(DMCS 01)

M.Sc. DEGREE EXAMINATION, DECEMBER 2019.

First Year

Computer Science

DATA STRUCTURES

Time : Three hours Maximum : 70 marks

SECTION A — (3 × 15 = 45 marks)

Answer any THREE questions.

1. (a) Write an algorithm to implement queue using linked list.

   (b) Explain about insertion and deletion operations on double linked lists.

2. Discuss about different hashing techniques.

3. (a) Write the algorithm for insertion and deletion of binary search trees?

   (b) Construct the binary tree from the following:

   Pre-order: 1, 2, 4, 8, 9, 10, 11, 5, 3, 6, 7

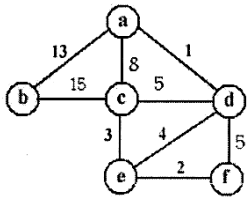
   In-order: 8, 4, 10, 9, 11, 2, 5, 1, 6, 3, 7

4. Explain Heap sort algorithm. Create Heap for the following elements and then sort them.

   (13, 102,405, 136, 15, 105, 390, 432, 28, 444)

5. (a) What are different ways of representing a graph? Explain using suitable example.

   (b) Generate minimum spanning tree from the following graph using Prim's algorithm. (Start at vertex a)



SECTION B — (5 × 4 = 20 marks)

Answer any FIVE questions of the following

6. What is meant by PUSH and POP on Stack? What is State of the STACK After insert 12, 75, 04, 100, 23, POP, POP, Insert 11, POP?

7. Evaluate the following postfix notation

   5 6 2 + * 8 4 / –

8. How to represent the polynomial $5x^5 + 3x^3 - 2x^2 + 4x + 10$ into linked list?

9. Draw the BST for the given list of elements 46,21,56,89,9, 12.

10. What is threaded binary tree? Draw an example for it?

11. Explain the working principle of Shell Sort for the list given:

    221, 121,322,14,103,435,345,116

12. Write topological sort algorithm with example.

13. Write the Hamiltonian path and circuit with example.

SECTION C — (5 × 1 = 5 marks)

Answer ALL questions

14. Give the applications of queues.

15. Define circular queue.

16. What is B — tree indexing?

17. What is expression tree?

18. Define weighted and directed tree.

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(DMCS02)

M.Sc. DEGREE EXAMINATION,
DECEMBER 2019.
First Year
Computer Science

OBJECT ORIENTED PROGRAMMING

Time : Three hours Maximum : 70 marks

SECTION A — (3 × 15 = 45 marks)

Answer any THREE questions.

1. Discuss different looping structures and conditions structures in C++ with syntax.

2. Write a C++ Program to overload + operator to add two matrices using friend functions?

3. Explain about constructors and destructors and their characteristics.

4. (a) What is a virtual base class? Why it is important to make a class virtual.

   (b) Illustrate hybrid inheritance with suitable example.

5. (a) What is a Stream? What are the stream classes in C++?

   (b) What is a file mode? Describe the various file mode options available.

SECTION B — (5 × 4 = 20 marks)

Answer FIVE questions from the following

6. Describe various data types and their sizes in C++.

7. Explain how inline function differ from a preprocessor macro? Explain significant advantage of inline function.

8. What are the different access specifiers used C++ and also mention its scope?

9. What is the difference between pointer and reference variable?

10. Write a C++ Program to copy the contents of one object into another using copy constructor?

11. What are the different types of Binding? Explain them

12. Write about usage of static keyword.

13. Write a C++ program that demonstrate number divided by zero exception.

SECTION C — (5 × 1 = 5 marks)

Answer ALL questions

14. Define type conversion.

15. Define function over riding.

16. Define multiple inheritance.

17. What operators cannot be overloaded?

18. What are the memory management Operators?

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(DMCS 03)

M.Sc. DEGREE EXAMINATION,
DECEMBER 2019.
First Year
Computer Science

COMPUTER ORGANIZATION

Time : Three hours Maximum : 70 marks

SECTION A — (3 × 15 = 45 marks)

Answer any THREE questions.

1. (a) Reduce the following function using K-map and implement it using NAND logic.

   $F(A, B, C) = \Sigma\ m(0, 2, 3, 4, 5, 6)$

   (b) Discuss about the error detection using parity bit code with examples.

2. Explain about multiplexers and shift registers with neat sketches.

3. Assume A = (+8) and B = (+5). Multiply these two numbers using Booth algorithm. Show the step-by-step multiplication process.

4. Write about register organization and stack organization in detail.

5. (a) Discuss decimal arithmetic operations.

   (b) What is the Cache memory? Explain why cache memories improve the system's performance.

SECTION B — (5 × 4 = 20 marks)

Answer any FIVE questions for the following.

6. Explain the working of the master slave JK flip-flop.

7. Write about floating point representation.

8. What is instruction cycle? Briefly explain with the help of state diagram.

9. Describe shift micro operations.

10. Explain hardware implementation of common bus system using three buffers.

11. What is addressing modes? Describe different addressing modes.

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

13. Explain the memory address map of RAM and ROM.

SECTION C — (5 × 1 = 5 marks)

Answer ALL questions.

14. Define counter.

15. What are 2's compliment? Give its significance.

16. What sign magnitude representation?

17. What is asynchronous data transfer?

18. What is virtual memory?

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(DMCS 04)

M.Sc. DEGREE EXAMINATION,
DECEMBER 2019.
First Year
Computer Science

DISCRETE MATHEMATICAL STRUCTURES

Time : Three hours Maximum : 70 marks

SECTION A — (3 × 15 = 45 marks)

Answer any THREE questions.

1. (a) By using direct proof, prove the following:

   (i) For all integers k and 1, if $k, 1$ are both even then $k+1$ is even.

   (ii) For all integers k and1, if $k, 1$ are even then $k.1$ is even

   (b) Show that $[(p \vee q) \wedge (p \to r) \wedge (q \to r)] \to r$ is tautology.

2. In the following problem, consider the partial order of divisibility on set A. Draw the Hasse diagram of the posets and determine whether the poset id linear ordered or not:

   (a) $A = \{1, 2, 3, 5, 6, 10, 15, 30\}$

   (b) $B = \{2, 4, 8, 16, 32\}$

3. (a) Prove that $f^{-1} \circ g^{-1} = (g \circ f)^{-1}$, where $f : Q \to Q$ such that $f(x) = 2x$ and $g : Q \to Q$. Such that $g(x) = x + 2$ are two functions.

   (b) Let $\begin{bmatrix} 1 & 1 & 0 \\ 0 & 1 & 1 \\ 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix}$ be a parity check matrix. Determine the group code: $e_H : B^2 \to B^5$.

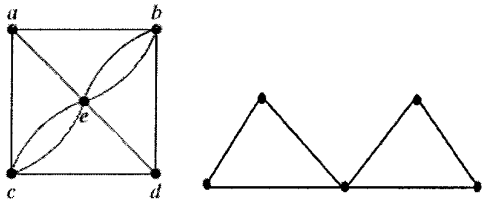
4. (a) For any lattice, prove that:

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

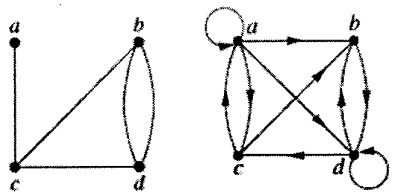
   (ii) $a \vee (a \wedge b) = a$

   (b) If the binary operation * on Z is given by $x * y = x + y + 1$. Verify that (Z, *) is abelian group.

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



(b) Represent the following graphs into adjacency matrix and adjacent list notation:



SECTION B — (5 × 4 = 20 marks)

Answer any FIVE questions from the following.

6. What is inference? State and write down rules of inference.

7. Let $X = \{1, 2, 3, 4, 5, 6, 7\}$ and $R = \{(x, y) \mid x - y$ is divisible by $3\}$. Show that R is an equivalence relation. Draw the graph of R.

8. Among the first 500 positive integers, determine the integers which are neither divisible by 5, 7, nor 9

9. Find the transitive closure of relation R on the set $\{a, b, c\}$, whose relation matrix M_R is given as $\begin{bmatrix} 1 & 0 & 1 \\ 1 & 1 & 0 \\ 1 & 1 & 1 \end{bmatrix}$.

10. In any Boolean algebra, show that $a = 0 \Leftrightarrow ab' + a'b = b$.

11. If H_1 and H_2 are subgroups of a group (G, *), prove that $H1 \cap H2$ is a sub group of G.

12. Write about planner graph Bipartite graph.

13. Show that the following graphs are isomorphic.

SECTION C — (5 × 1 = 5 marks)

Answer ALL questions.

14. Define conjunctive normal form.

15. Define reflexive and symmetric properties of a relations.

16. Define Abelian group.

17. Define chromatic number.

18. Define lattice.

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(DMCS 05)

M.Sc. DEGREE EXAMINATION,
DECEMBER 2019.
First Year
Computer Science

SOFTWARE ENGINEERING

Time : Three hours Maximum : 70 marks

SECTION A — (3 × 15 = 45 marks)

Answer any THREE questions.

1. Explain spiral model and describe its advantages over waterfall model.

2. Explain software architecture. Also explain how the data flow is mapped into software architecture.

3. Define module coupling and cohesion. Explain different types of coupling and cohesion.

4. (a) Write about the utility of state transition diagram in analysis modeling activity.

   (b) Describe the design procedure for data acquisition system.

5. What are the various testing strategies to software testing? Discuss them briefly.

SECTION B — (5 × 4 = 20 marks)

Answer any FIVE questions from the following.

6. Differentiate Prototype and RAD process models.

7. What are the umbrella activities in software engineering process?

8. Write about Flow oriented and Class based modeling.

9. Explain the verification and validation (V & V) process.

10. Write about horizontal and vertical partitioning.

11. What is an architectural pattern? How can the architectural style be assessed?

12. Briefly explain about alpha and beta testing.

13. What do you mean by boundary value analysis? Give two examples of boundary value testing.

SECTION C — (5 × 1 = 5 marks)

Answer ALL questions.

14. Define system testing.

15. What is SRS document?

16. How reliability is related to quality assurance?

17. What is meant by project metrics?

18. Define debugging.

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(DMCS 06)

M.Sc. DEGREE EXAMINATION,

DECEMBER 2019.
First Year
Computer Science

DISTRIBUTED OPERATING SYSTEMS

Time : Three hours Maximum : 70 marks

SECTION A — ($3 \times 15 = 45$ marks)

Answer any THREE questions from the following.

1. Explain about different kinds of transparency in a distributed system.
2. Explain about the Client-Server Model.
3. Explain about Atomic Transactions with suitable example.
4. Explain about the Distributed File System Design.
5. Explain about Page-Based Distributed Shared Memory.

SECTION B — ($5 \times 4 = 20$ marks)

Answer any FIVE questions from the following.

6. What are the potential bottlenecks that designers should try to avoid in very large distributed systems?
7. Name two advantages of a micro kernel over a monolithic kernel.
8. Explain about RPC.
9. Explain about the concurrency control using time stamps.
10. Explain about the implementing Threads in User Space.
11. Compare stakeless and stateful servers.
12. Explain about the how a cache ownership protocol works with an example.
13. Explain about the Release Consistency.

SECTION C — (5 × 1 = 5 marks)

Answer ALL questions.

14. What is UDP?

15. What is distributed real-time computer system?

16. What is TTP?

17. What is remote access model?

18. What is NUMA machine?

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(DMCS 07)

M.Sc. DEGREE EXAMINATION,
DECEMBER 2019.
First Year
Computer Science

DATABASE MANAGEMENT SYSTEMS

Time : Three hours Maximum : 70 marks

SECTION A — ($3 \times 15 = 45$ marks)

Answer any THREE questions.

1. (a) Discuss about different entity types and relation types with suitable example.
   (b) Draw E-R diagram for college management system.

2. Write SQL queries for the following tables :
   T_1 (Empno, Ename, Salary, Designation), T_2 (Empno, Deptno.)
   (a) Display all rows for salary greater than 5,000.
   (b) Display the deptno for the ename = 'syham'
   (c) Change the designation of ename = 'ram' from 'clerk' to 'senior clerk'
   (d) Display Empno, Ename, Deptno and Deptname
   (e) Find the total salary of all the rows.

3. Write about join, projection and division operations in relational algebra.

4. Explain about B+ tree and index files, B-tree index files and hash based indexing.

5. Explain Two Phase Locking Protocol. What are its advantages and disadvantages?

SECTION B — ($5 \times 4 = 20$ marks)

Answer any FIVE questions.

6. State different types database users and administrator.

7. What is data model? Describe different data models.

8. Explain about group by and having clauses with suitable example.

9. Differentiate between :
   (a) Update and insert
   (b) Primary and foreign keys.

10. Define functional dependency. Write about trivial and non-trivial FD's.

11. Explain the features of RAID technology.

12. Explain view serializability with example.

13. Write short notes on validation based protocols.

SECTION C — (5 × 1 = 5 marks)

Answer ALL questions.

14. Define atomicity and durability.

15. Define referential integrity.

16. What is hashing?

17. Define first normal form.

18. Define super and composite key.

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(DMCS08)

M.Sc. DEGREE EXAMINATION,
DECEMBER 2019.
First Year

Computer Science

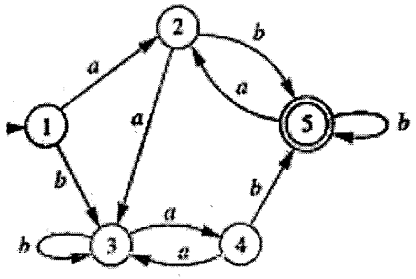
THEORY OF AUTOMATA AND FORMAL LANGUAGE

Time : Three hours Maximum : 70 marks

SECTION A — (3 × 15 = 45 marks)

Answer any THREE questions.

1. (a) For following DFA, find minimized DFA accepting same language.



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

Present State	Next State			
	Input = 0		Input = 1	
	State	Output	State	Output
→ 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

2. (a) Draw NFA for the Regular Expression (RE): (0+ 1)*(1+00) (0 + 1)*

(b) Describe closure properties of regular language.

3. Construct PDA's for the following languages:

(a) L contains equal number of a' s and equal number of b's.

(b) L = $\{a^n b^m c^{m+n} | n,m \geq 0\}$

4. Let G be the grammar as $S \to aB|bA, A \to a|aS|bAA, B \to b|bS|aBB$ for the string '*aabbabab*', Find
   (a) Derivation tree
   (b) Rightmost derivation
   (c) Leftmost derivation.

5. Design Turing machine that computes the addition of two unary numbers and also give different types of Turing machine.

SECTION B — (5 × 4 = 20 marks)

Answer any FIVE questions.

6. Write DFA that accepts even number of a's and even number of b's.

7. Check whether the following machines M_1 = ({A, B, C, D}, {0, 1}, δ_1 A, {B, D}) and M2 = ({P, Q, R}, {0, 1}, δ_2, P, {R}) equivalent or not

PS	Next State	
	0	1
→ A	B	C
B	A	C
C	D	B
D	C	A

PS	Next State	
	0	1
→P	R	R
Q	R	P
R	P	Q

8. Find regular expression for following over the alphabet {0, 1}
   (a) Language of all strings containing exactly two 0's.
   (b) Language of all strings that begins or ends with 00 or 11.

9. Eliminate ε - productions form the following CFG

   $S \to ABcC, A \to BC, B \to b|\varepsilon, C \to D|\varepsilon, D \to d$.

10. Show that $L = \{a^n | n \text{ is prime}\}$ is not CFL.

11. Construct CNF for the following $CFG: E \to E+T|T$, $T \to T*F|F$, $F \to (E)|a$.

12. What is parsing? What are the different types of parsing techniques?

13. State and explain about Post correspondence problem.

SECTION C — (5 × 1 = 5 marks)

Answer ALL questions.

14. Differentiate NFA and DFA.

15. Define Homomorphism.

16. What is meant by useless production?

17. What is Linear Bounded Automata?

18. State Halting problem.

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(DMCS 09)

M.Sc. DEGREE EXAMINATION,
DECEMBER 2019.
First Year
Computer Science

COMPUTER NETWORKS

Time : Three hours Maximum : 70 marks

SECTION A — (3 × 15 = 45 marks)

Answer any THREE questions from the following.

1. Draw the OSI reference model. Explain the functionality of each layer in detail.

2. Explain Transmission Control Protocol with TCP header fields.

3. Explain following with respect to IP address. Also give proper examples of each :

   (a) Structure of IPv4 address

   (b) Subnet mask

   (c) Default gateway

   (d) IPV6

4. Explain shortest path routing protocol with suitable example.

5. What is the difference between error detection and correction? Explain error correction techniques with suitable example.

SECTION B — (5 × 4 = 20 marks)

Answer any FIVE questions from the following.

6. Write the five basic functions provided by e-mail system.

7. Explain Ethernet Frame structure.

8. What is a resource record? How it is useful for DNS?

9. Explain the working principle of stop and wait protocol.

10. Explain Distance Vector routing with example.

11. What is CSMA? Explain persistent and non-persistent CSMA.

12. Write short notes on guided and unguided transmission media.

13. What is bridge? Describe different types of bridges.

SECTION C — (5 × 1 = 5 marks)

Answer ALL questions.

14. What is the advantage of layered architecture?

15. What is circuit switching?

16. Define congestion.

17. What is collision in data transmission?

18. Define Tunneling.

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(DMCS 10)

M.Sc. DEGREE EXAMINATION,
DECEMBER 2019.
First Year

Computer Science

DESIGN AND ANALYSIS OF ALGORITHMS

Time : Three hours Maximum : 70 marks

SECTION A — (3 × 15 = 45 marks)

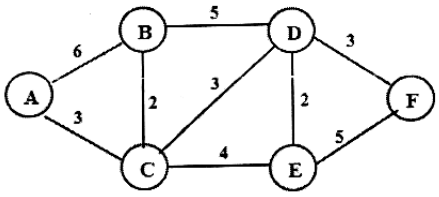
Answer any THREE questions.

1. (a) Describe the basic asymptotic efficiency classes. Give example for each class.

   (b) Find the complexity of below recurrence relation.

$$T(n) = \begin{cases} T(n-1) + n(n-1), & \text{if } n \geq 2 \\ 1, & \text{if } n = 1 \end{cases}$$

2. Find the shortest path using Dijkstra's algorithm for the following graph assume source node is *A*.



3. Given weight vector

   $(w_1, w_2, w_3, w_4, w_5, w_6, w_7) = (2, 3, 5, 7, 1, 4)$

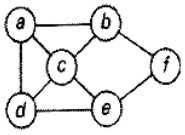
   and profit vector $(p_1, p_2, p_3, p_4, p_5, p_6, p_7) =$ (10, 5, 15, 7, 6, 18, 3) and Knapsack of capacity 15. Find optimal solution for 0/I knapsack problem.

4. Construct an optimal binary search tree for the following items with probabilities Given in the table below.

Items	1	2	3	4	5
Probability	0.24	0.22	0.23	0.3	0.01

5. (a) Solve the sub set sum problem with n = 4, w = { 2, 7, 8, 15 } and m = 17 by using back tracking.

   (b) Construct Hamiltonian circuit for the following graph problem.



SECTION B — (5 × 4 = 20 marks)

Answer any FIVE questions from the following.

6. What is Amortized analysis of algorithms and how is it different from Asymptotic analysis?

7. What is weighting rule? Discuss about the union algorithm using weighting rule.

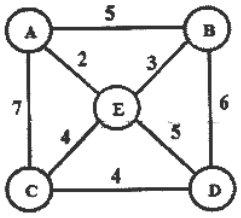
8. How to solve quick hull problem using Divide – and – Conquer strategy.

9. Solve the all-pair shortest path problems for given adjacent matrix graph using Floyd's Algorithm.

$$\begin{bmatrix} 0 & 4 & 8 & \infty \\ \infty & 0 & 5 & 12 \\ \infty & \infty & 0 & 7 \\ 5 & \infty & \infty & 9 \end{bmatrix}$$

10. Write job sequence problem with suitable example.

11. Using Prim's algorithms construct minimum spanning for the following graph



12. Apply branch and bound algorithm to solve the Travelling salesmen problem.

13. Explain about the FIFO branch and bound solution.

SECTION C — (5 × 1 = 5 marks)

Answer ALL questions.

14. Define space complexity of an algorithm.

15. What is basic principle greedy method?

16. Define principle of optimality.

17. State graph coloring problem.

18. What is Huff man tree?

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