

POKHARA UNIVERSITY

Level: Bachelor
Semester: Spring
Programme: BE
Course: Data Structure and Algorithms

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 n 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.

- 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

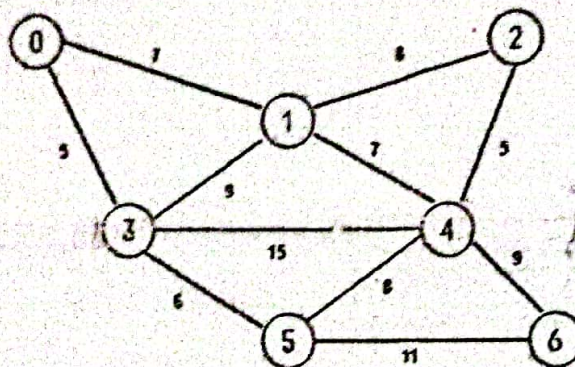
5, 3, 2, 6, 4, 1, 3, 7.

OR

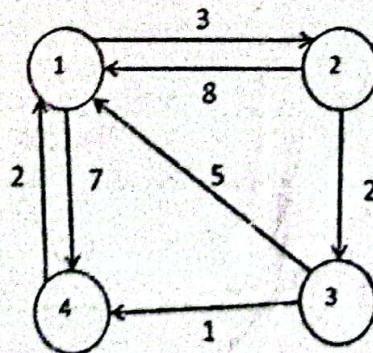
Create the heap structure from the following sequence of data and sort them using heap sort.

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)

- a) Rate of growth
b) Topological sort
c) Binary search

2×5