MULTIPLE CHOICE QUESTIONS

1.1 _____ refers to a single unit of values.
(a) Group item (b) Data item
(c) Elementary item (d) Basic item

1.2 A _____ is something that has certain attributes or properties which may be assigned values.
(a) Field (b) Record
(c) Entity (d) File

1.3 _____ is the collection of records of the entities in a given entity set.
(a) Field (b) Record
(c) Entity (d) File

1.4 The value in a _____ field uniquely determines the record in a file.
(a) Primary key (b) Secondary key
(c) Key (d) Pointer

1.5 In _____ length records, file records may contain different lengths.
(a) Fixed (b) Primary
(c) Variable (d) Entity

1.6 _____ is the logical or mathematical model of a particular organization of data.
(a) Structure (b) Variable
(c) Function (d) Data Structures

1.7 Which of the following is not a primitive data structure?
(a) Boolean (b) Integer
(c) Arrays (d) Character

1.8 Which of the following is a non-linear data structure?
(a) Array (b) Linked List
(c) Stack (d) Graph

1.9 _____ is also called last-in-first-out (LIFO) system
(a) Queue (b) Stack
(c) Graph (d) Tree

1.10 _____ is also called first-in fi out (FIFO) system.
(a) Tree (b) Stack
(c) Queue (d) Graph

1.11 Which of the following operations cesses each record exactly once so t certain items may be processed?
(a) Inserting (b) Deleting
(c) Traversing (d) Searching

1.12 _____ is a data structure that co tains a relationship between a pair elements, which is not necessarily hi archical in nature.
(a) Tree (b) Graph
(c) Array (d) String

1.13 _____ involves arranging t records in a logical order.
(a) Merging (b) Sorting
(c) Traversing (d) Searching

1.14 _____ is a set of data values a associated operations that are specifi accurately, independent of any partic lar implementation.
(a) Stack
(b) Tree
(c) Abstract Data Type
(d) Graph

1.15 Which of the following operatio combine records in two different sort files into a single sorted file?
(a) Inserting (b) Sorting
(c) Searching (d) Merging

ANSWERS TO MULTIPLE CHOICE QUESTIONS

1.1 (b) **1.2** (c) **1.3** (d) **1.4** (a) **1.5** (a) **1.6** (d) **1.7** (c) **1.8** (d)
1.9 (d) **1.10** (c) **1.11** (c) **1.12** (b) **1.13** (b) **1.14** (c) **1.15** (d)

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MULTIPLE CHOICE QUESTIONS

2.1 _____ of a set of n elements is an arrangement of the elements in a given order.
(a) Combination (b) Permutation
(c) Exponent (d) Logarithm

2.2 There are _____ permutations of a set of n elements.
(a) $n!$ (b) n
(c) $n2$ (d) $n+1$

2.3 Logarithms to the base 10 are called _____ logarithms.
(a) Natural (b) Simple
(c) Common (d) Binary

2.4 The first part of an algorithm tells the _____ of the algorithm.
(a) Logic (b) Process
(c) Purpose (d) Steps

2.5 Each step of an algorithm may contain its _____ in brackets.
(a) Purpose (b) Functions
(c) Steps (d) Comments

2.6 The term _____ will be used for an independent algorithmic module which solves a particular problem.
(a) Program (b) Logic
(c) Procedure (d) Name

2.7 _____ logic employs a number of conditions which lead to a selection of one out of several alternative modules.
(a) Selection (b) Sequential
(c) Iteration (d) Procedural

2.8 A structure is of the form:
If condition, then:
[Module A]
Else:
[Module B]
[End of if structures]
What is this structure?
(a) Multiple Alternative
(b) Double Alternative
(c) Single Alternative
(d) None of the above

2.9 _____ loop uses a condition to control the loop.
(a) Repeat-for (b) Repeat
(c) Continue (d) Repeat-while

2.10 In complexity theory, _____ case refers to the expected value of $f(n)$.
(a) Average (b) Best
(c) Worst (d) Good

2.11 $O(n^2)$ is the complexity of which searching and sorting algorithm?
(a) Binary search (b) Linear search
(c) Merge sort (d) Bubble sort

2.12 The _____ notation is used when the function $g(n)$ defines a lower bound for the function $f(n)$.
(a) Omega (b) Big O
(c) Theta (d) Little Oh

2.13 Each program module contains its own list of variables called _____
(a) Global (b) Local
(c) Search (d) Binary

2.14 _____ function of C is used to allocate a block of memory.
(a) malloc() (b) calloc()
(c) free (d) realloc()

2.15 Variables that can be accessed by some program modules are called _____ variables.
(a) Global (b) Local
(c) Search (d) Nonlocal

ANSWERS TO MULTIPLE CHOICE QUESTIONS

2.1 (b)	**2.2** (a)	**2.3** (c)	**2.4** (b)	**2.5** (d)	**2.6** (c)	**2.7** (a)
2.8 (b)	**2.9** (d)	**2.10** (a)	**2.11** (d)	**2.12** (a)	**2.13** (b)	**2.14** (a)
2.15 (d)						

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3.2 Write a program which reads a given WORD and then counts the number C of times WORD occurs in LINE. Test the program using (a) WORD = 'THE' and (b) WORD = 'HENCE'.

3.3 Write a program which interchanges the Jth and Kth paragraphs. Test the program using J = 2 and K = 4.

In Programming Problems 3.4 to 3.9, assume the preface of this text is stored in a single character variable TEXT. Assume 5 blank spaces indicates a new paragraph.

3.4 Write a program which constructs a linear array PAR such that PAR[K] contains the location of the Kth paragraph in TEXT, and which finds the value of a variable NPAR which contains the number of paragraphs. (Compare with Programming Problem 3.1.)

3.5 Write a program which reads a given WORD and then counts the number C of times WORD occurs in TEXT. Test the program using (a) WORD = 'THE' and (b) WORD = 'HENCE'. (Compare with Programming Problem 3.2.)

3.6 Write a program which interchanges the Jth and Kth paragraphs in TEXT. Test the program using J = 2 and K = 4. (Compare with Programming Problem 3.3.)

3.7 Write a program which reads words WORD1 and WORD2 and then replaces each occurrence of WORD1 in TEXT by WORD2. Test the program using WORD1 = 'HENCE' and WORD2 = 'THUS'

3.8 Write a subprogram INST(TEXT, NEW, K) which inserts a string NEW into TEXT beginning at TEXT[K].

3.9 Write a subprogram PRINT(TEXT, K) which prints the character string TEXT in lines with at most K characters. No word should be divided in the middle and appear on two lines, so some lines may contain trailing blank spaces. Each paragraph should begin with its own line and be indented using 5 blank spaces. Test the program using (a) K = 800, (b) K = 70 and (c) K = 60.

3.10 Write a program to find the distance between two character strings.

3.11 Write a program with three short strings, about 6 characters each, and use stropy to copy one, two, and three into them. Concatenate the three strings into one string and print the result out 10 times.

MULTIPLE CHOICE QUESTIONS

3.1 Computers are used for processing numerical data called _____ data.
(a) Float (b) Local
(c) Character (d) Nonlocal

3.2 Each programming language contains a _____ set that is used to communicate with the computer.
(a) Character (b) Integer
(c) Float (d) Numeric

3.3 Finite sequence S of zero or more characters is called _____.
(a) Array (b) List
(c) String (d) Block

3.4 String with zero characters is called _____ string.
(a) NULL (b) Binary
(c) Totalled (d) List

3.5 A computer which can access an

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individual byte is called a _____ machine.
(a) Memory addressable
(b) Byte addressable
(c) Bit
(d) Byte

3.6 Groups of consecutive elements in a string, such as words, phrases and sentences are called _____
(a) Main strings (b) Substring
(c) Index (d) Block

3.7 The number of characters in a string is called its _____.
(a) Length
(b) Breath
(c) Width
(d) None of the above

3.8 _____ operation of word processing involves replacing one string in the text by another.
(a) Insertion (b) Deletion
(c) Searching (d) Replacement

3.9 _____ is the problem of deciding whether or not a given string pattern P appears in a text T.
(a) Pattern matching
(b) Searching
(c) Sorting
(d) Deletion

3.10 _____ is a linearly ordered sequence of memory cells.
(a) Node (b) Link
(c) Variable (d) NULL

3.11 Each node in a linear list contains an item called _____ which points to the next node in the list.
(a) Node (b) Link
(c) Variable (d) NULL

3.12 _____ is a variable whose length may vary during the execution, but the length cannot exceed a maximum value defined before the program is executed.
(a) Dynamic (b) Static
(c) Semistatistic (d) Global

3.13 In _____ storage, each cell is divided into two parts—the first path stores a single character, while the second part contains the address of the cell containing the next character.
(a) Fixed-length (b) Linked list
(c) Variable length (d) Sequential

3.14 If string 1 = John, and string 2 = Rivers are merged; the process is called
(a) Insertion (b) Deletion
(c) Concatenation (d) Replacement

3.15 _____ is a variable whose length may vary during the execution of a program.
(a) Dynamic (b) Static
(c) Semistatistic (d) Global

ANSWERS TO MULTIPLE CHOICE QUESTIONS

3.1 (c)	**3.2** (a)	**3.3** (c)	**3.4** (a)	**3.5** (b)	**3.6** (b)	**3.7** (c)
3.8. (d)	**3.9** (a)	**3.10** (a)	**3.11** (b)	**3.12** (c)	**3.13** (b)	**3.14** (c)
3.15 (a)						

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MULTIPLE CHOICE QUESTIONS

4.1 _____ is a structure used to represent the linear relationship between elements by means of sequential memory locations.
(a) Linked list (b) Array
(c) Pointer (d) Stack

4.2 A _____ is a list of a finite number of homogenous data elements.
(a) Linear array (b) Pointer
(c) Linked List (d) Tree

4.3 The number of elements n is called the length or _____ of the array.
(a) Upper bound (b) Lower bound
(c) Size (d) Variable

4.4 The number K in A[K] is called the subscript or the _____.
(a) Size (b) Index
(c) Variable (d) Constant

4.5 Which of the following items are not part of the array declaration?
(a) Name of the array
(b) Data type of the array
(c) Index set of the array
(d) Length of the array

4.6 Programming languages like FORTRAN and PASCAL allocate memory space for arrays _____.
(a) Dynamically (b) Statically
(c) Successively (d) Alternatively

4.7 The process of accessing and processing each element of an array A, exactly once is called _____.
(a) Deleting (b) Inserting
(c) Traversing (d) Searching

4.8 _____ refers to the operation of rearranging the elements of an array A so that they are in increasing order.
(a) Searching (b) Sorting
(c) Traversing (d) Inserting

4.9 Two-dimensional arrays are sometimes called _____ arrays.
(a) Integer (b) Boolean
(c) Matrix (d) Real

4.10 _____ is a list in which the order of the items is significant, and the items are not necessarily sorted.
(a) Ordered list (b) Indexed list
(c) Sequential list (d) Unordered list

4.11 Representation of a two-dimensional array as one single column of rows and mapping it sequentially is called _____ representation.
(a) Row-major (b) Row
(c) Colum-major (d) Column

4.12 Matrices with relatively high proportion of zero entries are called _____ matrices.
(a) Triangular (b) Diagonal
(c) Sparse (d) Adjacency

4.13 _____ arrays are where the elements in the different arrays with the same subscript belong to the same record.
(a) One-dimensional (b) Parallel
(c) Two-dimensional (d) Static

4.14 Records can be stored in an area of memory called _____ memory.
(a) Dynamic (b) Static
(c) Simple (d) Parallel

4.15 A matrix in which nonzero entries can only occur on the diagonal or on elements immediately above or below the diagonal, is called _____ matrix.
(a) Triangular (b) Tridiagonal
(c) Sparse (d) Simple

ANSWERS TO MULTIPLE CHOICE QUESTIONS

4.1 (b)	4.2 (a)	4.3 (c)	4.4 (b)	4.5 (d)	4.6 (b)	4.7 (c)
4.8 (b)	4.9 (c)	4.10 (c)	4.11 (a)	4.12 (c)	4.13 (b)	4.14 (a)
4.15 (c)						

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5.9 Write a program which reads the social security number SSS of an employee and prints the employee's record. Test the program using (a) 165-64-3351, (b) 136-46-6262 and (c) 177-44-5555.

5.10 Write a program which reads an integer K and prints the name of each male employee when K = 1 or of each female employee when K = 2. Test the program using (a) K = 2, (b) K = 5 and (c) K = 1.

5.11 Write a program which reads the name NNN of an employee and deletes the employee's record from the structure. Test the program using (a) Davis, (b) Jones and (c) Rubin.

5.12 Write a program which reads the record of a new employee and inserts the record into the file. Test the program using (a) Fletcher, 168-52-3388, Female, 21 000; and (b) Nelson, 175-32-2468, Male, 19 000.

Remark: Remember to update the header record whenever there is an insertion or a deletion.

5.13 Write a 'C' program which inserts and deletes the elements from a circular doubly linked list.

5.14 Write an algorithm which counts the nodes in a singly linked list.

5.15 Write an algorithm to add two polynomials when they are represented using linked lists.

MULTIPLE CHOICE QUESTIONS

5.1 In a linked list, the pointer of the last node contains a special value, called the _____ pointer.
(a) NULL (b) Zero
(c) Link (d) Nextpointer

5.2 In a _____ linked list, the last node's link field points to the first node of the list.
(a) Circularly (b) Linearly
(c) Sequentially (d) Indexed

5.3 The second part of the node, is called _____ field, and contains the address of the next node in the list.
(a) Pointer (b) Field
(c) Node (d) Link

5.4 The link list also contains a list pointer variable called start or _____.
(a) Name (b) Field
(c) Node (d) Link

5.5 A _____ linked list is a linked list structure in which each node has a pointer to both its successor and predecessor.
(a) Circularly (b) Doubly
(c) Linear (d) Sequential

5.6 _____ list is a special list that is maintained, which consists of unused memory cells.
(a) Linear (b) Doubly linked
(c) Circularly linked (d) Free storage

5.7 _____ is a technique using which a computer periodically collects all the deleted space onto the free storage list.
(a) Garbage collection
(b) Garbage compaction
(c) Linked list
(d) Free storage

5.8 _____ attacks the problem of fragmentation by moving all the allocated blocks to one end of memory, thus combining all the holes.
(a) Underflow (b) Overflow
(c) Compaction (d) Free storage

5.9 A _____ linked list is a linked list which always contains a special node, called the header node.
(a) Circular (b) Grounded
(c) Header (d) Doubly

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5.10 A polynomial can be represented in a _____ by just storing the coefficient and exponent of each term.
(a) Array (b) Linked list
(c) Queue (d) Stack

5.11 _____ refers to situation where one wants to delete data from a data structure that is empty.
(a) Free storage (b) Underflow
(c) Overflow (d) Compaction

5.12 _____ is an organization that provides faster request and return time responses.
(a) Stack (b) Queue
(c) Buddy system (d) Recursion

5.13 _____ attacks the problem of fragmentation by moving all the allocated blocks to one end of memory, thus combining all the holes.
(a) Garbage compaction
(b) Garbage collection
(c) Buddy system
(d) Queue

5.14 A _____ list structure can be traversed in two directions—in the forward direction from beginning of the list to end, or in the backward direction, from the end of the list to the beginning.
(a) One-way (b) Linear array
(c) Two-way (d) Header

5.15 _____ header list combines the advantages of a two-way list and a circular header list.
(a) One-way
(b) Two-way circular
(c) Two-way
(d) Header

ANSWERS TO MULTIPLE CHOICE QUESTIONS

5.1 (a)	**5.2** (a)	**5.3** (d)	**5.4** (a)	**5.5** (b)	**5.6** (d)	**5.7** (a)
5.8 (b)	**5.9** (c)	**5.10** (b)	**5.11** (b)	**5.12** (c)	**5.13** (a)	**5.14** (c)
5.15 (b)						

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Test the procedures,

6.5 Suppose a priority queue is maintai

(a) Write a procedure

INSPQA(QUEUE, FRONT, REAR, ITEM, M)

which adds an ITEM with priority number M to the queue. (See Algorithm 6.23.)

(b) Write a procedure

DELPQA(QUEUE, FRONT, REAR, ITEM)

which removes an element from the queue and assigns the element to the variable ITEM. (See Algorithm 6.22.)

Test the procedures, using the data in Solved Problem 6.28. (Assume that QUEUE has ROW number of rows and COL number of columns, where ROW and COL are global variables.)

6.6 Given a stack S and a queue Q, write procedures FILLQ_WITHS which will empty the contents of the stack S and insert them into the queue Q and FILLS_WITHQ which will fill the stack S with the elements deleted from the queue Q. Implement the procedures with S and Q having (i) an array representation and (ii) a linked representation. What are your observations?

6.7 Write a 'C' program using pointers to implement a stack.

6.8 Write a function to test if a string is a palindrome using a stack.

6.9 Write a C program for implementation of various operations on a circular queue.

6.10 Write a program to convert an infix expression to prefix form.

6.11 Write a C program to evaluate a prefix expression.

6.12 Write a procedure that uses a stack to reverse the elements of a circular queue which is stored in an array.

6.13 Write a program to implement two stacks using an array.

6.14 Write a program for non recursive version of preorder.

MULTIPLE CHOICE QUESTIONS

6.1 _____ is a linear structure in which items may be added or removed at one end.
(a) Queue (b) Recursion
(c) Stack (d) Linear list

6.2 Which of the following is not the name used for stack?
(a) FIFO (b) LIFO
(c) Piles (d) Push-down list

6.3 _____ is a linear list in which items may be added only at one end and items may be removed only at the other end.
(a) Queue (b) Stack
(c) Recursion (d) List

6.4 _____ is the term used to insert an element into a stack.
(a) Pop (b) Push
(c) Bottom (d) Pull

6.5 Stacks may be represented in the computer usually by means of a one-way list or a _____.
(a) queue (b) linear array
(c) recursion (d) linear list

6.6 In a linked representation of a stack, the _____ fields of the nodes hold the elements of the stack.
(a) Link (b) Info
(c) Node (d) Pointer

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6.7 With the _____ notation, the operator symbol is placed between its two operands.
(a) Infix (b) Postfix
(c) Polish (d) Exponential

6.8 _____ notation refers to the notation in which the operator symbol is placed before its two operands.
(a) Prefix (b) Postfix
(c) Polish (d) Exponential

6.9 In _____, the problem of sorting a set is reduced to the problem of sorting two smaller sets.
(a) Quicksort (b) Heapsort
(c) Bubble sort (d) Merge sort

6.10 If P is a procedure containing a Call statement to itself or a Call statement to a second procedure that may eventually result in a Call statement back to the original procedure P. Then P is called a _____ procedure.
(a) Heap (b) Recursive
(c) Sort (d) Search

6.11 In a queue, insertions can take place only at the other end called _____
(a) front (b) rear
(c) top (d) bottom

6.12 _____ is a linear list in which the elements can be added or removed at either end but not in the middle.
(a) linear list (b) deque
(c) enqueue (d) dequeue

6.13 A _____ queue is a queue in which the element next to the last element is the first element.
(a) deque (b) circular
(c) linked list (d) heap

6.14 A _____ queue is a collection of elements such that each element has been assigned a priority and the order in which elements are added and processed comes from certain rules
(a) circular (b) priority
(c) heap (d) dequeue

6.15 _____ is the insert operation of the queue structure.
(a) deque (b) enqueue
(c) dequeue (d) linear list

ANSWERS TO MULTIPLE CHOICE QUESTIONS

6.1 (a)	**6.2** (a)	**6.3** (a)	**6.4** (b)	**6.5** (b)	**6.6** (b)	**6.7** (a)
6.8 (c)	**6.9** (a)	**6.10** (b)	**6.11** (b)	**6.12** (b)	**6.13** (b)	**6.14** (a)
6.15 (b)						

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7.14 Write a function which will traverse ... discussed in Supplementary Problem 7.19, similar to the postorder traversal technique.

7.15 Write functions SEARCHB, INSERTB, DELETEB to search, insert and delete keys respectively, into a B-tree of order m. Implement a menu driven program to perform these operations on a B-tree.

7.16 Suppose you have to delete a node from a binary search tree. Write an algorithm to perform this.

7.17 Write procedures for insertion and deletion in a B+ tree.

7.18 Write an algorithm that counts the number of leaves in a binary tree.

7.19 Write a function to print the family tree for an individual.

MULTIPLE CHOICE QUESTIONS

7.1 A terminal node in a binary tree T is called _____.

(a) Edge (b) Path
(c) Leaf (d) Branch

7.2 A _____ is in the form of a balanced tree in which every path from the root of the tree to a leaf of the tree is the same length.

(a) Threaded tree (b) Red-Black tree
(c) B+ -tree (d) B-tree

7.3 In a _____ the left and right subtrees for any given node, differ in height by no more than one.

(a) Balanced binary tree
(b) Weight-balanced binary tree
(c) Height-balanced binary tree
(d) Binary search tree

7.4 A _____ is a binary tree in which every node that does not have a right child has a thread to its inorder successor.

(a) Threaded binary tree
(b) Weight-balanced binary tree
(c) Height-balanced binary tree
(d) Binary Search Tree

7.5 _____ trees are used to represent all the possible moves from a given board position, and to reason about what the best move is.

(a) Expression (b) Threaded
(c) Game (d) Binary

7.6 Which of the following is not the order of traversing a binary tree?

(a) Preorder (b) Inorder
(c) Postorder (d) Order

7.7 Binary tree is said to be 2 tree or _____.

(a) Extended binary tree
(b) Expression
(c) Threaded
(d) Game

7.8 _____ is a binary heap-ordered tree for which the operations are based on a special way of performing the Union operation.

(a) Leftist (b) Binary
(c) Skew (d) Expression

7.9 A _____ is a self-adjusting form of a leftist heap, which may grow arbitrarily unbalanced because they do not maintain balancing information.

(a) Game (b) Expression
(c) Skew (d) Threaded

7.10 _____ is a self-balancing binary search tree, where no path from the root to a leaf is more than twice as long as any other path from the root to a leaf.

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(a) Expression (b) Game
(c) Red-black (d) Threaded

7.11 In tree construction, which is the most suitable data structure?
(a) Array (b) Stack
(c) Linked List (d) Queue

7.12 To reinstate a violated property in red-black trees, we use _____ and rotation methods.
(a) Recoloring (b) Threaded
(c) Expression (d) Rotation

7.13 A tree used to represent arithmetic expressions is called _____
(a) Threaded (b) Game
(c) Red-black (d) Expression

7.14 A tree is said to be _____ if all its levels except possibly the last, have the maximum number of possible nodes, and if all the nodes at the last level appear as far left as possible.
(a) Balanced (b) Complete
(c) Threaded (d) Expression

7.15 If T is a binary tree, and each node of T has the property—the value at N is greater than every value in the left subtree of N and is less than every value in the right subtree of N, then T is called a _____ tree.
(a) Binary Search (b) Balanced
(c) Complete (d) Threaded

ANSWERS TO MULTIPLE CHOICE QUESTIONS

7.1 (c)	7.2 (c)	7.3 (c)	7.4 (a)	7.5 (c)	7.6 (d)	7.7 (a)
7.8 (a)	7.9 (c)	7.10 (c)	7.11 (c)	7.12 (a)	7.13 (d)	7.14 (b)
7.15 (a)						

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6 Write a procedure with inpu... city A to city B and also finds the cost. Test the procedure using the data in Programming Problem 8.5. (Compare the results.)

7 Write a procedure which deletes a record from the file given the flight number NUMB. Test the program using (a) NUMB = 503 and NUMB = 504 and (b) NUMB = 303 and NUMB = 304.

8 Write a procedure which inputs a record of the form

(NUMBNEW, PRICENEW, ORIGNEW, DESTNEW)

Test the procedure using the following data:

(a) NUMBNEW = 505, PRICENEW = 80, ORIGNEW = Chicago, DESTNEW = Denver
NUMBNEW = 506, PRICENEW = 80, ORIGNEW = Denver, DESTNEW = Chicago

(b) NUMBNEW = 601, PRICENEW = 70, ORIGNEW = Atlanta, DESTNEW = Miami
NUMBNEW = 602, PRICENEW = 70, ORIGNEW = Miami, DESTNEW = Atlanta

(Note that a new city may have to be inserted into the binary search tree of cities.)

.9 Translate the topological sort algorithm into a program which sorts a graph G. Assume G is input by its set V of nodes and its set E of edges. Test the program using the nodes A, B, C, D, X, Y, Z, S and T and the edges

(a) (A, Z), (S, Z), (X, D), (B, T), (C, B), (Y, X), (Z, X), (S, C) and (Z, B)
(b) (A, Z), (D, Y), (A, X), (Y, B), (S, Y), (C, T), (X, S), (B, A), (C, S) and (X, T)
(c) (A, C), (B, Z), (Y, A), (Z, X), (D, Z), (A, S), (B, T), (Z, Y), (T, Y) and (X, A)

10 Write a program which finds the number of connected components of an unordered graph G and also assigns a component number to each of its nodes. Assume G is input by its set V of nodes and its set E of (undirected) edges. Test the program using the nodes A, B, C, D, X, Y, Z, S and T and the edges:

(a) [A, X], [B, T], [Y, C], [S, Z], [D, T], [A, S], [Z, A], [D, B] and [X, S]
(b) [Z, C], [D, B], [A, X], [S, C], [D, T], [X, S], [Y, B], [T, B] and [S, Z]

.11 Write a program to find a minimum spanning tree in a graph.

.12 Write a program using the DFS method for graph traversal.

.13 Write an algorithm that traverses a graph. If the graph is connected, it should return true, and should return false if the graph is disjoint.

MULTIPLE CHOICE QUESTIONS

8.1 The _____ of a node is the number of edges containing that node.

(a) Path (b) Degree
(c) Vertex (d) Loop

8.2 If an edge has identical end points, it is called a _____.

(a) Degree (b) Vertex
(c) Loop (d) Path

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8.3 A graph is said to be _____ if there is a path between any two of its nodes.
(a) Connected (b) Complete
(c) Balanced (d) Binary

8.4 A graph g is _____ if every node u in G is adjacent to every node v in G.
(a) Spanning (b) Complete
(c) Balanced (d) Binary

8.5 The graph G is said to be _____ if each edge in the graph is assigned a nonnegative numerical value called the weight or length of the edge.
(a) Complete (b) Weighted
(c) Balanced (d) Tree

8.6 _____ is a common method used to store a graph.
(a) Stack
(b) Adjacency matrix
(c) Diagraph
(d) List

8.7 A connected graph without any cycles is called a _____ graph.
(a) Threaded (b) Weighted
(c) Tree (d) Balanced

8.8 A _____ graph is the same as the multigraph except that each edge is assigned a direction.
(a) Tree (b) Directed
(c) Complete (d) Bi-connected

8.9 A _____ tree of a graph is just a subgraph that contains all the vertices and is a tree.
(a) Binary (b) Balanced
(c) Spanning (d) Complete

8.10 A _____ is a spanning tree in which the total weight of the lines is guaranteed to be the minimum of all possible trees in the graph.
(a) Binary
(b) Complete
(c) Balanced
(d) Minimum Spanning

8.11 _____ graphs are directed graphs with no cycles.
(a) Bi-connected
(b) Directed acyclic
(c) Complete
(d) Binary

8.12 A _____ graph is a connected graph that is not broken into disconnected pieces by deleting any single vertex (and incident edges)
(a) Bi-connected
(b) Directed acyclic
(c) Complete
(d) Tree

8.13 In a _____ search, we begin at out search at the starting node A, and when we come across a dead end we backtrack.
(a) Breadth-first (b) Connected
(c) Depth-first (d) Bubble

8.14 In a _____ search, we use a queue to hold nodes that are waiting to be processed.
(a) Breadth-first (b) Connected
(c) Depth-first (d) Bubble

8.15 One way of maintaining a graph G in the memory of a computer is _____ representation of G, by means of its adjacency matrix.
(a) Linked (b) Sequential
(c) Circular (d) Complete

ANSWERS TO MULTIPLE CHOICE QUESTIONS

8.1 (b) 8.2 (c) 8.3 (a) 8.4 (b) 8.5 (b) 8.6 (b) 8.7 (c)
8.8 (b) 8.9 (c) 8.10 (d) 8.11 (b) 8.12 (a) 8.13 (c) 8.14 (a)
8.15 (b)

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are added to ... Example 9.11.) Suppose the following additional records ... probes for an

(P, 2), (Q, 7), (R, 4), (S, 9)

(Here the left entry is the record and the right entry is the hash address.) (a) Find the updated tables T and LIST. (b) Find the average number S of probes for a successful search and the average number U of probes for an unsuccesful search.

9.13 Write a subprogram MID(KEY, HASH) which uses the midsquare method to find the 2-digit hash address HASH of a 4-digit employee number key.

9.14 Write a subprogram FOLD(KEY, HASH) which uses the folding method with reversing to find the 2-digit hash address HASH of a 4-digit employee number key.

9.15 You are given as input a word form assigned to the variable WORD. Derive function WORDSEARCH which searches the ordered array of words looking for the word form. It the word form is present, its index location is returned, else zero is returned. You can use any search procedure for deriving the function.

PROGRAMMING PROBLEMS

9.1 Write a C program to search a tree for a given element in the integer array using binary search.

9.2 Write an algorithm and program for two-way merge sort. Analyze its time complexity.

9.3 Write a program that takes strings as inputs and stores them in a hash table.

MULTIPLE CHOICE QUESTIONS

9.1 _____ refers to the operation of finding the location of a given item in a collection of items.
(a) Sorting (b) Searching
(c) Function (d) Complexity

9.2 _____ is a field whose values uniquely determine the records in the file.
(a) Pointer (b) Primary key
(c) Secondary key (d) Function

9.3 By using which of the following methods sorting is not possible?
(a) Insertion (b) Exchange
(c) Selection (d) Deletion

9.4 Which is the simplest file structure?
(a) Sequential (b) Indexed
(c) Random (d) Bubble

9.5 A _____ is a data structure used for the storage of records.
(a) Tree (b) Hash table
(c) Stack (d) Graph

9.6 _____ is a search for data that uses an index to locate the item.
(a) Binary search
(b) Sequential search
(c) Indexed search
(d) Jump search

9.7 If the input array is unsorted, then only a linear _____ can be used.

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(a) Binary search
(b) Sequential search
(c) Indexed search
(d) Jump search

9.8 _____ is an attribute of a sort, indicating that data with equal keys maintain their relative input order in the output.
(a) Sort order (b) Sort stability
(c) Sort efficiency (d) Collision

9.9 In _____ method of hashing, selected digits are extracted from the key and used as the address.
(a) Subtraction (b) Digit extraction
(c) Rotation (d) Folding

9.10 _____ hashing method is used in combination with other methods.
(a) Subtraction (b) Digit extraction
(c) Rotation (d) Division

9.11 If two different keys yield the same hash address, it is called _____.
(a) Binary search
(b) Sequential search
(c) Collision
(d) Rotation

9.12 The _____ sort algorithm is called diminishing increment sort.
(a) Merge (b) Radix
(c) Shell (d) Selection

9.13 A _____merge sort uses a constant number of input merge files and the same number of output merge files.
(a) K-way (b) Balanced
(c) Polyphase (d) Radix

9.14 _____ method of collision resolution involves maintaining two tables in memory.
(a) Linear probing
(b) Chaining
(c) Quadratic probing
(d) Double hashing

9.15 _____ is a merge sort that sorts a data stream using repeated merges.
(a) Balanced (b) Polyphase
(c) Radix (d) K-way

ANSWERS TO MULTIPLE CHOICE QUESTIONS

9.1 (b)	**9.2** (b)	**9.3** (d)	**9.4** (a)	**9.5** (b)	**9.6** (c)	**9.7** (b)
9.8 (b)	**9.9** (b)	**9.10** (c)	**9.11** (c)	**9.12** (c)	**9.13** (b)	**9.14** (b)
9.15 (d)						

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