

M.Sc. (Previous) DEGREE EXAMINATION

Computer Science

Paper I — DATA STRUCTURES

Assignment-1

Answer All questions.

1. What is linked list? Explain about various operations double-linked list.
 2. (a) Write about different queue operations.
(b) Describe the various types of queues.
 3. What is binary tree? Explain about various tree-traversing techniques with suitable example.
 4. Write and implement quick sort technique.
 5. What is spanning tree? Write an algorithm for construction of minimum spanning tree.
 6. What is recursion? Write a program to find the factorial of given number using recursion.
 7. Define hash function. Explain briefly hashing technique.
 8. Write about various types of binary trees.
 9. Write an algorithm for shell sorting technique.
-

Assignment-2

Answer All questions.

10. Explain different tree operations.
 11. Define graph. Write methods to represent graph.
 12. Discuss Euler's circuit and Hamilton circuit.
 13. Discuss the applications of stacks.
 14. What is meant by linear data structure?
 15. Define B-tree.
 16. What is heap condition?
 17. Translate the expression $a * (b + c)$ into postfix form.
 18. Define complete binary tree.
-

Assignment-1

Answer All questions.

1. (a) Differentiate C and C++.
(b) Discuss control structures in C++.
 2. What is Constructor? Explain copy constructor. What are the characteristics of constructors?
 3. Explain operator overloading. Write C++ program to overload '+' operator to concatenate two strings with suitable example?
 4. Explain about any five string handling functions with suitable example.
 5. What a Template? Design template class to insert elements and find a given value in a list of elements.
 6. What pointer? What are the advantages of pointers?
 7. Write the different data types in C++.
 8. Define class and object. Write the syntax of class and object.
 9. Write about access modifiers.
-

Assignment-2

Answer All questions.

10. Define inheritance. Explain multiple inheritances with suitable example.
11. Write a short notes on exception handling in C++.
12. Write short notes on virtual functions.
13. Write about various file operations in C++.
14. Define an array?
15. What is use of scope resolution operator?
16. What is destructors?
17. Give two I/O streams?
18. Define encapsulation.

Assignment-1

Answer All questions.

- 1.(a) Describe combinational circuit with its block diagram.
 - (b) Explain about edge-triggered flip-flop.
 2. Discuss decoder and encoders.
 3. (a) Explain about shift micro operations.
 - (b) Describe memory reference instructions.
 4. Explain instruction formats and addressing modes.
 5. (a) Compare and contrast isolated I/O and memory mapped I/O.
 - (b) Explain the need of memory hierarchy.
 6. Write about 2421 code and gray code.
 7. Design 4 bit binary adder and subtractor.
 8. Explain the organization of DMA.
 9. Explain address sequencing with help of an example.
-

Assignment-2

Answer All questions.

10. Detect and correct error if any in the following even-parity Hamming code word 1110111.
 11. Distinguish between microprogramming and hard-wired control.
 12. Write a short note on Asynchronous data transfer.
 13. Write a short note on cache memory.
 14. Define counter.
 15. Full adder.
 16. What do you understand by internal interrupt?
 17. Define Multiplexer.
 18. Describe typical RAM chip.
-

M.Sc. (Previous) DEGREE EXAMINATION

Computer Science

Paper IV — DISCRETE MATHEMATICAL STRUCTURES

Assignment-1

Answer All questions.

1. (a) Construct truth table for $[(p \wedge \neg q) \rightarrow r] \rightarrow [p \rightarrow (q \vee r)]$ check whether it is a tautology.

(b) Show that $\forall x (P(x) \wedge Q(x))$ and $\forall x P(x) \wedge \forall x Q(x)$ have the same truth value.

2. (a) Prove that $2^n < n!$ using mathematical induction.

(b) Give that $A = \{1, 2, a, b, c, d\}$, $B = \{1, 2, b\}$, $C = \{b, c, d\}$. Write all elements of cartesian product of $A - B$ and $A - C$.

3. (a) Let m be the positive integer with $m > 1$. Show that the relation $R = \{[a, b] / a \equiv b \pmod{m}\}$ is an equivalence relation on the set of integers.

(b) Draw the Hasse diagram for divisibility on the set $P = \{1, 2, 3, 6, 12, 24, 36, 48\}$.

4. Define a lattice. In complemented distributive lattice L , for any $a, b, c \in L$. Show that the following the equivalent.

(a) $a \leq b$

(b) $a * b' = 0$

(c) $a' \oplus b = 1$

(d) $b' \leq a'$.

5. (a) Define chromatic number. Find chromatic number of cycle, path and complete bipartite graph.

(b) Explain about four colour problem.

6. Prove that the following argument is valid wherein 'C' is specified element of the universe :

$$\forall x [p(x) \rightarrow q(x)]$$

$$\forall x [q(x) \rightarrow r(x)]$$

$$\neg r(c)$$

$$\therefore \neg p(c)$$

7. Let $f : R \rightarrow R$ be defined as $f(x) = 3x + 7$. Show that f is one-one and onto find $f^{-1}(x)$.

8. Let $A = \{1, 2\}$ and $B = \{a, b, c\}$ then find

(a) $A \times B$

(b) $B \times A$

(c) $A \times A$.

9. Find the coefficient of x^{16} in $(1 + x^4 + x^8)^{10}$.

Assignment-2

Answer All questions

10. Draw the Hasse diagram of $D(45)$ of all the divisors of 45.
 11. Find the identity element of group of integers with binary relation operator $*$ define by $a * b = a + b - 2, \forall a, b \in \mathbb{Z}$.
 12. Write down an algorithm to construct Euler circuits in connected graph.
 13. Find the transitive closure of the following relation R by Warshall algorithm, where $R = \{(a, b), (a, a), (b, c), (c, d), (c, e), (d, e)\}$.
 14. Define ordered set.
 15. Give truth table for $P \rightarrow Q$.
 16. What is recurrence relation?
 17. What is meant by Hamiltonian path?
 18. State Pigeon hole principle.
-

Assignment-1

Answer All questions.

1. (a) What are the names of the five levels of the SEI CMM? Describe each level in detail.
(b) How do software characteristics differ from hardware characteristics?
 2. Explain basis path testing technique with suitable example.
 3. List the four design models required for a complete specification of a design and explain how each is created.
 4. Explain Design concepts and principles.
 5. What elements of a user interface design can be evaluated without building a working computer prototype?
 6. How are the project risks different from technical risks?
 7. How does adaptive maintenance differ from preventive maintenance?
 8. What are the five steps of requirements engineering?
 9. What is control flow diagrams and why it is used?
-

Assignment-2

Answer All questions.

10. Why is feasibility assessment part of the planning process?
 11. What are four useful indicators of S/W quality?
 12. What is meant by reliable software?
 13. List three principles that should be applied when building any user interface.
 14. Differentiate between pattern and framework.
 15. Define cyclomatic complexity.
 16. What is coupling?
 17. Differentiate between verification and validation.
 18. What is the difference between top-down and bottom up testing?
-

Assignment-1

Answer All questions.

1. Discuss the design issues of a distributed operating system
 2. How is mutual exclusion achieved in distributed systems? Explain the algorithms used for mutual exclusion.
 3. Write about the following in detail.
 - (a) Workstation Model
 - (b) Processor pool model
 4. Discuss about the distributed file system design in detail.
 5. What is bus- based multiprocessor? Explain.
 6. Discuss about the disadvantages of distributed systems
 7. Explain how communication is carried out between receiver and sender in the data link layer.
 8. What is optimistic concurrency control?
 9. Writ about graph theoretic deterministic algorithm for processor allocation.
-

Assignment-2

Answer All questions.

10. What is static scheduling?
11. Write the Christians algorithm?
12. What is sequential consistency?
13. Discuss about fault tolerance in distributed file system.
14. What is Uniform Memory Access Multiprocessor? (UMA)
15. Define Dead Lock.
16. What is the purpose of application layer?
17. Define one to many communications.
18. What is time triggered real time system?

Assignment-1

Answer All questions.

- 1.(a) With a neat sketch, explain the architecture of DBMS .
(b) List out various jobs performed by the data base administrator.
 2. What is ER Model? Explain the features of ER Model.
 3. (a) What are integral constraints? Explain.
(b) What are aggregate functions? Explain.
 4. (a) How does 3NF differ from BCNF? Explain.
(b) Write short notes on dynamic hashing.
 5. (a) What is serializability? Explain.
(b) Discuss about lock based protocols in detail.
 6. Data Model
 7. Key Constraints
 8. Triggers
 9. Data Dictionary
-

Assignment-2

Answer All questions.

10. B- tree index files
11. Functional Dependency
12. Dead Lock
13. ACID Properties.
14. What is relational model?
15. Write any two advantages of DBMS.
16. Define Join Operation.
17. Define arity of a relation.
18. Define transaction.

Assignment-1

Answer All questions.

- 1.(a) Find NFA without E-transitions from NFA with E-transition.
(b) Construct DFA equivalent to the following FSM :
- 2.(a) State and prove pumping lemma for regular sets.
(b) Construct DFA for the regular expression $10 + (0 + 11)0^* 1$.
- 3.(a) Explain about PDA.
(b) Design PDA for the language $L = \{w \subset w^R \mid w \in \{a,b\}^*\}$.
- 4.(a) Design turing machine for the language $L = \{a^n b^n \mid n \geq 1\}$.
(b) Explain about types of turing machines.
- 5.(a) Explain about closure properties of CFL.
(b) Describe Chomsky hierarchy of languages.
6. Construct DFA for the language, that containing even number of 0's and even number of 1's.
7. Construct Moore machine equivalent to the mealy machine described below :

| PS | Next State | | | |
|-------|------------|-----|-------|-----|
| | a = 0 | | a = 1 | |
| | NS | O/P | NS | O/P |
| q_1 | q_1 | 1 | q_2 | 0 |
| q_2 | q_4 | 1 | q_4 | 1 |
| q_3 | q_2 | 1 | q_3 | 1 |
| q_4 | q_3 | 0 | q_1 | 1 |

8. Convert the following CFG into equivalent CNF where $G = (V, T, P, S)$ and $V = \{S, A, B\}$, $T = \{a, b\}$ and productions $S \rightarrow aAbB$, $A \rightarrow aA/a$, $B \rightarrow bB/b$.

9. Define ambiguity in CFG. Show that the following grammar is ambiguous :

$S \rightarrow abSb/aAb/a$

$A \rightarrow bS/aAAb$

Assignment-2

Answer All questions.

10. Show that $L = \{a^n b^n c^n \mid n \geq 1\}$ is not CFL.
11. Construct left linear and right linear grammar for RE $0^*(1(0+1))^*$.
12. Write about church hypothesis.

13. Explain about universal turing machine.
 14. Define NFA with E-transition.
 15. Define Moore machine.
 16. What is unit production?
 17. What is turing machine?
 18. Define LBA.
-

Assignment-1

Answer All questions.

- 1.(a) Compare and contrast connection less and connection oriented services.
(b) Discuss about the types of delays in packet switch networks.
 - 2.(a) Discuss about processes communication in networks.
(b) Explain about the two types of HTTP message formats.
 - 3.(a) Explain the Selective repeat protocol.
(b) What is congestion control? What are the approaches used to counteract congestion control.
 4. Discuss about the IPV4 addressing in detail.
 5. Explain various multiple access protocols.
 6. Twisted pair copper wire.
 7. Internet Control Message Protocol.
 8. Differences between switch and hub.
 9. SMTP.
-

Assignment-2

Answer All questions.

10. TCP connection.
11. Flow Control.
12. Datagram format of IPV6.
13. E-mail.
14. Protocol.
15. Modem.
16. Multiplexing.
17. Minimum Spanning tree.
18. Full Duplex.

Answer any THREE of the following.

- 1.(a) Define algorithm. Explain the properties of an algorithm.
(b) Explain how we define average, best and worst case analysis.
 2. Discuss Strassen's matrix multiplication with suitable example and derive its time complexity.
 - 3.(a) Explain how shortest path is achieved in multistage graph with forward approach with suitable example.
(b) What is Flow shop scheduling problem? Explain.
 4. Discuss about the basic traversal and search techniques.
 - 5.(a) Discuss the 8-Queens problem.
(b) Discuss the graph coloring problem.
 6. Write short notes on Time Complexity and Space Complexity.
 7. Explain the optimal storage on tapes problem.
 8. Discuss about the job sequencing problem.
 9. What is reliability design?
-

Assignment-2

Answer All questions.

10. What is traveling sales person problem?
 11. Explain the sum of subsets problem.
 12. State the difference between a tree and a graph.
 13. What is Hamiltonian cycle?
 14. What is multistage graph?
 15. What is a binary tree?
 16. What is DFS?
 17. State Union Operation.
 18. Define data structure.
-