

DR. BABASAHEB AMBEDKAR TECHNOLOGICAL UNIVERSITY, LONERE

Regular/Supplementary Winter Examination – 2024

Course: B. Tech Branch: Computer Engineering/Computer Science and Engg(AI & ML) & Allied

Subject Code & Name: Data Structures (BTCOC303)

Semester : III

Max Marks: 60

Date:10/02/2025

Duration: 3 Hrs.

Instructions to the Students:

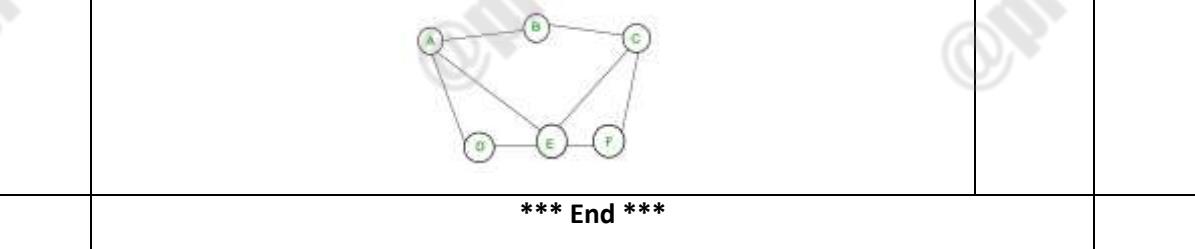
1. Each question carries 12 marks.
2. Question No. 1 will be compulsory and include objective-type questions.
3. Candidates are required to attempt any four questions from Question No. 2 to Question No. 6.
4. The level of question/expected answer as per OBE or the Course Outcome (CO) on which the question is based is mentioned in () in front of the question.
5. Use of non-programmable scientific calculators is allowed.
6. Assume suitable data wherever necessary and mention it clearly.

		(Level/ CO)	Marks
Q. 1	Objective type questions. (Compulsory Question)		12
¹ 51648465	Linked list is not suitable data structure for which one of the following problems? a) Insertion sort b) Binary search c) Radix sort d) Polynomial manipulation		¹ 51648465
² 51648465	A program <i>P</i> reads in 500 integers in the range [0..100] representing the scores of 500 students. It then prints the frequency of each score above 50. What would be the best way for <i>P</i> to store the frequencies? a) An array of 50 numbers b) An array of 100 numbers c) An array of 500 numbers d) A dynamically allocated array of 550 numbers		¹ 51648465
³ 51648465	You have to sort a list <i>L</i> consisting of a sorted list followed by a few random elements. Which of the following sorting methods would be especially suitable for such a task? a) Bubble sort b) Selection sort c) Quick sort d) Insertion sort		¹ 51648465
4	The number of interchanges required to sort 10, 6, 11, 7,		1

	9 in ascending order using bubble sort is a) 7 b) 5 c) 6 d) 8		
5	The number of element in an array $A[l1:u1, l2:u2]$ is given by a) $(u1-l1-1)(u2-l2-1)$ b) $(u1 \times u2)$ c) $(u1-l1)(u2-l2)$ d) $(u1-l1+1)(u2-l2+1)$		1
6	A situation where one wants to delete data from from a data structure that is empty. a) Free storage b) Underflow c) Overflow d) Compaction		1
7	Which of the following is/are application(s) of linked list? a) To implement file systems b) For separate chaining in hash-table c) To implement non-binary trees d) All of the mentioned		1
8	The matrix contains m rows and n columns. The matrix is called sparse matrix if a) Total number of Zero elements $> (m * n)/2$ b) Total number of Zero elements $= m+n$ c) Total number of Zero elements $= m/n$ d) Total number of Zero elements $= m-n$		1
9	A binary tree with n nodes has <i>null</i> childrens? a) n b) $n+1$ c) $n/2$ d) n^2		1
10	The maximum number of edges in an undirected graph with n vertices is a) $n(n-1)/2$ b) 2^n c) $n!$ d) $(n-1)/2$		1
11	How many distinct binary search trees can be constructed with 3 distinct keys? a) 4 b) 5 c) 6 d) 9		1
12	The best data structure to check whether an arithmetic expression has balanced parenthesis is. a) Queue b) Stack c) Tree d) Linked list		1
Q. 2	Solve the following.		12
A)	Why <i>queue</i> is called abstract data type (ADT). Write an		6

	algorithm to implement <i>enqueue</i> and <i>dequeue</i> operations using array as data structure.		
B)	What is binary search tree (bst)? Construct <i>bst</i> for the following data items and show tree after each insert operation. 85, 40, 7, 55, 91, 89, 24		6
Q.3	Solve the following.		12
A)	Convert the infix expression $((A + B) * C - (D - E) ^ (F + G))$ to equivalent <i>Prefix</i> and <i>Postfix</i> notations using stack.		6
B)	Explain how to implement two stacks using one array $A[1..n]$ in such way that neither stack overflows unless the total number of elements in both stacks together is n . The <i>PUSH()</i> and <i>POP()</i> operations should run in $O(1)$ time.		6
Q.4	Solve Any Two of the following.		12
A)	What is hash data structure? Consider the <i>Keys</i> (k) = {25, 38, 41, 52, 3, 13, 56} are inserted into an empty hash table using hash function $h(k) = (k \bmod 7)$ and linear probing is used for collision resolution. Give content of the hash table after every key insertion.		6
B)	Consider insertion of characters into empty circular linked list <i>A, B, C, D, E, F</i> . Assume these elements are stored using 10 memory locations. Find the sequence of characters in the list. Suppose <i>F</i> and then <i>C</i> are deleted and <i>G</i> is inserted at the beginning of list. Find the final structure.		6
C)	What is linked list? Let <i>List</i> be a linked list in memory. Write a separate procedure for each of the following which: i) Finds the how many times a given <i>Item</i> occurs in the <i>List</i> . ii) Add a given value <i>K</i> to each Item in the List.		6

Q.5	Solve Any Two of the following.	12
A)	<p>The inorder and preorder traversals of T yield the following:</p> <p>i) Inorder traversal: $E, A, C, K, F, H, D, B, G$ ii) Preorder traversal: $F, A, E, K, C, D, H, G, B$</p> <p>Construct the original binary tree T using above two sequences.</p>	6
B)	<p>A scheme for storing binary trees in an array X is as follows. Indexing of <i>an array</i> start with <i>1</i>. The root is stored at $X[1]$. For a node stored at $X[i]$, the left child is stored in $X[2i]$ and the right child is stored in $X[2i+1]$.</p> <p>Give the array representation of the below given tree.</p> <p>Also, in worst case to store any binary tree of n number of vertices, how many places do you need in array?</p>	6
C)	<p>Write and explain bubble sort algorithm. Also, prove that the complexity of bubble sort is $O(n^2)$.</p>	6
Q.6	Solve Any Two of the following.	12
A)	<p>An array $A[1 \dots 5][1 \dots 5]$ is stored in the memory with each element requiring 4 bytes of storage. If the base address of array is 300, then determine the location of $A[3][4]$, if the array elements are stored (i) Row wise and (ii) Column wise.</p>	6
B)	<p>Enlist properties of the following trees.</p> <ul style="list-style-type: none"> i) Red black tree iii) AVL tree iv) m-way search tree vi) b+ tree 	6
C)	<p>Consider the simple graph given below. Describe G formally in terms of its set V of nodes and its set E of edges. Also find the indegree, outdegree and total degree of each node.</p>	6



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DR. BABASAHEB AMBEDKAR TECHNOLOGICAL UNIVERSITY, LONERE

End Semester Examination – Winter 2018

Course: B. Tech in Computer Engineering

Sem: III

Subject Name: Data Structures

Subject Code: BTCOC303

Max Marks: 60

Date: 5/12/2018

Duration: 3 Hrs.

Instructions to the Students:

1. Solve **ALL** questions.
2. The level question/expected answer as per OBE or the Course Outcome (CO) on which the question is based is mentioned in front of the question.
3. Use of non-programmable scientific calculators is allowed.
4. Assume suitable data wherever necessary and mention it clearly.

(Level/CO) Marks

Q. 1 Solve Any Three of the following.

- A) What is data structure? Why to study data structure? Enlist the five areas of computer science in which data structure is used. Understand 4
- B) What is garbage collection? Who will run garbage collection program? When it will be run? Understand 4
- C) Suppose multidimensional arrays A and B are declared using A (0:5, -2:7) and B (0:5, -1:4). Find the length of each dimension and the number of elements in array A and B. Apply 4
- D) What is primitive data structure? Enlist the differences between primitive and non-primitive data structures. Understand 4

Q.2 Solve Any Two of the following.

- A) What is circular queue? Let the following circular queue can accommodate maximum six elements with the following data, front = 2, rear = 4 and initial queue content is queue = ----, L, M, N, ----, --- Show the queue content with front and rear value after the following operations.
i) Insert A ii) Delete iii) Insert B iv) Delete Apply 6
- B) What is singly linked list? Write algorithm to find the number of times a given ITEM occurs in the singly linked list. Creating 6
- C) Let the keys: 46, 34, 42, 23, 52, 33 are inserted into an empty hash table using function $h(\text{key}) = \text{key mod } 10$. Give hash table content after every insertion, if open addressing with linear probing is used to deal with collision. Creating 6

Q. 3 Solve Any Two of the following.

- A) What is selection sort? Sort the number following numbers in ascending order and also show the worst case time complexity of selection sort is $O(n^2)$. Analyzing 6
- B) Consider the stack of size 6 memory cells. Suppose initially stack contains **a, b, c, d, e** (Top of stack). Then the following operations are executed Evaluating 6

in order. Show the stack top and any other situation raised while doing each of the operation.

- i) Push(f) ii) Pop(top) iii) Push(g) iv) Push(h) v) Pop(top) vi) Push(i)

- C) Explain how to implement two stacks in one array $A[1 \dots N]$ in such a way that neither stack overflow unless the total number of elements in both the stacks together is N . Note that, Push() and Pop() operations should be run in $O(1)$ time.

Q.4 Solve Any Two of the following.

- A) What are the different types of the linked list? Give advantages and disadvantages each of the linked list over another.

Apply

6

- B) Assume, the following letters are inserted into an empty binary search tree in given order. J, B, D, F, N, K, O. Construct binary search tree and also give height of the tree.

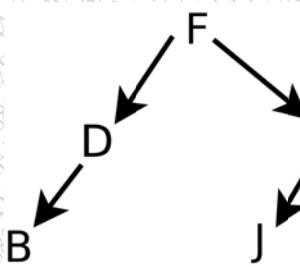
Remember

6

- C) What is threaded binary trees? Give the threaded binary tree of the following binary tree.

Apply

6

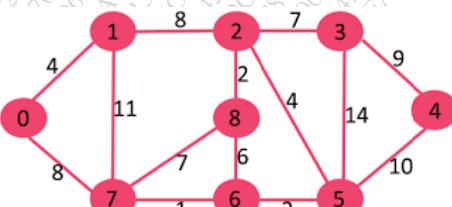


Q. 5 Solve the following.

- A) What is graph? Find the shortest path using Dijkstra algorithm. Assume starting node is 0.

Evaluating

6



- B) Explain the in brief the following

Understand

6

- i) red black tree ii) m-way search tree iii) b tree iv) b+ tree
v) sparse matrix vi) AVL tree

*** End ***

DR. BABASAHEB AMBEDKAR TECHNOLOGICAL UNIVERSITY, LONERE

End Semester Examination – Summer 2019

Course: B. Tech in Computer Engineering

Sem: III

Subject Name: Data Structures

Subject Code: BTCOC303

Max Marks:60

Date: 30/05/2019

Duration: 3 Hr.

Instructions to the Students:

1. Solve ANY FIVE questions out of the following.
2. The level question/expected answer as per OBE or the Course Outcome (CO) on which the question is based is mentioned in () in front of the question.
3. Use of non-programmable scientific calculators is allowed.
4. Assume suitable data wherever necessary and mention it clearly.

(Level/CO) Marks

Q. 1 Solve Any Two of the following.

A) What is Data Structure? Explain the various characteristics of an algorithm **6**

B) What is time complexity? Compute the frequency count for : **6**

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for   i := 1   to n
for   j := i + 1 to n
for   k := j + 1 to n
for   l := k + 1 to n
      x = x + 1;
  
```

C) What is an algorithm? Write an algorithm to find Greatest common divisor (GCD). **6**

Q.2 Solve the following.

A) Write a “C” code to find the transpose of a sparse matrix stored in this way. **6**

B) Using linear probing insert the following values in hash table of size 10. **6**

Elements are 28, 55, 71, 67, 11, 10, 90, 44.

Q. 3 Solve the following.

A) Explain sequential search. Write an algorithm for sequential search. **4**

B) What is skip list? Give its representation .Write an algorithm to insert new item (k,e) in the skip list S. **8**

Q.4 Solve the following.

- A) Write a program in C to create a singly linked list and perform the following
operations I) Insert into list II) Search for data III) Delete from list
- B) Construct algorithm for following operations on a Doubly Linked List
1) CREATE AT END 2) DELETE AT START 3) TRAVERSE

Q. 5 Solve the following.

- A) With the help of suitable example, explain following operation, Enqueue and Dequeue and traverse operation of circular queue **6**
- B) Convert the A*B+C/D expression into postfix using stack **6**

Q.6 Solve the following.

- A) Explain breadth first search technique for graph traversals. **6**
- B) What is a Binary Tree. Explain inorder and postorder traversals with example **6**

***** End *****