



University of Engineering & Management, Kolkata

End Semester Examination, November - December, 2022

Programme Name: B.Tech in CSE/CSE(AIML)/CSE(IOT)/CSBS

Semester: 3rd

Course Name: Data Structure & Algorithms

Course Code: PCCCSE301

Full Marks: 100

Time: 3 Hours

Group - A

Answer 10 questions. Each question carries 2 marks. (2 × 10)

- 1.A. Compare between BTree and B+ Tree. **2,CO2,Understand**
Or
1.B. Contrast between the best case scenarios of linear search and binary search operations. **2,CO2,Understand**
- 2.A. Select true or false: To represent hierarchical relationship between elements, which data structure is suitable? **2,CO2,Understand**
a) Dequeue b) Priority c) Tree d) Graph
Or
2.B. What is the complexity of check if vertex 'u' and 'v' are connectd or not if adjacency matrix is used to represent the graph **2,CO2,Understand**
- 3.A. Discuss properties of binary search tree. **2,CO2,Understand**
Or
3.B. Explain the concept of average case running time. **2,CO2,Understand**
- 4.A. Select true or false: If there is Back edge in a directed graph then there must be a cycle present in the graph. **2,CO2,Understand**
Or
4.B. Explain the need of a tree to be balanced. **2,CO2,Understand**
- 5.A. Explain the concept of worst-case running time. **2,CO2,Understand**
Or
5.B. The Breadth First Search traversal of a graph will result into? **2,CO2,Understand**
a) Linked List b) Tree c) Graph with back edges d) Arrays
- 6.A. Define complete binary tree. **2,CO1,Remember**

Or

6.B. Define data structure.

2,CO1,Remember

7.A. What is Clique?

2,CO1,Remember

Or

7.B. What do you understand by stable sorting?

2,CO1,Remember

8.A. When do you think the worst-case scenario for linear search occurs and why?

2,CO1,Remember

Or

8.B. Which data structure is used to implement Breadth First Search of a graph?

2,CO1,Remember

9.A. Describe Graph Isomorphism with an example.

2,CO1,Remember

Or

9.B. What is the no. of distinct binary search trees possible with n nodes?

2,CO1,Remember

10.A. Which data structure is used to implement Depth First Search of a graph? Give an example.

2,CO1,Remember

Or

10.B. State the difference between the m-way search tree & binary search tree.

2,CO1,Remember

Group - B

Answer 8 questions. Each question carries 5 marks. (5 × 8)

11.A. a) Evaluate the need for different types of arithmetic expressions.

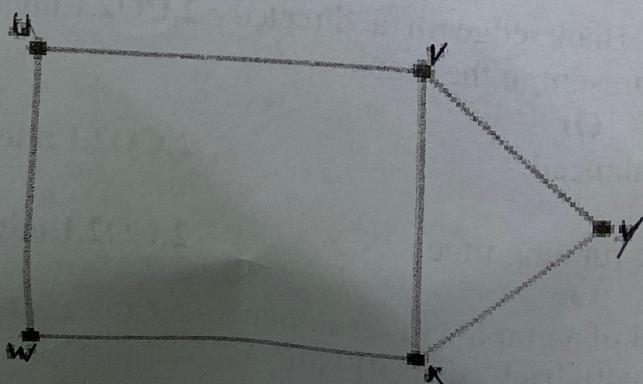
5,CO5,Evaluate

b) Specify the need for a priority queue over a normal queue.

11.B. Perform the DFS for the node "u".

Or

5,CO5,Evaluate



- 12.A.** Calculate time complexity of the following function: (Show all the steps) 5,CO5,Evaluate

```
A(){  
int i,j,k;  
for(i=n/2; i<=n; i++)  
for(j=1;j<=n/2; j++)  
for(k=1; k<=n; k=k*2)  
printf("UEMK");}
```

Or

- 12.B.** Give an example of non-comparison based sorting algorithm and analyse its complexity. 5,CO5,Evaluate

- 13.A.** Analyse the Space complexity of Breadth First Search algorithm. 5,CO4,Analyze

- a) Graph is represented using Adjacency List
- b) Graph is represented using Adjacency Matrix

Or

- 13.B.** Analyse the Time complexity of Breadth First Search algorithm. 5,CO4,Analyze

- a) Graph is represented using Adjacency List
- b) Graph is represented using Adjacency Matrix

- 14.A.** Analyse the time complexity of Depth First Search algorithm. 5,CO4,Analyze

- a) Graph is represented using Adjacency List
- b) Graph is represented using Adjacency Matrix

Or

- 14.B.** In case of recursion, queue cannot be used – Justify. 5,CO4,Analyze

- 15.A.** Show that “array representation of complete binary tree is considered as efficient.” 5,CO4,Analyze

Or

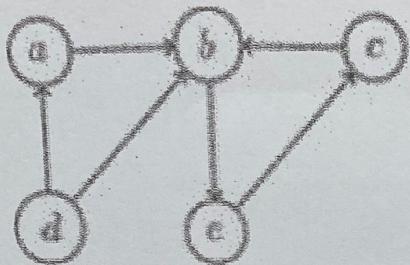
- 15.B.** Write an algorithm to find all prime numbers present in a list of 'n' numbers and find its time complexity. 5,CO4,Analyze

- 16.A.** Write an algorithm to insert an element at the beginning and end of an array. 5,CO3,Apply

Or

16.B. Apply DFS to classify Back Edge of the graph.

5,CO3,Apply



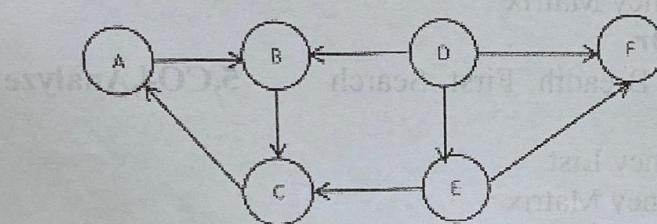
17.A. Create a B tree of order 5 by inserting the following elements:
3,14,7,1,8,5,11,17,13,6,23,12,20,26,4,16,18,24,25 and 19.

5,CO6,Create

Or

17.B. Construct the connected components of the graph.

5,CO6,Create



18.A. Convert following tree into a binary tree.

5,CO5,Evaluate

$$T = (A(B(M, N), C(G(H))), D(F), E(P, Q, R)))$$

Or

18.B. Suppose a graph is represented by Adjacency list. Show that complexity to remove a vertex from the graph is $O(V+E)$. Where V is set of Vertices and E is set of edges.

5,CO5,Evaluate

Group - C

Answer 4 questions. Each question carries 10 marks. (10 × 4)

19.A. Design an algorithm to find mirror image of a binary search tree. Construct binary tree version of a height balanced binary search tree, created by numbers 1 to 10 in such a way so that no link should be assigned as NULL.

10,CO6,Create

Or

19.B. Design a data structure in such a way that you can insert as many as data and which should not have ending point as NULL.

10,CO6,Create

- 20.A.** Create a Huffman tree and corresponding codes for the following nodes:

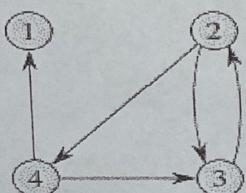
10,CO5,Evaluate

A	B	C	D	E	F	G	H	I	J
7	9	11	14	18	21	27	29	35	40

Or

- 20.B.** Find out reachability between every pairs of vertices for the following graph.

10,CO5,Evaluate



- 21.A.** Write Prim's algorithm. Analyse the complexity to find an edge between two vertex if the graph is represented in Adjacency list.

10,CO4,Analyze

Or

- 21.B.** Write Kruskal's algorithm. Analyse the complexity to find an edge between two vertex if the graph is represented in Adjacency list.

10,CO4,Analyze

- 22.A.** Show that a BFS always explore shortest path. Here shortest path means minimum number of edges between any path from u to v.

10,CO3,Apply

Or

- 22.B.** Write a C program to arrange 'n' words using array of pointers concept.

10,CO3,Apply
