Printed Page:- 05 **Subject Code:- ACSBS0203**

Roll. No:

NOIDA INSTITUTE OF ENGINEERING AND TECHNOLOGY, GREATER NOIDA

(An Autonomous Institute Affiliated to AKTU, Lucknow)

B.Tech

SEM: II - THEORY EXAMINATION (20222-2023)

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 performs lesser number of operations when the size of input is small, but performs more operations when the size of input gets larger. State the correct option. (CO1) 1

(a) may be

(b) TRUE

(c) FALSE

(d) all of the mentioned

1-b. An algorithm is made up of 2 modules M1&M2.; If order of M1 is f(n) & M2 is g(n) then the order of algorithm is? (CO1) 1

(a) f(n) + g(n)

(b) f(n) X g(n)

(c) max (f(n),g(n))

(d) min (f(n),g(n))

1-c. Which principle works on Stack? (CO2) 1

(a) FILO

(b) FIFO

(c) LILO

(d) LIFO or FILO

1-d. Which Linked List have the last node of the list pointing to the first node? (CO2) 1

(a) Circular Doubly Linked List

(b) Circular Linked List

(c) Circular Singly Linked List

(d) Doubly Linked List

1-e. Which among the following belongs to the category of a Post-order Traversal? (CO3) 1

(a) Root -> Left Sub Tree -> Right Sub Tree

(b) Root -> Right Sub Tree -> Left Sub Tree

(c) Right Sub Tree -> Left Sub Tree -> Root

(d) Left Sub Tree -> Right Sub Tree -> Root

1-f. In a heap the element with the greatest key is always located in which node? (CO3) 1

(a) leaf

(b) root

(c) first node of left sub tree

(d) first node of right sub tree

1-g. Which of the following is the fastest sorting algorithm to sort a list? (CO4) 1

(a) Quick sort

(b) Bubble sort

(c) Binary sort

(d) Linear sort

1-h. Which of the following is false in the case of a spanning tree of a graph G? (CO4) 1

(a) It is tree that spans G

(b) It is a subgraph of the G

(c) It includes every vertex of the G

(d) It can be either cyclic or acyclic

1-i. Which of the following is not a collision resolution technique? (CO5) 1

(a) Separate chaining

(b) Linear probing

(c) Quadratic probing

(d) Hashing

1-j. What is the disadvantage of hashing with chaining? (CO5) 1

(a) not easy to implement

(b) takes more space

(c) quite sensitive to hash function

(d) table gets filled up easily

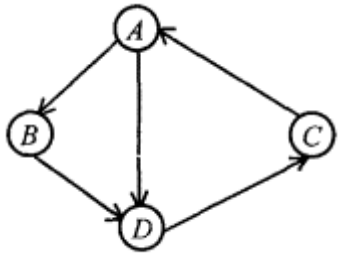
2. Attempt all parts:-

2.a. What are the features of an efficient algorithm in data structure? (CO1) 2

2.b. Define Binary search tree. How it is different from binary tree? (CO2) 2

2.c. How many null nodes will a binary tree with 20 nodes have? (CO3) 2

2.d. For the following graph ,obtain adjacency matrix and adjacency list representation : (CO4) 2



2.e. What are the methods available in storing sequential files? (CO5) 2

SECTION B **30**

3. Answer any <u>five</u> of the following:-

3-a. Discuss an example which can be represented both recursively and iteratively. (CO1) 6

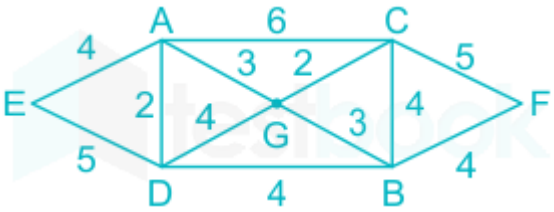
3-b. Show that f(n) +g(n) =O(n^2) where f(n) =3n^2-n+4 and g(n) =nlogn+5. (CO1) 6

3-c. Explain operations of a stack with an example. (CO2) 6

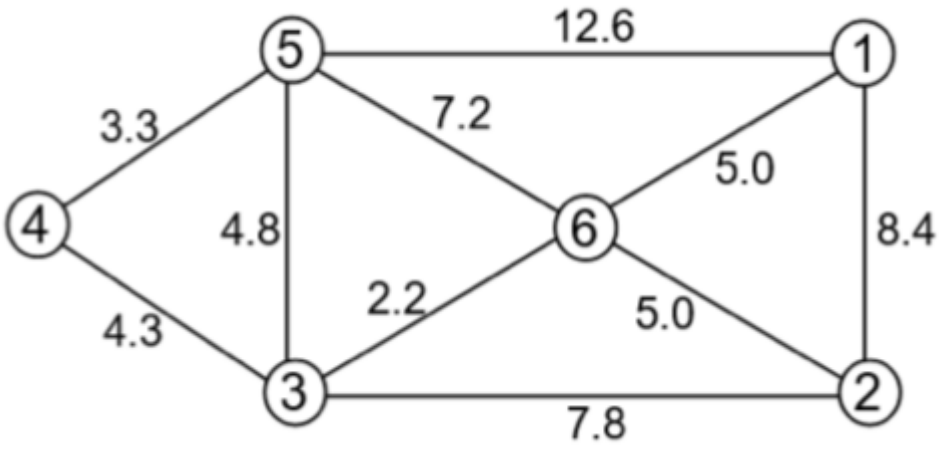
3-d. Explain and implement a single linked list with an example. (CO2) 6

3.e. How binary trees are represented as Arrays in the memory. (CO3) 6

3.f. Find the Minimum Spanning Tree of the following graph using Kruskal's algorithm. Also find its cost for all intermediate effects. (CO4) 6



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



SECTION C **50**

4. Answer any <u>one</u> of the following:-

4-a. Define the following terms in brief: (CO1) 10
(i) Time complexity (iii) Space complexity
(ii) Asymptotic Notation (iv) Big O Notation

4-b. Write a recursive program for checking whether a number is a palindrome or not. (CO1) 10

5. Answer any <u>one</u> of the following:-

5-a. Write algorithm for Push and Pop operations in stack. Transform the following expression into its equivalent postfix expression using stack: 10
A + (B * C – (D / E ↑ F) * G) * H (CO2)

5-b. What do you mean by Array? Describe the storage structure of Array.(CO2) 10

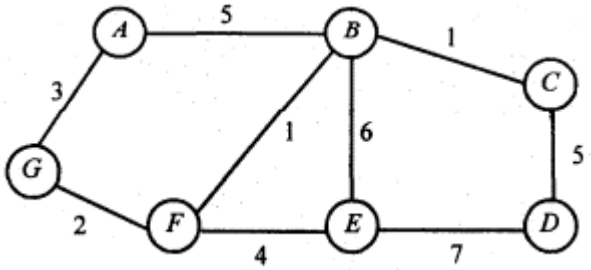
6. Answer any <u>one</u> of the following:-

6-a. Create a Binary Search Tree for the following data and do in-order, Preorder and Post-order traversal of the tree. 50, 60, 25, 40, 30, 70, 35, 10, 5 (CO3) 10

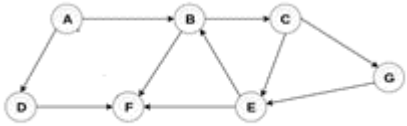
6-b. Construct a tree for the given inorder and postorder traversals. (CO3) 10
Inorder : DGBAHEICF

7. Answer any <u>one</u> of the following:-

7-a. Use Kruskal's Algorithm to extract minimum spanning tree of the graph. (CO4) 10



7-b. Write algorithm to perform Breadth First Search. Write one possible order of visiting the nodes of the following graph starting at vertex A. (CO4) 10



8. Answer any <u>one</u> of the following:-

8-a. What do you understand by BFS. Discuss with an appropriate example. Differentiate BFS and DFS. (CO5) 10

8-b. Classify in detail the Hashing Functions based on the various methods by which the key value is found. (CO5) 10