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NOIDA INSTITUTE OF ENGINEERING AND TECHNOLOGY, GREATER NOIDA

(An Autonomous Institute Affiliated to AKTU, Lucknow)

B.Tech

SEM: II - CARRY OVER THEORY EXAMINATION - MAY 2023

Subject: Data Structures & Algorithms

Time: 3 Hours

Max. Marks: 100

General Instructions:**IMP:** Verify that you have received the question paper with the correct course, code, branch etc.

1. This Question paper comprises of **three Sections -A, B, & C.** It consists of Multiple Choice Questions (MCQ's) & Subjective type questions.

2. Maximum marks for each question are indicated on right -hand side of each question.

3. Illustrate your answers with neat sketches wherever necessary.

4. Assume suitable data if necessary.

5. Preferably, write the answers in sequential order.

6. No sheet should be left blank. Any written material after a blank sheet will not be evaluated/checked.

SECTION A**20****1. Attempt all parts:-**

- 1-a. An algorithm that requires operations to complete its task on n data elements is said to have a linear runtime.(CO1) 1
- (a) $n^3 + 9$
- (b) $3n^2 + 3n + 2$
- (c) $2n + 1$
- (d) 9
- 1-b. The running time of an algorithm T(n), where 'n' is the input size, of a recursive algorithm is given as follows. is given by $T(n) = c + T(n - 1)$, if $n > 1$ and, if $n \leq 1$ The order of this algorithm is (CO1) 1
- (a) n
- (b) $n+1$
- (c) $n-1$
- (d) $n*1$
- 1-c. The data structure required to check whether an expression contains a balanced parenthesis is(CO2) 1

- (a) Stack
- (b) Queue
- (c) Array
- (d) Tree

- 1-d. In linked list implementation of queue, if only front pointer is maintained, which of the following operation take worst case linear time (CO2) 1
- (a) Insertion
 - (b) Deletion
 - (c) To empty a queue
 - (d) Both insertion and to empty a queue
- 1-e. The number of nodes in a full binary tree of depth 4 is: (CO3) 1
- (a) 15
 - (b) 16
 - (c) 14
 - (d) 13
- 1-f. Which of the following properties does a simple graph not hold.(CO3) 1
- (a) Must be connected
 - (b) Must be unweighted
 - (c) Must have no loops or multiple edges
 - (d) Must have no multiple edges
- 1-g. Which of the following sorting procedure is slowest.(CO4) 1
- (a) Bubble sort
 - (b) Heap sort
 - (c) Shell sort
 - (d) Quick sort
- 1-h. In a max-heap, element with the greatest key is always in the which node(CO4) 1
- (a) Leaf node
 - (b) First node of left sub tree
 - (c) root node
 - (d) First node of right sub tree
- 1-i. Which of the following statements for a simple graph is correct.(CO5) 1
- (a) Every path is a trail
 - (b) Every trail is a path

(c) Every trail is a path as well as every path is a trail

(d) Path and trail have no relation

1-j. A connected planar graph having 6 vertices, 7 edges contains _____ regions.(CO5) 1

(a) 15

(b) 3

(c) 1

(d) 11

2. Attempt all parts:-

2.a. What is space complexity? (CO1) 2

2.b. What is a stack data structure give its applications.(CO2) 2

2.c. In tree construction which is the suitable efficient data structure. (CO3) 2

2.d. What is the complexity of insertion sort? (CO4) 2

2.e. What is a weighted graph? (CO5) 2

SECTION B

30

3. Answer any five of the following:-

3-a. Which characteristics of algorithms shows that running time or the execution time of operations of data structure must be as small as possible.(CO1) 6

3-b. List out the main objectives of Data structure. (CO1) 6

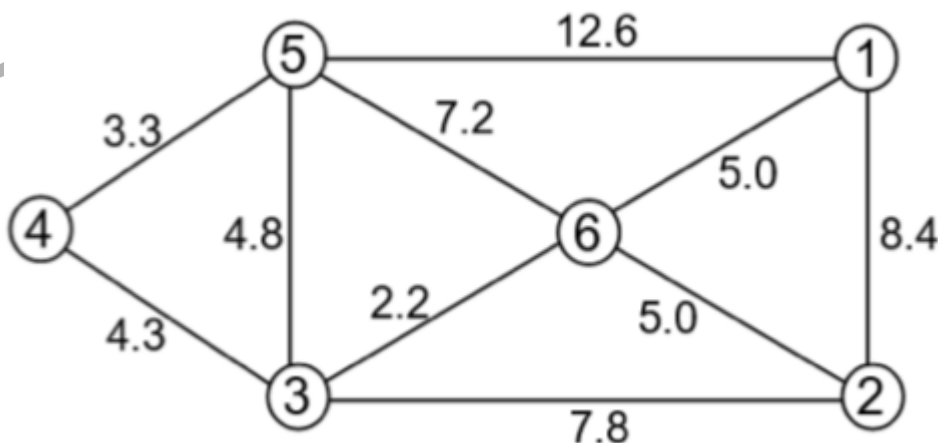
3-c. List the applications of Stack. (CO2) 6

3-d. What are enqueue and dequeue operations? Give algorithms.(CO2) 6

3.e. List out few applications of the tree data structure. (CO3) 6

3.f. What is sorting? List some popular sorting methods. (CO4) 6

3.g. Find the shortest path using Dijkstra's algorithm. (CO5) 6



4. Answer any one of the following:-

- 4-a. What is a recursion? Compare the recursive programs with iterative programs.(CO1) 10
- 4-b. Write a recursive program to solve the Binary Search problem.(CO1) 10

5. Answer any one of the following:-

- 5-a. What do you mean by Array? Describe the storage structure of Array.(CO2) 10
- 5-b. How the operations performed on linked list implementation of stack? (CO2) 10

6. Answer any one of the following:-

- 6-a. What is Spanning Trees? Explain Spanning Tree in detail with example.(CO3) 10
- 6-b. How will you balance the tree constructed using elements : 8,10,21,28,36,50. (CO3) 10

7. Answer any one of the following:-

- 7-a. What is selection sort? Write the process of selection sort. (CO4) 10
- 7-b. Explain shell Sort with the help of an example.(CO4) 10

8. Answer any one of the following:-

- 8-a. Explain various multiple key access file organization in brief with advantages and disadvantages of each method.(CO5) 10
- 8-b. Find all pair shortest path using Floyd Warshall algorithm in the following graph: (CO5) 10

