, 75, 80, 85, 60, 55, 50, 45.

5. Construct minimum spanning tree for the following graph using Prim' s algorithm.



SECTION B — (5 × 4 = 20 marks)

Answer any FIVE questions from the following

6. Write an algorithm to delete an element anywhere from doubly linked list

7. Covert the prefix expression "*–/ab * + b c d*" into infix expression.

8. Explain polynomial addition using arrays with an example.

9. Explain the Construction of Tree from given In-order and Preorder traversals In-order sequence : D B E A F C

   Pre-order sequence : A B D E C F

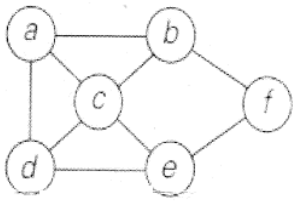
10. What is Balanced Binary Tree? Explain with Example?

11. Sort the following list of elements by using insertion sort

    35, 19, 66, 14,8, 10, 57, 100

12. Write about topological sorting techniques.

13. Construct Hamiltonian circuit for the following graph problem.



SECTION C — (5 × 1 = 5 marks)

Answer FIVE questions from the following

14. Define Priority queue.

15. Define hashing.

16. What is expression tree?

17. Define heap condition.

18. Define Euler's circuit.

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(DMCS 02)

M.Sc. DEGREE EXAMINATION,
NOVEMBER 2021.

First Year

Computer Science

OBJECT ORIENTED PROGRAMMING

Time : Three hours Maximum : 70 marks

SECTION A – (3 × 15 = 45 marks)

Answer any THREE questions from the following.

1. What is an array? How to declare two dimensional arrays? Write array program addition two matrices.

2. What are the characteristics of constructors? Illustrate copy constructors and parameter constructors with suitable example.

3. Write a C++ Program to overload ++ operator to increment content of object.

4. Explain different types of inheritance. Illustrate with an example each type with example.

5. What is Template? Declare a Template class. Write a function template for finding the minimum value contained in an array.

SECTION B – (5 × 4 = 20 marks)

Answer any FIVE questions from the following.

6. Describe various data types allowed in C++.
7. Write about formatted console I/O and unformatted console I/O.
8. What is a destructor? Illustrate memory allocation to an object using destructor?
9. Explain how inline function differ from a preprocessor macro.
10. What is abstract class? How to the protected visibility specifiers to a class member?
11. Differentiate between static data member and static member functions.
12. Explain about early binding and late binding.
13. What are the rules for virtual functions?

SECTION C – (5 × 1 = 5 marks)

Answer ALL questions.

14. Define function prototyping.
15. Define exception.
16. Give any two string handling functions.
17. What is meant by type conversion?
18. Define polymorphism.

(DMCS 03)

M.Sc. DEGREE EXAMINATION,
NOVEMBER 2021.

First Year

Computer Science

COMPUTER ORGANIZATION

Time : Three hours Maximum : 70 marks

SECTION A – (3 × 15 = 45 marks)

Answer any THREE questions from the following

1. (a) By using the required parity generator/checker circuit, explain how parity checking can be used for the error detection?

   (b) Explain the operation clocked S – R flip – flop.

2. (a) Explain the instruction cycle with help of a flow chart.

   (b) Write about arithmetic and logical micro operations.

3. Explain the concept of address sequencing for control memory.

4. Explain how multiplication is done for floating point numbers with flow chart.

5. Discuss about auxiliary and associative memory in detail.

SECTION B – (5 × 4 = 20 marks)

Answer any FIVE questions from the following

6. Differentiate combinational and sequential circuits.

7. What is floating point Representation? Explain with examples.

8. Describe memory reference instructions.

9. Describe the basic symbols used in register transfer.

10. Draw the block diagram for micro programmed control organization.

11. What is priority interrupt? Discuss about daisy chaining priority interrupt.

12. How addition and subtraction is done for decimal numbers? Give the pictorial representation for adding two decimal numbers.

13. Compare and contrast between Asynchronous DRAM and Synchronous DRAM.

SECTION C – ($5 \times 1 = 5$ marks)

Answer ALL questions

14. What is multiplexer?

15. What is Register Transfer?

16. What is DMA?

17. State any two addressing modes.

18. Define Cache memory

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(DMCS 04)

M.Sc. DEGREE EXAMINATION, NOVEMBER 2021.

First Year Computer Science

DISCRETE MATHEMATICAL STRUCTURES

Time : Three hours Maximum : 70 marks

SECTION A — (3 × 15 = 45 marks)

Answer any THREE questions from the following

1. (a) Prove that, for any three propositions p. q. r. the compound proposition $[(p \to q) \wedge (q \to r)] \to (p \to r)$ is tautology.

   (b) Show that $R \to S$ can be drawn from the premises $P \to (Q \to S), \neg R \vee P$ and Q.

2. (a) Show that "the number $\sqrt{2}$ is irrational" using proof by contradiction.

   (b) On the set Z of all integers, a relation R is defined by aRb if and only if $a^2 = b^2$. Verify that R is equivalence relation. Determine the partition induced by this relation.

3. (a) What is a partially ordered set. If R is a relation on the set $A = \{1,2,3,4\}$ defined by xRy, If x divides y, prove that (A,R) is Poset. Draw its Hasse diagram.

   (b) In any group $(G,*)$, by proving the inverse of every element is unique. Show that

   $(a * b)^{-1} = b^{-1} * a^{-1} \forall a, b \in G$.

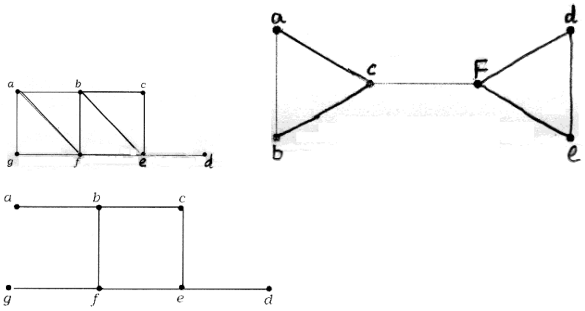
4. (a) Express the Boolean expression $xyz' + y'z + xz'$ in a sum of product form.

   (b) For any lattice, prove that

   (i) $a \vee (b \wedge c) = (a \vee b) \vee c$

   (ii) $a \vee (a \wedge b) = a$

5. Determine whether the following graphs have Euler circuit and Hamiltonian circuits. Construct such a circuit when one exists.



SECTION B — (5 × 4 = 20 marks)

Answer any FIVE questions from the following

6. Without using truth tables. Prove the following logical equivalence:

$[(\neg p \vee \neg q) \rightarrow (p \wedge q \wedge r)] \equiv p \wedge q$.

7. Find the disjunctive normal of $\neg(p \vee q) \leftrightarrow (p \wedge q)$.

8. Draw the Hasse diagram for the Poset, $(P(A), \subseteq)$ where $A = \{1,2,3,4\}$ and $P(A)$ is the power set of A.

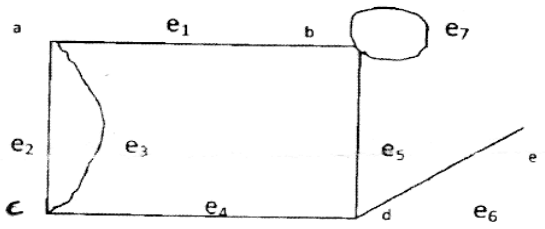
9. Let $A = \{1,2,3,4\}$. $R = \{(1,2),(2,3),(3,4),(2,1)\}$, Find the transitive closure of R.

10. On the set Q of all rational numbers, the operation * is defined by $a * b = a + b - ab$. Show that, under this operation Q forms commutative monoid.

11. Let $A = R - \{3\}$ and $B = R - \{1\}, f : A \rightarrow B$ defined by $f(x) = \dfrac{(x-2)}{(x-3)}$ find f^{-1}.

12. State and explain about four color problem.

13. Find the Adjacency matrix and Incidence matrix of the following graph.



SECTION C — (5 × 1 = 5 marks)

Answer ALL questions

14. Define conjunctive normal form.

15. Define abelian group.

16. Define Bipartite graph.

17. Define distributed lattice.

18. Define one - to - one and onto functions.

(DMCS 05)

M.Sc. DEGREE EXAMINATION, NOVEMBER 2021.

First Year

Computer Science

SOFTWARE ENGINEERING

Time : Three hours Maximum : 70 marks

SECTION A — (3 × 15 = 45 marks)

Answer any THREE questions from the following.

1. Explain the features of Spiral model and discuss working of Prototyping model with its diagram.

2. Describe various approaches to Software Quality Assurance.

3. Write about functional and non-functional requirements for software with example.

4. Explain about architectural design patterns and components level design patterns.

5. Explain black box testing methods and its advantages and disadvantages.

SECTION B — (5 × 4 = 20 marks)

Answer any FIVE questions from the following.

6. Describe the three levels of software process.

7. Compare functional and behavioral models.

8. Write the distinct steps in requirements engineering process.

9. What is the importance of User Interface? Explain User Interface design rules.

10. Explain the role of data dictionary in analysis and design.

11. What is a cohesive module? Write about different types of Cohesion.

12. Explain the testing procedures for boundary conditions.

13. Write about unit and integration testing.

SECTION C — (5 × 1 = 5 marks)

Answer ALL questions.

14. What is meant by software prototyping?

15. Distinguish between horizontal and vertical partitioning.

16. What is the need for cyclomatic complexity?

17. Define regression testing.

18. Define System Modeling.

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(DMCS 06)

M.Sc. DEGREE EXAMINATION, NOVEMBER 2021.

First Year

Computer Science

DISTRIBUTED OPERATING SYSTEMS

Time : Three hours Maximum : 70 marks

SECTION A — (3 × 15 = 45 marks)

Answer any THREE questions from the following.

1. (a) Discuss the Software layers of distributed system architectural model.

   (b) What is ATM? Explain about ATM reference model.

2. Explain how mutual exclusion is handled in distributed system.

3. Explain the following election algorithms:

   (a) The Bully algorithm

   (b) Ring algorithm.

4. Discuss distributed file system design and implementation issue.

5. What is distributed shared memory? Explain page based distributed shared memory in detail.

SECTION B — (5 × 4 = 20 marks)

Answer any FIVE questions from the following.

6. What is group communication? What are the various design issues in it?

7. State and explain client - server model.

8. Write about atomic transaction.

9. Write about routing overlays of distributed file systems.

10. Differentiate the process and thread in distributed environment.

11. What are the features required for election algorithms?

12. Explain how distributed deadlocks can be detected

13. What is the need of consistency in distributed system?

SECTION C — (5 × 1 = 5 marks)

Answer ALL questions.

14. Define deadlock.

15. What is scheduling?

16. Define clock synchronization.

17. What is processor pool model?

18. What is RPC?

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(DMCS 07)

M.Sc. DEGREE EXAMINATION, NOVEMBER 2021.

First Year

Computer Science

DATABASE MANAGEMENT SYSTEMS

Time : Three hours Maximum : 70 marks

SECTION A — (3 × 15 = 45 marks)

Answer any THREE questions from the following.

1. (a) With a neat diagram describe the overall system structure of DBMS

   (b) Write about Select and Project operations in relational algebra.

2. Write about different types of attributes in ER model. Construct E-R diagram for a hospital with a set of patients and medical doctors. Associate with each patient a log of various tests suggested by doctors and examinations conducted. Use Specialization and Generalization in your diagram.

3. Explain about set operations and aggregate functions in SQL with proper syntax.

4. Discuss about different hashing techniques.

5. Explain about Concurrency control with locking methods.

SECTION B — (5 × 4 = 20 marks)

Answer any FIVE questions from the following.

6. Differentiate between File system and Database System.

7. Who are the different database users? Explain their interfaces to database management system.

8. List and explain the common data types available in SQL.

9. What is a view? How views are implemented in SQL?

10. Describe the structure of a node in B-tree.

11. State and explain 1st and 2nd normal forms.

12. Illustrate multi - valued dependency with suitable example.

13. What is transaction? Mention the desirable properties of a transaction.

SECTION C — (5 × 1 = 5 marks)

Answer ALL questions.

14. Define Weak entity.

15. Define nested query.

16. Define Primary and foreign keys.

17. Define functional dependency.

18. What is meant by serializability?

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(DMCS 08)

M.Sc. DEGREE EXAMINATION, NOVEMBER 2021.

First Year

Computer Science

THEORY OF AUTOMATA AND FORMAL LANGUAGE

Time : Three hours Maximum : 70 marks

SECTION A — (3 × 15 = 45 marks)

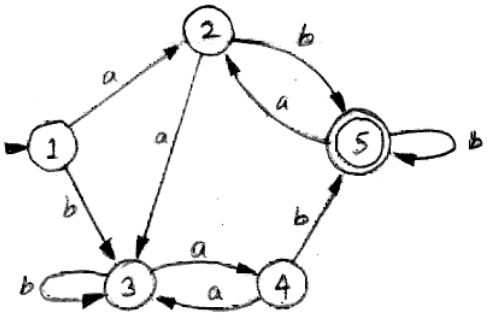
Answer any THREE questions from the following

1. (a) Convert the following mealy machine into its equivalent Moore machine.

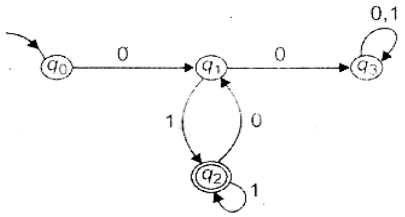
Present State	Next State			
	Input =0		Input =1	
	State	Output	State	Output
$\rightarrow q_1$	q_3	0	q_2	0
q_2	q_1	1	q_4	0
q_3	q_2	1	q_1	1
q_4	q_4	1	q_3	0

(b) Prove that "L be the language accepted by NFA then there exists that accepts DFA"

2. (a) For following DFA find minimum DFA accepting same language.



(b) Find the left linear and right linear grammar for the following FSM:



3. Consider the grammar $S \to (L) | a, L \to L, S | S$. Derive expression ((*a*, *a*), (*a*, *a*)) by leftmost derivation-and rightmost derivation and also construct derivation tree.

4. (a) Construct NPDA for the language $L = \{a^n b^m c^{m+n} \mid n, m \geq 0\}$.

   (b) Construct a PDA equivalent to the CFG : $S \to 0BB, B \to 0S \mid 1S \mid 0$.

5. What is Turing machine? Explain different types of Turing machines.

SECTION B — (5 × 4 = 20 marks)

Answer any FIVE questions from the following.

6. Differentiate NDFA and DFA.

7. Construct NFA that contains the string starting and ending with same symbol over {a, b}*.

8. Prove that

$(1+00*1)+(1+100*1)(0+10*1)*(0+10*1) = 0*1(0+10*1)*$.

9. Construct NFA for the regular expression $(a+b)*abb$.

10. Find the CFG with no useless symbols equivalent to the following grammar.
    $S \to AB \mid CA, B \to BC \mid AB, A \to a, C \to aB \mid b$.

11. Show that $L = \{a^n \mid n$ is perfect square$\}$ is not CFL using pumping theorem.

12. Write about Church hypothesis.

13. State and formulate Post Correspondence Problem.

SECTION C — (5 × 1 = 5 marks)

Answer ALL questions

14. Define Moore machine.

15. What is ambiguous grammar?

16. Define Chomsky Normal Form.

17. Define Halting problem.

18. What is meant by decidability?

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(DMCS 09)

M.Sc. DEGREE EXAMINATION, NOVEMBER 2021.

Computer Science First Year

COMPUTER NETWORKS

Time : Three hours Maximum : 70 marks

SECTION A – (3 × 15 = 45 marks)

Answer any THREE questions from the following.

1. (a) Explain about the Architecture of WWW.

   (b) What is DNS? What are the services provided by DNS and explain how it works?

2. Describe the features of UDP and compare TCP and UDP.

3. (a) Illustrate shortest path routing algorithm with suitable example.

   (b) Describe the problem and solutions associated with distance vector routing.

4. Write about services, framing and multiplexing concepts of Point-Point Protocol.

5. Explain about different error detection and correction techniques.

SECTION B – (5 × 4 = 20 marks)

Answer any FIVE questions from the following.

6. What are the different Status Codes available in HTTP? Explain.

7. Write short notes on File Transfer Protocol.

8. What is multiplexing? Explain the basic format of multiplexed system.

9. Draw and explain TCP packet header.

10. What is routing? How flooding can be used for routing?

11. Describe in detail about the Hierarchical routing.

12. What is ALOHA? Compare different ALOHA protocols.

13. Explain the working bridges and Switches.

SECTION C – (5 × 1 = 5 marks)

Answer ALL questions.

14. What is URL?

15. Write the advantages of optical fiber over twisted-pair and coaxial cables.

16. What is peer – to – peer process?

17. What is the use of datalink layer?

18. Define congestion control.

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(DMCS 10)

M.Sc. DEGREE EXAMINATION,
NOVEMBER 2021.

First Year

Computer Science

DESIGN AND ANALYSIS OF ALGORITHMS

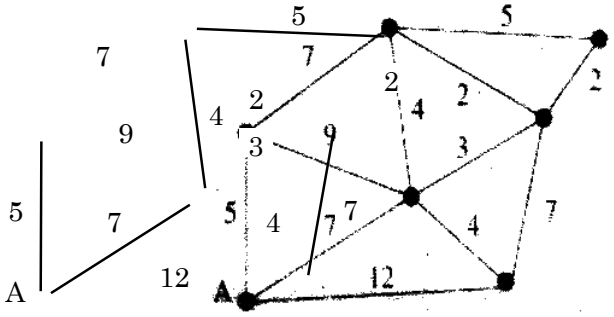
Time : Three hours Maximum : 70 marks

SECTION A — (3 × 15 = 45 marks)

Answer any THREE questions from the following.

1. Discuss different notations used to analyze algorithm complexity.

2. Write the pseudo code for Kruskal's algorithm. Construct Minimum spanning tree for the following graph using Kruskal's algorithm.



3. Write pseudo code for merge sort algorithm. Show how the merge sort algorithm will sort the following array in increasing order: 12, 24, 8, 71, 4, 23, 6, 89, 56. Analyze the time complexity of merge sort algorithm.

4. Draw an Optimal Binary Search Tree for n = 4 identifiers (a1, a2, a3, a4) = (do, if, read, while) P(1:4)=(3,3,1,1) and Q(0:4) = (2,3,1,1,1).

5. Solve the following Knapsack problem by Brach-and-Bound technique. Knapsack capacity = 10

Item	Weight	Value
1	4	40
2	7	42
3	5	25

4	3	12

SECTION B — (5 × 4 = 20 marks)

Answer any FIVE questions from the following.

6. Describe the characteristics of good algorithm.

7. Write about Bi-connected components with example.

8. State and explain Strassen's matrix multiplication.

9. Compare Greedy Method with Dynamic Programming Method.

10. State Quick hull problem. How to solve it by using divide – and – conquer method?

11. Construct Huffman tree for the following data and text DAD

Character	A	B	C	D	–
Probability	0.35	0.1	0.2	0.2	0.15

12. Solve the all pair shortest paths problem for the digraph with weight matrix.

$$\begin{bmatrix} 0 & \infty & 3 & \infty \\ 2 & 0 & \infty & \infty \\ \infty & 7 & 0 & 1 \\ 6 & \infty & \infty & 0 \end{bmatrix}$$

13. Give solution of 4-Queens Problem using Backtracking Method.

SECTION C — (5 × 1 = 5 marks)

Answer ALL questions.

14. Define time and Space complexity.

15. Define Convex — hull problem.

16. Define Back tracking.

17. What is basic principle of Divide and Conquer method?

18. State sub-set sum problem.

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