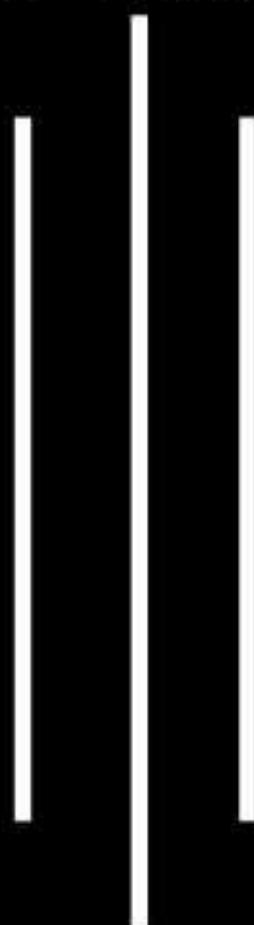
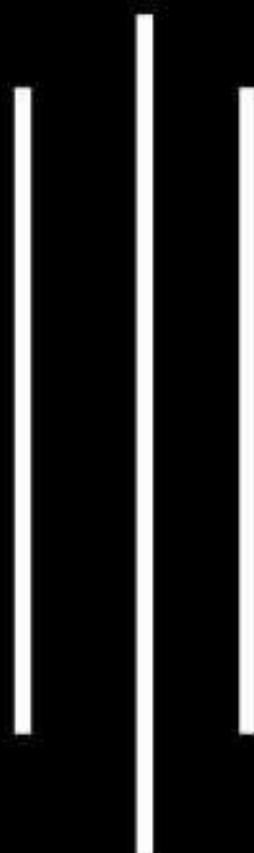


Pre-University Examination subject wise paper collection



Data Structure and Algorithm



Provided By:

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Asim Pandey

Harry Xettri

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Samir kc

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Safal Poudel

POKHARA UNIVERSITY

Level: Bachelor

Programme: BE

Course: Data Structure and Algorithms

Semester: Spring

Year : 2023

Full Marks: 100

Pass Marks: 45

Time : 3hrs.

Candidates are required to give their answers in their own words as far as practicable.

The figures in the margin indicate full marks.

Attempt all the questions.

1. a) Why do we generally use worst case analysis to state the complexity of an algorithm? Suppose the given algorithm and compute its total running time $T(n)$ for best case and worst case. 8

Algorithm ABC (n)		Cost	Time
1	$m=1$	C1	1
2	for $i=1$ to n do	C2	n
3	for $j=1$ to i do	C3	n
4	$m=i+j$	C4	n
5	return m	C5	1

- b) Convert the following infix expression into postfix expression: 7

$$A * B / C + (D + E - (F * (G / H)))$$

2. a) Suppose you are given a problem to find the sum of the first ten natural numbers. How do you use recursion to solve this problem? Explain it with required base case, base condition, partial solution and recursive case. 7

b) Define queue as an ADT. Implement insert and delete operation in circular queue using C or C++ code. 8

3. a) Write an algorithm to insert a node at first and delete from last in a singly linked list. 8

OR

What are the advantages of linked list over array? Write an algorithm for push and pop operation in the linked implementation of stack. 7

- b) Why is balancing a tree important? Construct an AVL tree using the following data: 7

73, 25, 92, 47, 10, 68, 36, 58, 81, 14

4. a) Generate Huffman code for the following data: 7

Character	P	O	K	H	A	R
Frequency	22	9	41	7	2	32

- b) Write algorithm for quick sort. Trace quick sort algorithm for following data: 8

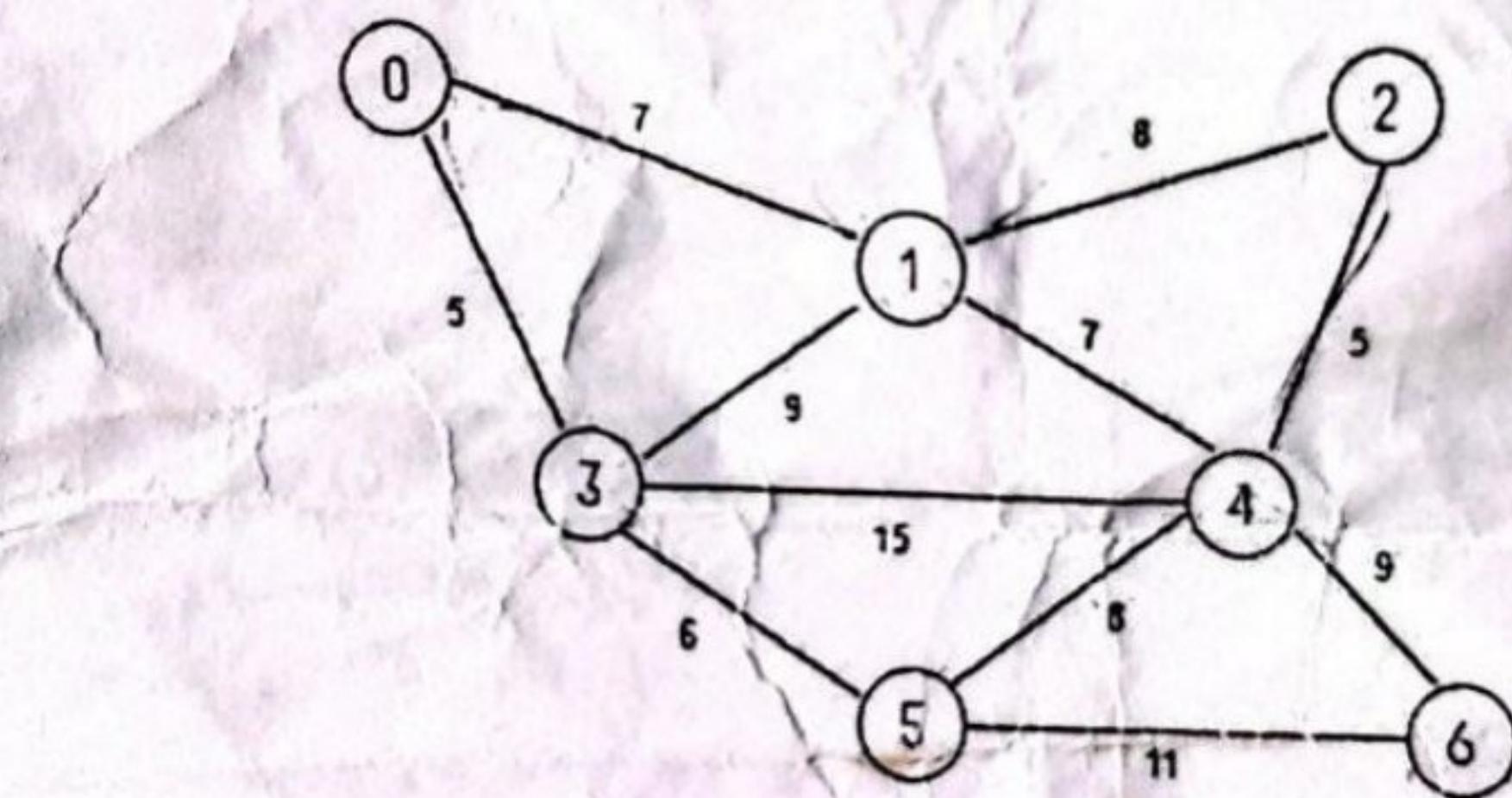
5, 3, 2, 6, 4, 1, 3, 7.

OR

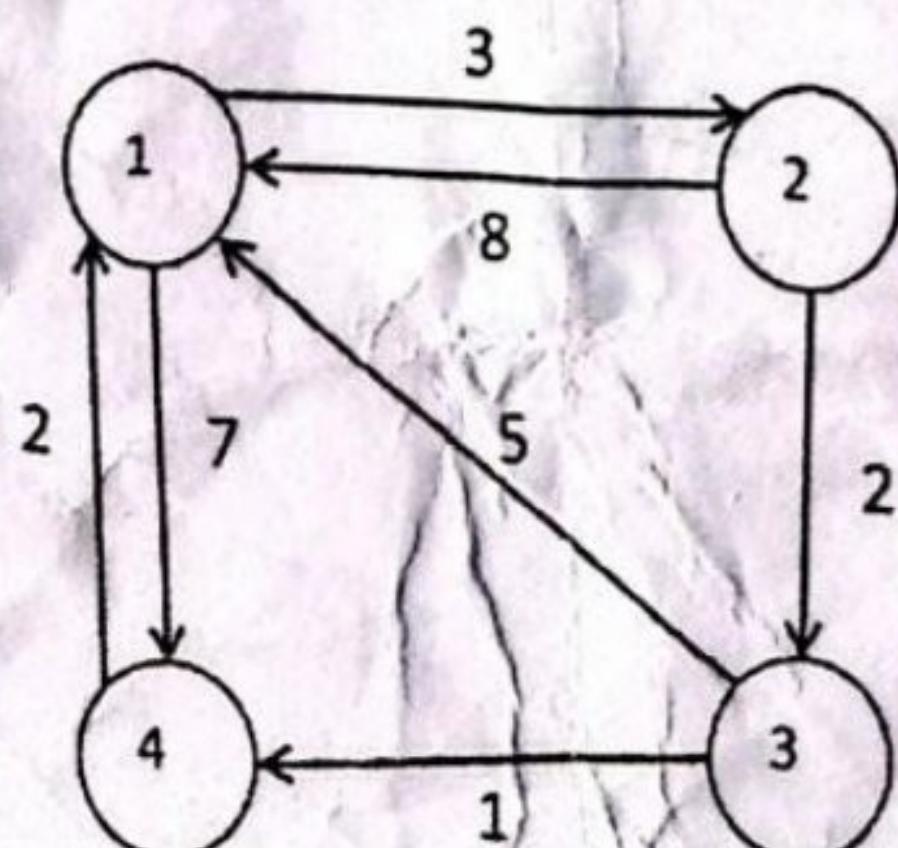
Create the heap structure from the following sequence of data and sort them using heap sort.

5, 13, 2, 25, 7, 17

5. a) Design and implement a simple hash system with a hash function $h(\text{key}) = \text{key \% } 11$ using C or C++ code. If any collision occurs in the hash system, just ignore it. 10
- b) Explain the applications of B tree in computer science with appropriate examples. 5
6. a) Find the minimum spanning tree for the following graph using Prim's algorithm. 8



- b) Define transitive closure. Represent the given graph using adjacency matrix, incident matrix and adjacency list. Also find the transitive closure of the graph. 7



7. Write short notes on: (Any two) 2×5
- a) Rate of growth
 - b) Topological sort
 - c) Binary search

NEPAL ENGINEERING COLLEGE
Changunarayan-04, Bhaktapur
(Assessment Fall Semester 2024)

Level: Bachelor

Full Marks: 100

Programme: BE

Pass Marks: 45

Course: Data Structure and Algorithm

Time: 3hrs.

Candidates are required to give their answers in their own words as far as practicable.

The figures in the margin indicate full marks.

Attempt all the questions.

1. a) What is Abstract Data Types (ADT)? Why do we need data structure? Compare and contrast between primitive and non-primitive data structure. 8
- b) Differentiate stack and queue. Convert the given Infix expression into Postfix expression showing the content of stack at each step.
$$A+((B-C)*(D-E)+F)/G)S(H-J)$$
 7
2. a) What is a benefit of circular queue when compared to linear queue? Write an algorithm to **enqueue (insert)** an item in circular queue in array implementation. 8
- b) Write down the merits and demerits of contiguous list and linked list. Write an algorithm for **inserting an element at nth position (at any position) in a singly linked list.** 7
3. a) What is difference between recursion and iteration? Write a recursive C program that is used to solve the Tower of Hanoi (TOH) problem. 7
- b) Define binary search tree. Draw the Binary Search Tree (BST) for the following node in a binary search tree.
60, 25, 72, 15, 30, 68, 101, 13, 18, 47, 70, 34
Also traverse the constructed tree in post-order, pre-order and in-order. 8
4. a) Construct an AVL tree from the given data. Also explain all types of rotation in an AVL tree.
21, 26, 30, 9, 4, 14, 28, 18, 15, 10, 2, 3, 7 8
- b) Construct Huffman tree and generate the Huffman code for the symbol **A, B, C, D, and E** with the corresponding weights **10, 20, 15, 5, 25** respectively. 7

5. a) Why sorting is necessary? Sort the following data by heap sort method. 8

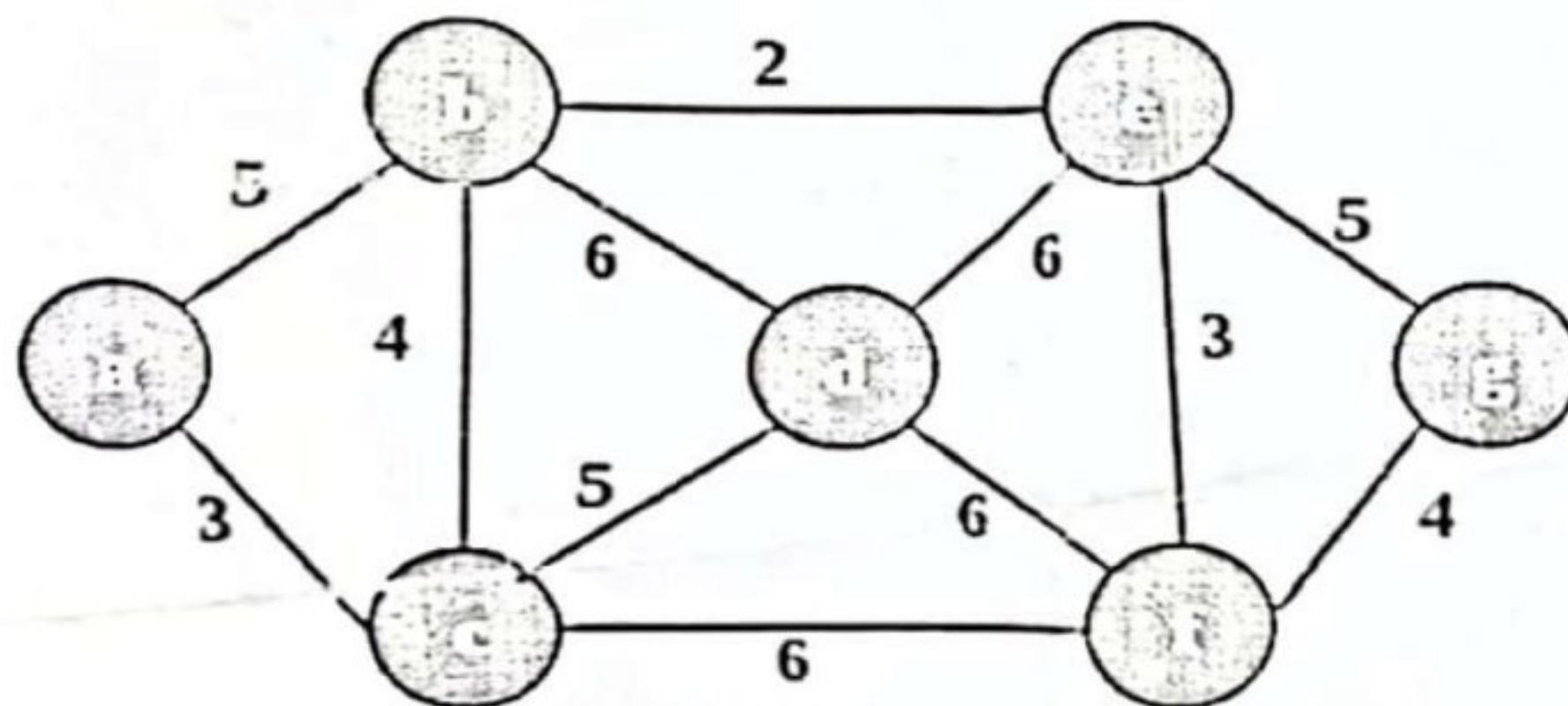
10, 30, 5, 63, 22, 12, 56, 33

OR

Why sorting is necessary? Write a C program to implement the algorithm of bubble sort.

7

- b) Define Hash Function. Explain about collision resolution technique used in hashing. 8
6. a) Define graph, connected graph, complete graph and weighted graph. Differentiate between DFS and BFS with an example. 8
- b) What is spanning tree? Find the minimum spanning tree using Kruskal's algorithm for the following graph. 7



7. Write short notes on (Any two) 2x5
- a) Topological sort
 - b) Game tree
 - c) Deque (Double Ended Queue)
 - d) Big O Notation

NEPAL COLLEGE OF INFORMATION TECHNOLOGY

Level: Bachelor Assessment
Programme: Computer
Course: Data Structure and Algorithm

Year : 2024
Full Marks: 100
Pass Marks: 45
Time : 3hrs.

Candidates are required to give their answers in their own words as far as practicable.

The figures in the margin indicate full marks.

Attempt all the questions.

1. a) Classification of data structure. Write an algorithm of stack for push and pop operation. 7

b) Convert infix to postfix: K+L-M*N+(O^P) *w/u/v*T+Q. 7

2. a) What are advantages of recursion over iteration explain? Explain TOH with an example which having 4 disks. 8

b) Differentiate between linear and circular queue. Write an algorithm to insert elements in circular queue. 8

3. a) Explain about BST and why we need balanced tree. Create the balanced tree of following keys using AVL balanced tree method: 20, 10, 5, 45, 46, 47, 15, 15, 30, 75. 7

b) Why we use linked list in data structure and algorithm. Write a program to insert a node at beginning, delete a node from specified position in a single linked list. 8

OR

Write an algorithm to insert and an element in circular queue. Write a program to implement linear queue.

4. a) Generate the Huffman code for the following data: 7

Character	A	B	C	D	E	F	G
Frequency	32	23	46	92	42	36	94

b) Sort the following data using quick sort:

21, 43, 51, 32, 20, 35, 8, 12.

OR

How we sort the above keys using merge sort.

5. a) Search the index of following keys: 1, 10, 11, 13, 2, 20, 21, 15, 25. If collision occur resolve the collision using quadratic probing method or double hashing method. 7
b) Sort elements using max heap sort of the following elements: 1000, 50, 103, 30, 300, 500, 730, 540, 1.

b. a) Write an algorithm to insert and delete an element from front(left) side in double ended queue. 8
b) Explain merge sort with your own example, take at least 11 elements in your example. 7

7. Write short notes on: (Any two) 2×5
a) Rational number as an ADT.
b) Dequeue.
c) Double linked list.

POKHARA UNIVERSITY
School of Engineering
INTERNAL ASSESSMENT

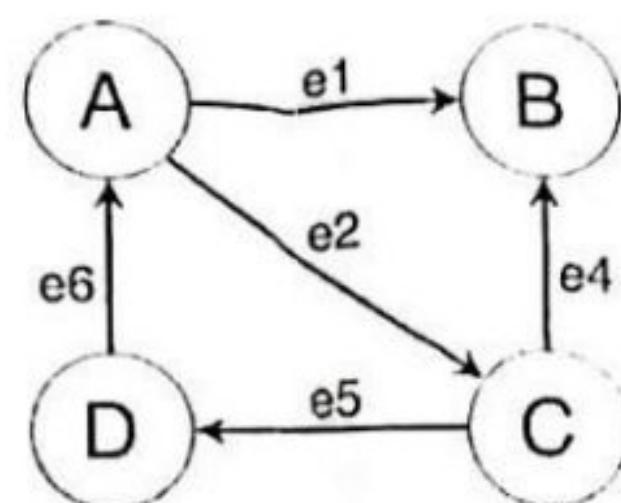
Level: Bachelor	Semester: Spring	Year : 2024
Programme: BE	Full Marks: 100	Pass Marks: 45
Course: Data Structure and Algorithms	Time : 3hrs.	

Candidates are required to give their answers in their own words as far as practicable. The figures in the margin indicate full marks.

Attempt all the questions.

1. a) Define rate of growth. Compare and analyze the rate of growth of algorithm A which has the running time $T_A(n) = 91n + 2$ and algorithm B with running time $T_B(n) = n^2 + n + 2$ for input size $n = 5, 50, 70, 90, 100$ and 200. If your application need to handle the input size less than 90, which algorithm will you prefer and why? What will happen for the input size greater than 90? Explain in detail. 2+5
- OR**
- What is algorithm design technique? Does it depend on the nature of a problem to be solved? Explain with an example of merge sort.
- b) Define a stack ADT class. Implement the push and pop operations of the stack ADT using C or C++ language. 2+6
2. a) How does a recursion technique is used to solve a complex problem? Explain with an example in detail. List two disadvantages of recursive solution. 5+2
- b) Define a max-heap. How and why do you use a max-heap to implement the priority queue? Explain with a suitable example. 2+6
3. a) Define a node of a singly linked list to contain the id and age of students (You can use either struct of C or class of C++ to define the node). What is singly linked list? Implement the insertion operation in a singly linked list to insert a new node at the beginning. Also explain each step of your implementation in brief. 2+2+4
- b) Explain the linked stack in detail with a suitable example. While implementing the push and pop operations, which end - the beginning or end of the singly linked list do you prefer to use as the top of the stack? and why? 5+1+1
4. a) Define a complete binary tree. What are the binary tree traversing algorithms? Explain each in detail with suitable examples. 2+6
- b) Define binary search tree. Why do you need to balance a binary search tree? Explain in detail with a suitable example. 2+5
5. a) Perform the worst case analysis of the selection sort. 5

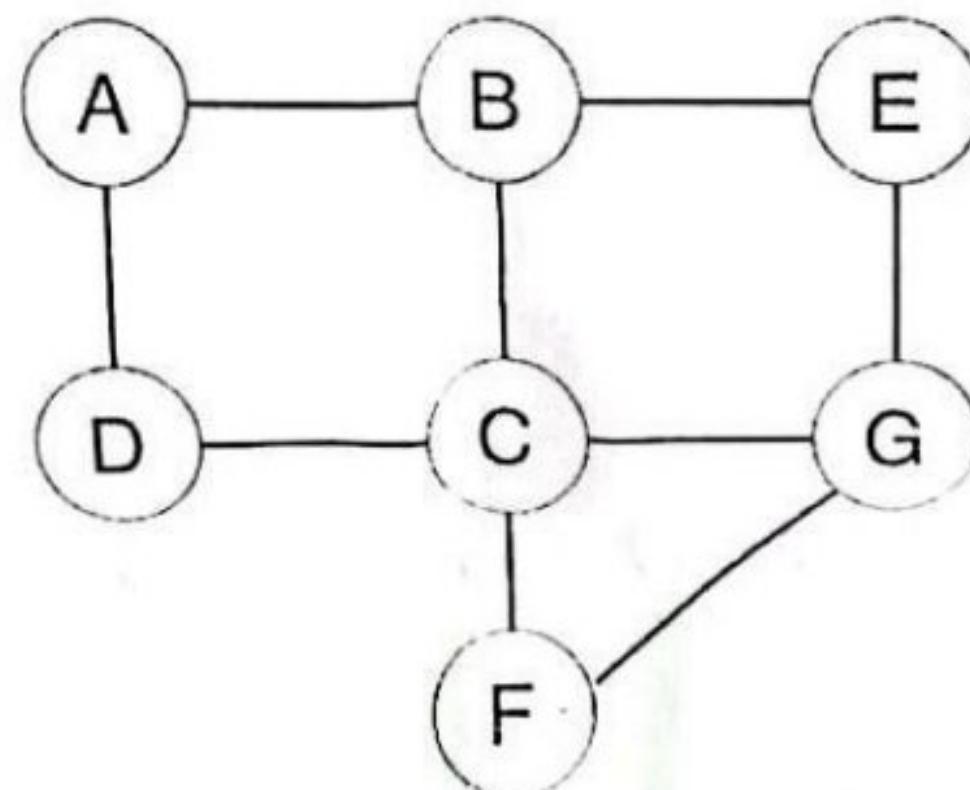
- b) Design and implement a simple hash system with a hash function $h(x) = x \% 6$. Use linear probing for collision resolution in your hash system if it occurs.
6. a) Define a graph. Represent the given graph using adjacency matrix, incidence matrix and adjacency list. 2+6



A v. B
A-A → B-B

OR

Define a Directed Acyclic Graph. How does breadth first search work to traverse every node in a graph? Explain with the given graph starting from the node A.



Top

- b) What is a spanning tree? What is the role of a minimum spanning tree in designing a network of cities connected by roads? How do you use the Prim's algorithm to connect all the cities by the roads with minimum length. Explain in detail. 1+2+4
- 7 Write short notes on any two (2X5)
- Need of Data Structures
 - Quick Sort
 - Rehashing

National Academy of Science & Technology

(Affiliated to Pokhara University)

Dhangadhi, Kailali

Pre-University Examination

Level: Bachelor

Semester - II_Spring

Year : 2024

Programme: B.E. Computer

Full Marks : 100

Pass Marks : 45

Course: Data Structure and Algorithm

Time : 3hrs.

Candidates are required to give their answers in their own words as far as practicable. The figures in the margin indicate full marks.

Attempt all the questions.

1. a) What do mean by algorithm analysis? Suppose the given algorithm and compute its total time $T(n)$ for worst case and average case. 7

Algorithm

for i = 1 to n

Cost

C1 ✓

for j = 1 to n-1

C2

printf("NAST College")

C3

- b) Convert the following expression into postfix :

$$A + (B / C - (D * E ^ F) + G) * H$$

Also evaluate : abc *+ d - , a = 4, b = 3, c = 2, d = 5 8

2. a) Write an application area of queue. Write an algorithm for enqueue and dequeue operations for Circular queue. 8

- b) What are the advantages of Dynamic list? Write C/C++ program to insert a node in Single linked list. 7

3. a) How do you represent polynomial expression in linked list? Write an algorithm to implement stack operation using linked list. 7

- b) Compare recursion and iteration. Write a program to solve Tower of Hanoi (TOH) problem. 8

4. a) Generate Huffman code for the following data: 7

Character	C	E	I.	R	S	T	X
Frequency	12	8	18	10	9	5	2

- b) Construct an AVL tree for following data. 8

35, 56, 64, 68, 65, 44, 31, 49, 45, 20, 25

Explain the methods of balancing the AVL tree. Also, find preorder and postorder.

5.a) Create the heap structure from the following sequence of data and sort them using heap sort. 7

5, 13, 2, 25, 7, 17

Contrast time complexity of heap sort.

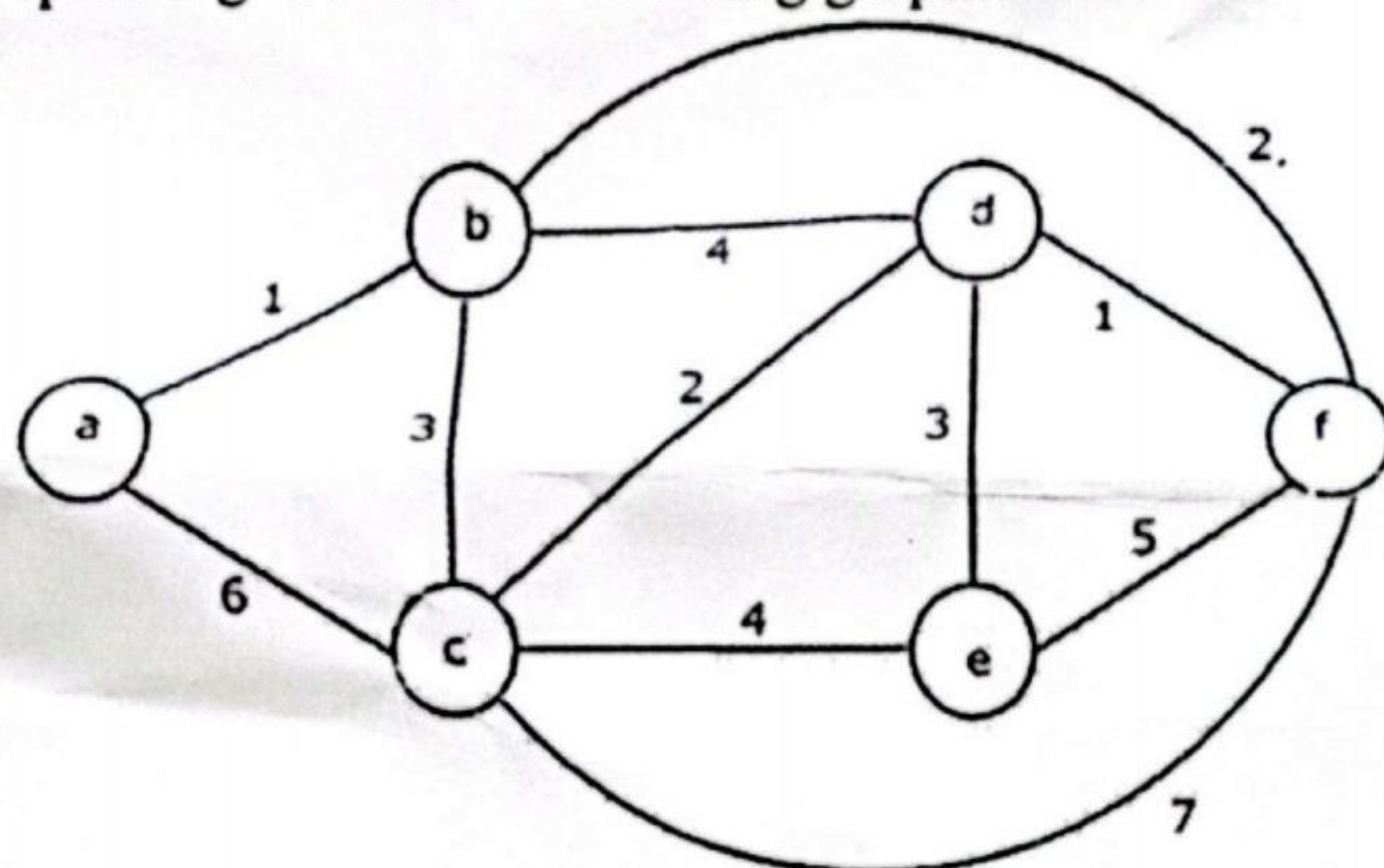
b) Given input {1, 16, 49, 36, 25, 64, 0, 81, 4, 9} and a hash function $h(x) = x \bmod 10$. Show the resulting: 8

- hash table using linear and quadratic probing
- hash table using separate chaining

OR

Write a C or C++ program for binary search. Also compare the time complexity of linear and binary search.

6.a) What do you mean by spanning tree of graph? Find the minimal spanning tree of the following graph. 7



b) What is breadth first traversal? Explain with example. Discuss the application of the Breadth first search traversal algorithm? 8

OR

What is graph data structure? Why it is needed? Explain the Dijkstra's algorithm with example.

7. Write short notes on following (Any Two) 5x2

- Backtracking
- B Tree and its application
- Internal and External Sort

Date: 20/02/29

Level BE

Full Marks 50

Programme BCE

Time

Semester II

1.5 hrs

Subject: - Data Structure Algorithms

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ Attempt All questions.
- ✓ The figures in the margin indicate Full Marks.
- ✓ Assume suitable data if necessary.

1. Define Abstract Data Type (ADT). Which data structure would you prefer to implement the following features? Justify your reasons.
 - a) CPU Scheduling
 - b) History on a Browser
 - c) File Management System
 - d) Display route on GPS
 - e) Representation of Polynomial equations

OR

Illustrate the principle of stack with an example. Convert the following infix expression to a prefix expression using stack. [2+5]

$$A + B - C / (D * F) \$ G / H ^ I$$

2. Explain Dequeue. Write an algorithm to insert an item on a circular queue. [2+5]
3. Explain List ADT. Implement the queue data structure using a singly linked list. [2+8]
4. Explain the limitations of a linear queue. How does a circular queue overcome this limitation? Demonstrate with an example. [3+5]
5. Write down an algorithm to solve the T0II problem. Also generate its recursion tree. [7+3]
6. Write short notes on: (Any Two) [4*2=8]
 - a) Iteration vs Recursion
 - b) Dynamic List
 - c) Balanced Tree

D10, 1

A

Date:	20/8/08	Full Marks	50
Level	BE	Time	
Programme	BCE		
Semester	II	1.5 hrs	

Subject: - Data Structure Algorithms

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ Attempt All questions.
- ✓ The figures in the margin indicate Full Marks.
- ✓ Assume suitable data if necessary.

1. Explain the importance of the B tree. Create an AVL tree of the following data: [3+7]
11, 99, 22, 43, 58, 32, 1, 88, 33, 77, 8, 44, 66, 55, 96

2. Define Internal Sort. Write down the Space and Time complexity of merge sort. Sort the following data using quick sort: [1+2+7]
1, 9, 101, 87, 34, 55, 7, 2, 79, 64

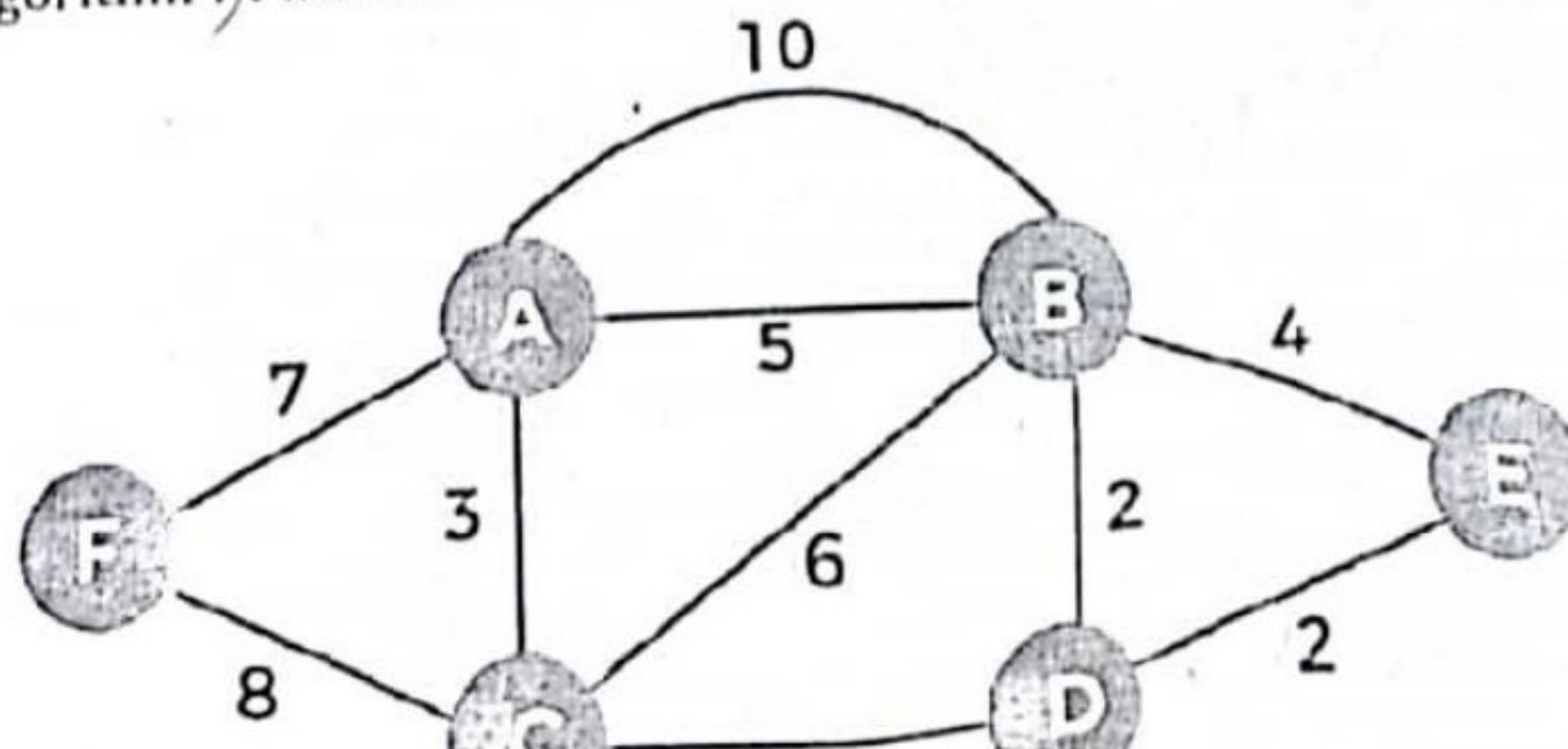
③ Define Hashing. Why is hashing important? Consider a hash table of size 10. Insert the following data using Linear Probing. [1+2+7]
72, 27, 36, 24, 63, 81, 92, 101

4. Define strongly connected graphs. Let G be the graph represented by this adjacency list. [2+2*4]

Vertex	Adjacent List
A	F
B	C
C	B
D	A, B
E	C, D
F	E

- Draw G.
- Is G a directed graph?
- Is G a weakly connected graph?
- Give the adjacency matrix for G.

5. Define Minimum Spanning Tree (MST). What is the significance of the shortest path algorithm? Find the MST of the following graph using Prim's Algorithm. [1+2+7]



Lumbini Engineering, Management & Science College
Final Internal Assessment Exam

Level: Bachelor

Year: 2024

Program: Computer 2nd sem.

Full Mark: 100

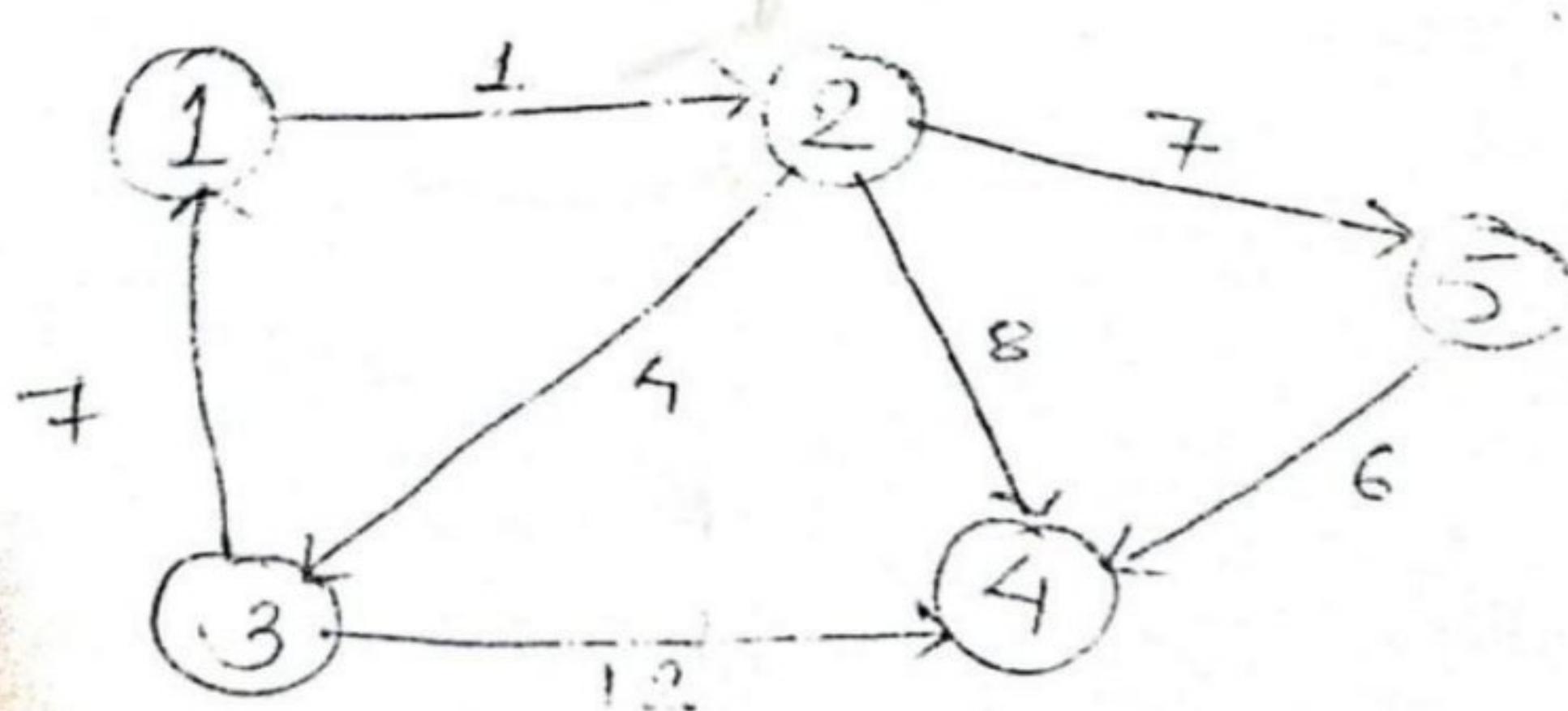
Course: DSA

Pass Mark: 45

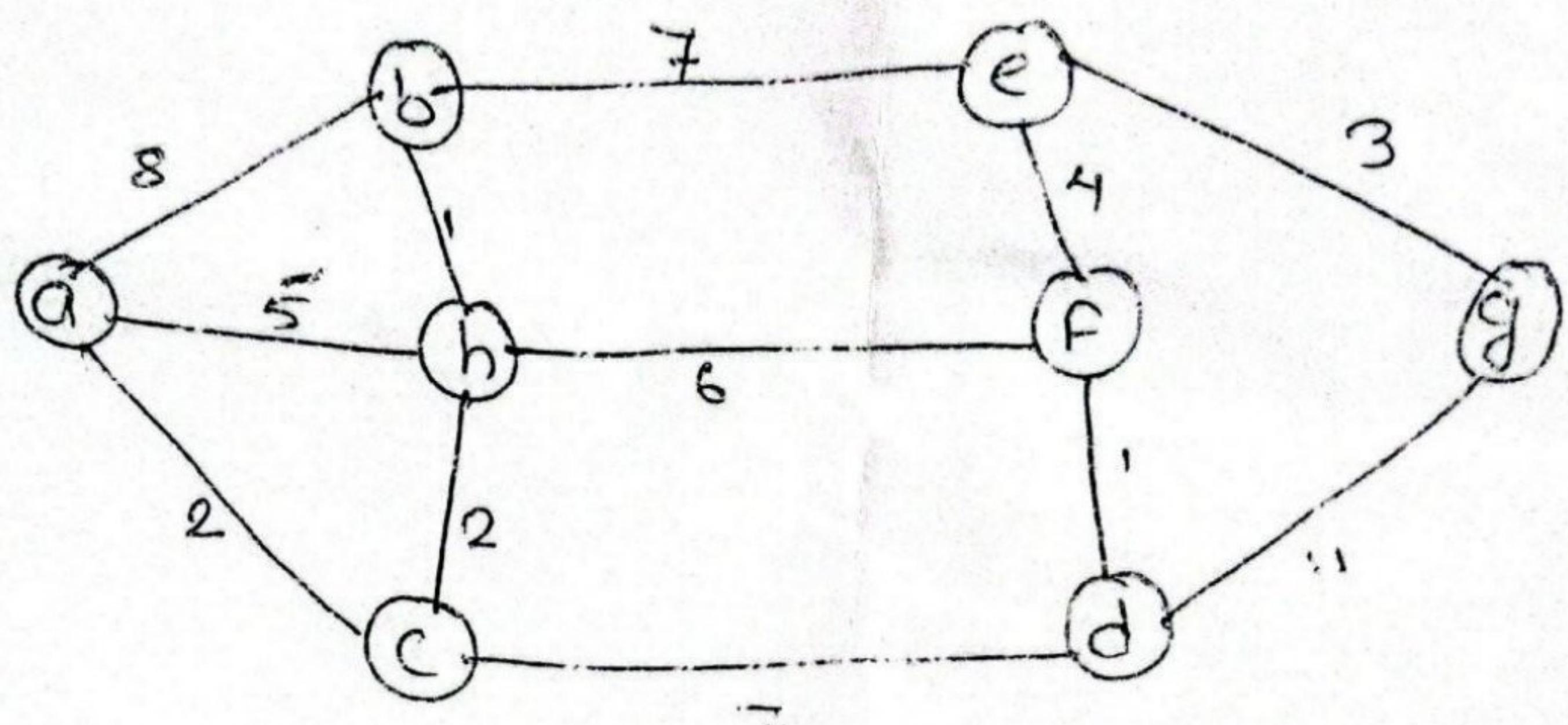
Attempt all the questions

[8x10=80]

- 1.a) Why data structure is needed? Explain the advantages of abstract data type.
- b) Write an Algorithm for conversion of infix to postfix expression. $(a \cdot b / c \cdot d)^{*} e / (f - g^{*} h)$
- 2.a) Write a program to implement stack operations.
- b) Define doubly linked list? Write an algorithm to implement insertion at beginning and end using doubly linked list.
- 3.a) Define recursion: WAP to find gcd using recursion. Explain TOH.
- b) Explain with example the different cases of balancing AVL tree after inserting a node that violates the property.
- 4.a) Construct a BST and show VLR, LVR, LRV from 14, 10, 17, 12, 11, 20, 15, 25, 20, 8, 22, 23 and delete 8 and 23.
- b) Construct a heap from the following data and illustrate heap sort.
56, 103, 88, 24, 77, 89, 53, 47, 90
- 5.a) What is transitive closure? Explain Floyd warshall's Algorithm form the graph below.

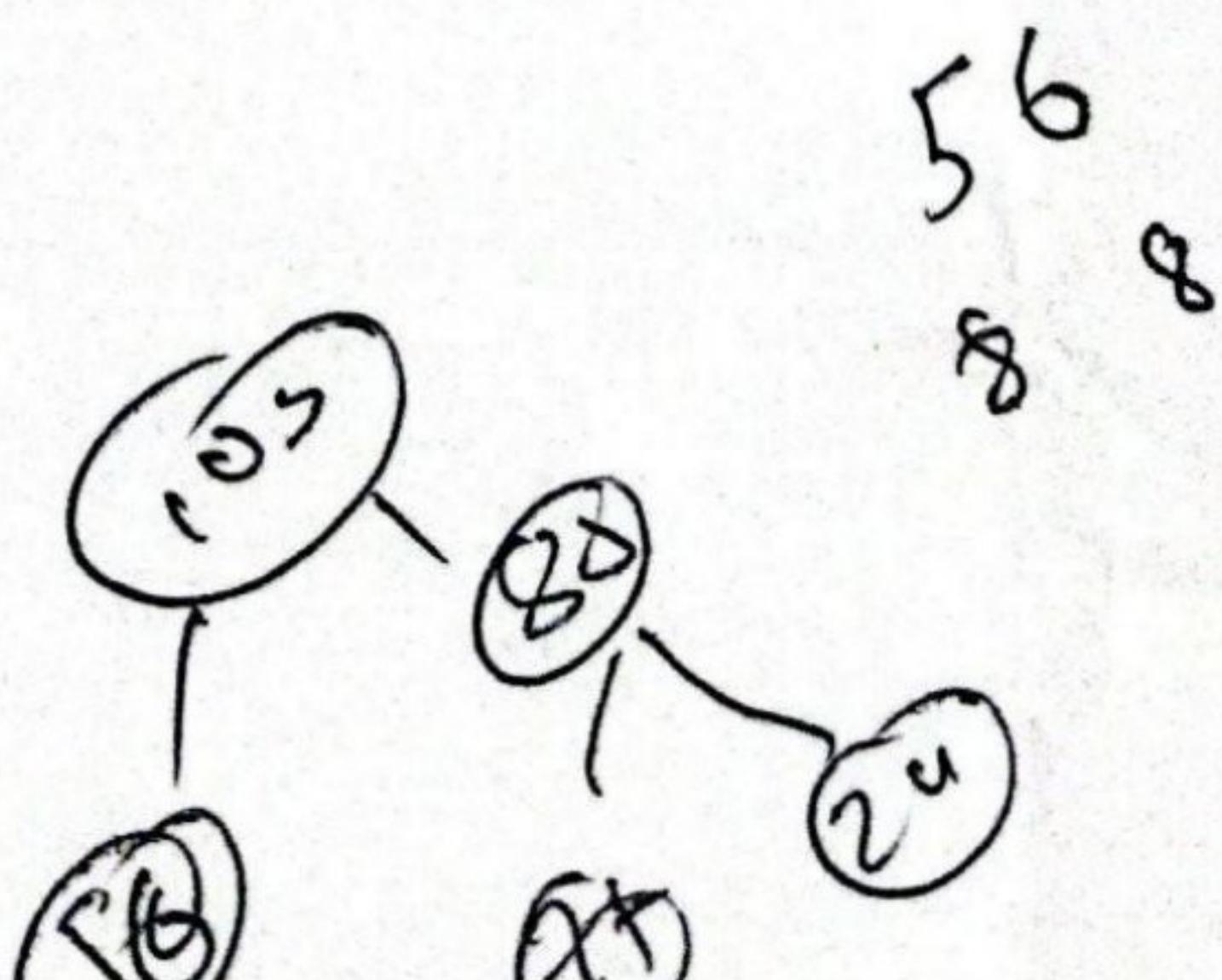


- b) Define graph traversing. Find the shortest path from any node using Dijkstra's Algorithm.



6. Write short notes on (any four) [5×4 = 20]

- a) Divide and conquer
- b) Binary search
- c) Big.O notation
- d) Priority Queue
- e) Deterministic and non-deterministic algorithm
- f) B-tree



POKHARA ENGINEERING COLLEGE
Internal Assessment Examination

Level: Bachelor
Programme: Computer
Course: Data Structure and Algorithm

Semester – Spring

Year : 2024
Full Marks: 100
Pass Marks: 45
Time : 3 hrs.

Candidates are required to give their answers in their own words as far practicable.

The figures in the margin indicate full marks.

Attempt all the questions.

Define Abstract Data Types with examples. What are the data structures used in the following areas: 8

- i. Evaluating the arithmetic expression
- ii. Process scheduling by operating systems
- iii. Hierarchical data model

Convert the given expression into Postfix expression showing the content of stack at each step.

$$P+Q/R+(S+T -(U*(V/W)))$$

Define Recursion. Write a simple program to implement factorial of a positive integer using recursion in C/C++. 7

Write an algorithm to insert and delete operation in circular queue. 8

Define List. List down the operation performed in list. Explain dynamic implementation of list with suitable example. 8

What is the advantage of doubly linked list over singly linked list?

Write algorithm to push and pop operation in the liked implementation of stack. 7

Why is balancing a tree is important? Construct an AVL tree from the following data: 8

83, 35, 102, 57, 21, 69, 38, 59, 83, 16

b. Generate Huffman code for the following data:

7

Character	A	E	Z	K	M	I
Frequency	25	11	66	4	36	16

a. What is sorting? Write a program to implement quick sort in C/C++.

7

OR

Create a heap structure from the following sequence of data and sort them using heap sort.

17,15,14,18,16,13,14,19

b. Explain various collision resolution techniques in hashing with example.

8

a. Define transitive closure. For the adjacency matrices A given below.

7

i. Draw the corresponding digraph

ii. Find the matrix of the transitive closure using the diagram implementation of Warshall's algorithm.

$$A = \begin{bmatrix} 0 & 1 & 0 & 0 \\ 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 1 \\ 1 & 0 & 0 & 0 \end{bmatrix}$$

b. Write Dijkstra's shortest path algorithm and explain the algorithm with suitable example.

8

Write short notes on: (**Any two**)

2*5

- a. Recursion Vs Iteration
- b. Binary Search
- c. Topological sort

NEPAL ENGINEERING COLLEGE

Level: Bachelor

Assessment

Year: 2023

Programme: BE- Computer

Full Marks: 100

Course: Data Structure and algorithm

Pass Marks: 45

Time: 3 hr.

Candidates are required to give their answers in their own words as far as practicable.

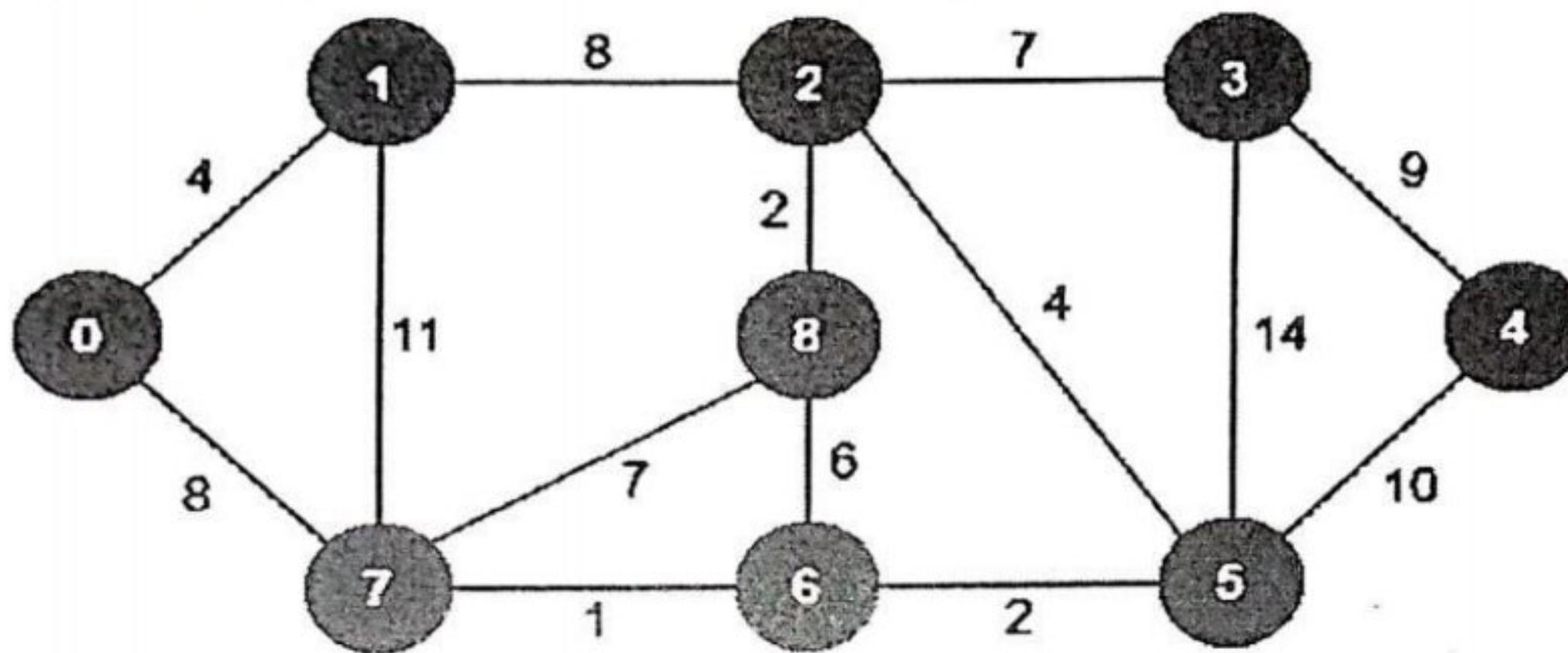
The figures in the margin indicate full marks.

Attempt all the questions.

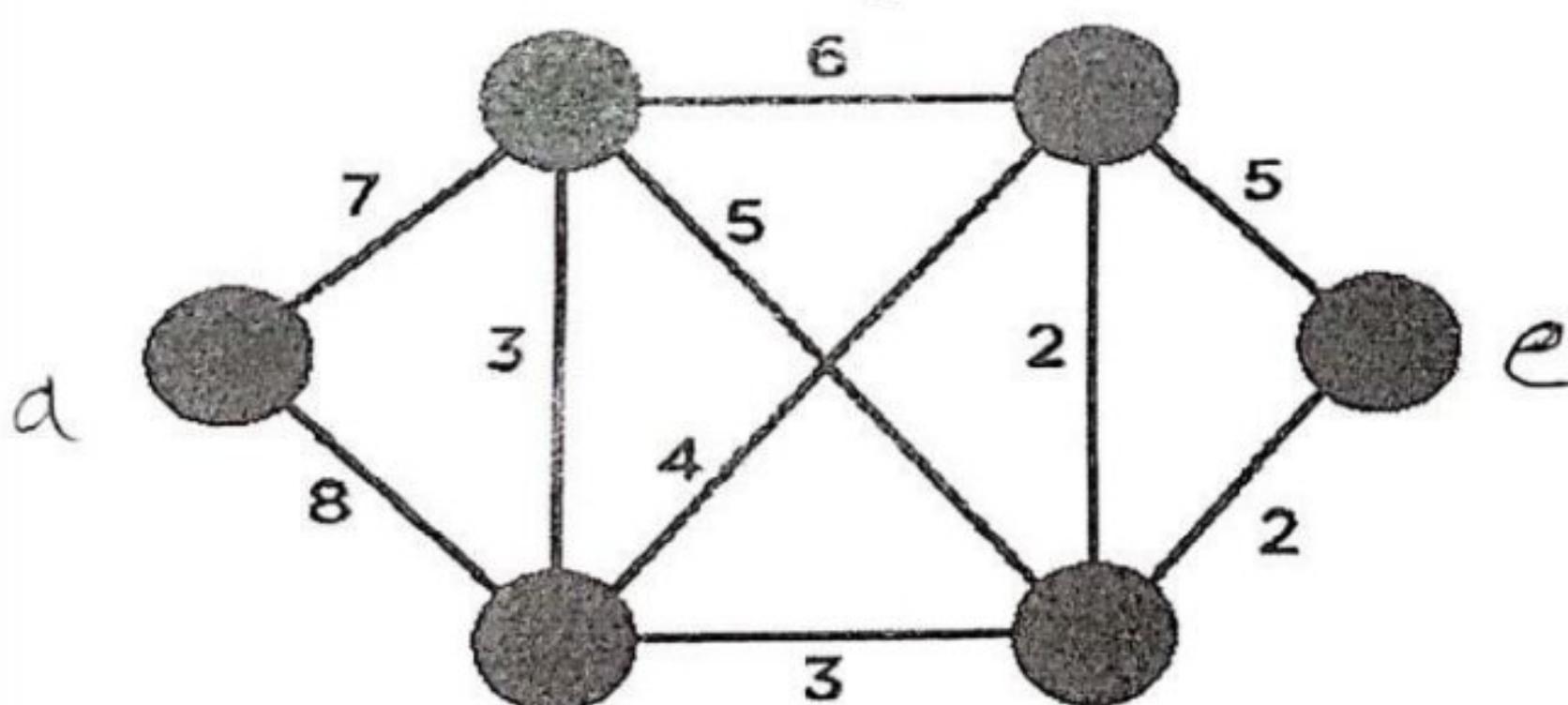
1. a. What is an algorithm? What is to analyze in an algorithm?
Explain best case, worst case and average case analysis of an algorithm.[7]
- b. Define queue as an ADT and its applications. Discuss the merits and demerits of contiguous list and non-contiguous list. [8]
2. a. Write C functions to add and delete the items from a circular queue implemented as an array. [7]
- b. Trace out Infix to Postfix conversion algorithm with given Infix expression. [8]
$$A + ((B + C)*(D - E) + F) / G$$

Evaluate the postfix expression acquired from above for the given values:
 $A = 10, B = 2, C = 4, D = 3, E = 8, F = 2$ and $G = 3$.
3. a. State TOH problem. Explain a recursive algorithm to solve the problem. [7]
- b. Explain the structure of Singly Linked List (SLL). Differentiate between Singly Linked List (SLL) and Doubly Linked List (DLL). Explain the algorithm to insert a node in SLL at the beginning.[8]
4. a. Define complete binary tree. Construct a BST from the following data: 15, 25, 35, 30, 32, 22, 12, 9, 28, 10, 14, 13 and also show the result of deleting 25, 32, and 13 in that order. [7]
- b. Discuss different types of rotation of an AVL tree. Create a balanced AVL Tree with the following data:
10 20 30 50 45 40 8 5 3 [8]
5. a. Explain the basic principle of merge sort and write down its merge algorithm. Trace the sorting steps in merge sort algorithm for the following data:[7]
12, 11, 30, 21, 25, 39, 36, 17, 29, 10, 26, 33, 7, 9

- b. What is Hashing? Given input {4371, 1323, 1222, 3424, 6173, 4199, 4344, 9679, 1989} and with hash function: $h(x) = x \bmod 10$, show the following [8]
- Hash table using linear probing
 - Hash table using quadratic probing
 - Hash table using Double hashing
6. a. Define MST. Apply Kruskal's algorithm to find the minimum spanning tree of the following graph. [7]



- b. Define Adjacency matrix with an example. Apply Dijkstra's algorithm to find the shortest path from vertex A to E. [8]



7. Write short notes on ANY TWO: [5 * 2 = 10]
- a. Deterministic and Non Deterministic Algorithm
 - b. Greedy Algorithms and Backtracking
 - c. Create Huffman tree with following data: A=48, B=11, C=9, D=14, E=7, F=11.
 - d. Trace Exchange – sort algorithm for the following data: 50, 20, 15, 60, 48, 42, 40