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Question Paper Code : 30106

M.C.A. DEGREE EXAMINATIONS, NOVEMBER/DECEMBER 2022.

First Semester

(Bridge Course)

BX 4001 – DATA STRUCTURES AND ALGORITHMS

(Regulations 2021)

Time : Three hours

Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. Explain the types of data structures. Also discuss their merits and demerits.
2. What is space and time complexity of an algorithm?
3. Convert the expression “(a+b)*c” into postfix and prefix forms.
4. Define queue and mention its applications.
5. What are the merits and demerits of array implementation of lists?
6. List the various operations that can be performed in doubly linked list.
7. Differentiate full binary tree from complete binary tree with one example.
8. Justify the purpose of AVL tree over a binary search tree.
9. What is an undirected acyclic graph?
10. How does Kruskal's algorithm work?

PART B — (5 × 13 = 65 marks)

11. (a) (i) What is a structure? How to declare and initialize a structure? (6)
- (ii) Write and explain any one recursive mathematical function. (7)

Or

(b) (i) Define Big Oh, Big Omega and Big Theta Notations. (6)

(ii) Given two time periods. Write a program to print their difference in terms of Hours, Minutes and Seconds. (7)

12. (a) (i) Consider the following sequence of operations on an empty stack. push(54); push(52); pop(); push(55); push(62); s = pop(); Also,

consider the following sequence of operations on an empty queue. enqueue(21); enqueue(24); dequeue(); enqueue(28); enqueue(32); q = dequeue(); The value of s + q after these operations is _____ (7)

(ii) Explain the concept of circular queue? How is it better than a linear queue? (6)

Or

(b) (i) Write the algorithm for infix to postfix conversion using reverse polish notation. (5)

(ii) Evaluate the following prefix-expression with necessary explanation / - * 2 5 * 1 2 - 11 9. (8)

13. (a) (i) What is a singly linked list? How do you create an empty linked list? (5)

(ii) Explain with an example, how a singly linked list can be used for sorting a set of N numbers. (8)

Or

(b) Consider a list of 10 elements: numList = [89, 45, 68, 90, 29, 34, 17]. Display the partially sorted list after three complete passes of Bubble sort. (13)

14. (a) (i) Draw the binary search tree for the following input list 50, 70, 60, 20, 90, 10, 40, 100. (7)

(ii) Write an algorithm for in-order traversal of binary search tree, and give the order of visiting the nodes of the tree of questions 14 (a) (i). (6)

Or

(b) (i) Define Hashing. List the various open addressing methods. (6)

(ii) Give the pseudocode for the operations of insertion of nodes and deletion of nodes from, a binary search tree with suitable example. (7)

15. (a) Explain how one can identify connected components of a graph by using
- (i) a depth-first search. (6)
 - (ii) a breadth-first search. (7)

Or

- (b) Produce the algorithms and, traverse the following binary tree figure – 1. (13)
- (i) in preorder.
 - (ii) in inorder.
 - (iii) in postorder.

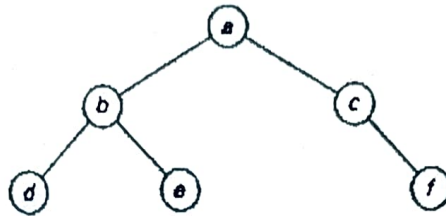


Figure – 1

PART C — (1 × 15 = 15 marks)

16. (a) Identify the data structure that is appropriate for the following
- (i) Convert the decimal number into a binary number
 - (ii) Towers of Hanoi puzzle
 - (iii) Also give the step by step algorithm for both.

Or

- (b) Construct a binary search tree T for the following sequence of numbers: 45, 36, 76, 23, 89, 115, 98, 39, 41, 56, 69, 48. Find the result of Preorder, Inorder and Postorder traversal of T.

Reg. No. :

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Question Paper Code : 90212

M.C.A. DEGREE EXAMINATIONS, APRIL/MAY 2022.

First Semester

(Bridge Course)

BX 4001 — DATA STRUCTURES AND ALGORITHMS

(Regulations 2021)

Time : Three hours

Maximum : 100 marks

Answer ALL questions.

PART A — ($10 \times 2 = 20$ marks)

1. Define ADT. What are the advantages of an ADT?
2. Define Asymptotic notation.
3. Assess the role of stack in function call.
4. Distinguish between dequeue and circular queue.
5. List the advantages of linked list over arrays.
6. Define circular linked list.
7. Compare linear search and binary search.
8. Define hashing.
9. What is meant by non-linear data structure?
10. Define binary tree with its node structure.

PART B — ($5 \times 13 = 65$ marks)

11. (a) Develop a C program to multiply two matrices (two dimensional array) which will be entered by a user. The user will enter the order of a matrix and then its element and similarly input the second matrix. If the entered orders of two matrices are such that they can't be multiplied by each other, then an error message is displayed on the screen.

Or

- (b) Write a C program to create a structure called employee with name, employee id, name, age, designation and salary as data members. Accept five employee details and display it.

12. (a) Explain in detail the operations of stack and its implementation using linked list.

Or

- (b) Simulate the conversion of infix expression to postfix expression using stack for the following expression:

$$3-(4/2)+(1*5)+6$$

13. (a) Write algorithms to create the singly linked list and perform deletion operations at all possible positions in the list.

Or

- (b) Illustrate the insertion operations at first, middle and last position of a doubly linked list with example.

14. (a) (i) Construct a C code to perform binary search. (7)
(ii) Derive an algorithm for insertion sort. (6)

Or

- (b) Explain in detail about the various hash functions with example.

15. (a) Discuss about various Graph traversal techniques.

Or

- (b) Explain the operations of binary search tree with an example for each routine.

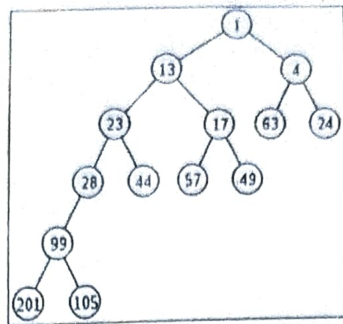
PART C — (1 × 15 = 15 marks)

16. (a) Develop a C program to perform the following operations for the customers of a bank using the concept of structures.

- (i) Input the customer details like name, account number and balance
(ii) When a withdrawal transaction is made the balance must change to reflect it.
(iii) When a deposit transaction is made the balance must change to reflect it.

Or

- (b) For the below given tree, list the labels of the nodes of the tree according to the pre-ordering algorithm, in-ordering algorithm and then re-list them according to the post-ordering algorithm.



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Question Paper Code : 12326

M.C.A. DEGREE EXAMINATIONS, JANUARY 2022.

First Semester

(Bridge Course)

BX 4001 — DATA STRUCTURES AND ALGORITHMS

(Regulations 2021)

Time : Three hours

Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. Define a data structure.
2. What is an abstract data type?
3. Convert the following infix expression to prefix and postfix expression.

$$A + B * C + D$$

4. What is a queue data structure?
5. Outline an array with an example.
6. Define a linked list.
7. What is linear search?
8. Outline a hash function with an example.
9. What is a binary tree? Give example.
10. Outline a directed graph with an example.

30* A+B+C+D
* D+C+A+D

PART B — (5 × 13 = 65 marks)

11. (a) Outline best, worst and average case algorithm analysis with an example. (13)

Or

- (b) Develop an algorithm to compute the sum for the first n terms (13)
 $S = 1 + (1/2) + (1/3) + \dots n$ terms.

12. (a) Outline the operations that can be performed on a stack data structure with an algorithm, example and relevant diagrams. (13)

Or

- (b) Outline the operations that can be performed on a queue data structure with an algorithm, example and relevant diagrams. (13)

13. (a) What is a doubly linked list? Outline the operations that can be performed on a doubly linked list with an algorithm, example and relevant diagrams. (13)

Or

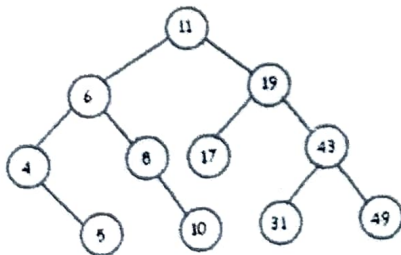
- (b) Outline polynomial addition using linked lists with an algorithm and an example. (13)

14. (a) Outline the steps in the bubble sort algorithm with an example.

Or

- (b) Outline the algorithm to perform binary search with an example.

15. (a) Perform the different traversals for the binary tree given below and write algorithms for all the traversals.



Or

- (b) Elaborate breadth first search traversal on a graph with an algorithm, example and relevant diagrams.

PART C — ($1 \times 15 = 15$ marks)

16. (a) Consider two linked lists L1 and L2, each growing separately. Assume that there is a threshold of growth for each of the lists, say 'n1' for L1 and 'n2' for L2, where 'n1' and 'n2' are non-negative integers. Upon reaching the threshold values by both the lists, they start to grow together as a single merged linked list. Note that both the lists need not reach a threshold value at the same time. Implement this scenario as an algorithm and compute the time complexity of your algorithm. (15)

Or

- (b) Construct a binary search tree with the following key values

55, 12, 75, 13, 10, 90, 40, 110

- (i) Assign 55 as the root node. Illustrate the tree construction process step by step. (7½)
- (ii) Insert the key value 95 to the binary search tree you have constructed and then delete the key value 110 from the binary search tree. Illustrate the tree construction process for insertion and deletion separately. (7½)
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