

POKHARA UNIVERSITY

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

Semester: Spring

Year : 2015
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) "To write an efficient program, we should know about data structure." 5
Explain the above statement.
- b) What is ADT? Explain different primitive operations that we can perform on data structures. 5
- c) List the applications of stack in computing as well as non-computing world. 5
2. a) What is infix, prefix and postfix expression? Convert the following infix expression into postfix expression showing the content of stack in each step. 7
$$P = A + (B * C - (D / E \$ F) * G) * H$$
- b) Compare circular queue with linear queue. Write Enqueue and Dequeue algorithm of circular queue. 8
3. a) How dynamic list is different from static list? What are the primitive operations that we can perform in a list? Explain with suitable example. 7
- b) What is doubly linked list (DLL) and Circular Linked List (CLL)? Write an algorithm to insert a node in specified position of doubly linked list. 8
4. a) Define BST. Construct a BST using the following data U, N, I, V, E, R, S, L, T, Y, O, F, P, O, K, H, A, R, A.
Also Perform pre-order, in-order and post order traversal 7
- b) Generate the Huffman code for the symbol A, B, C, D, E, F with the probability of occurrence are 0.2, 0.28, 0.2, 0.16, 0.12, 0.04 respectively. Also construct Huffman tree. 8
5. a) Why do we need to balance the tree? Perform the balancing algorithm 7

- according to AVL for the following sequence of numbers.
- b) Differentiate bubble sort with selection sort. Explain the divide and conquer approach in quick sort algorithm. Trace the algorithm to find the following unordered list. 25, 30, 18, 16, 45, 40, 60, 20, 10, 7, 1, 100, 12, 14.
6. a) Define graph. What are the difference between traversing in graphs and traversing in tree? Explain with suitable example.
- b) Define Hash Collision. 66, 47, 87, 90, 126, 140, 145, 153, 177, 20, 23, 393, 395, 467, 566, 620, 735. From above data, store the values in hash table with 20 positions, using division method (key % table size) of hashing and the linear probing and quadratic probing method for resolving collision.

7. Write short notes on: (Any two)

- a) Recursion vs Iteration
- b) Deque
- c) Serial and Parallel algorithm.

POKHARA UNIVERSITY

Level: Bachelor

Programme: BE

Course: Data Structure and Algorithms

Semester: Fall

Year : 2016

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.

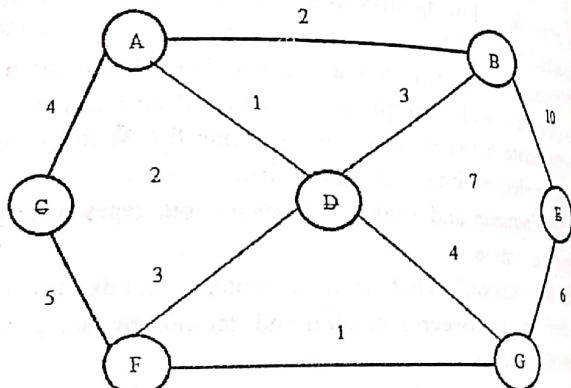
1. a) Discuss the concept of data structure. Explain various ways of representing rational number as an ADT. 7
- b) Write an algorithm for conversion of infix to postfix expression. 8
- Convert the following infix expression to postfix in tabular form:
 $(a-b/c\$d)^*e/(f-g^*h)$
2. a) Differentiate between stack and queue. How do you insert and delete an element in a circular queue? Explain with an example. 7
- b) Differentiate between static and dynamic list. Write an algorithm to insert an element into a contiguous list. 8
3. a) Define Enqueue and Dequeue. Explain four types of dequeue with suitable example. 7
- b) What is recursion? What are its advantages and disadvantages? Give the difference between recursion and iteration by taking reference of factorial function. 7
4. a) Design a Binary tree whose pre-order and in-order traversal sequences are FAEKCDHGB and EACKFHDBG respectively. 7
- b) What is height balanced tree? Insert 3,2,1,4,5,6,7 in an empty AVL tree. 8
5. a) Define Hash Function. Suppose, In a company with its 68 employees, every employee has 4 digit employee number and also assume that memory table has 100 address starting from 00, 01, 02, 03,.....99. The employee numbers are 4205, 3605, 7777, 8282, 7626, 0234, 2522, 5228, 5175, 1002. Perform division method, folding method and mid square method. Allocate the desired result in memory. 7

- b) Explain selection sort. Sort the following list using heap sort:
31, 41, 5, 9, 36, 53, 58, 97
6. a) Explain Warshall's algorithm to find the transitive closure of a digraph. For the adjacency matrices A given below

- draw the corresponding digraph
- find the matrix T of the transitive closure using the steps 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) Define shortest path algorithm. Find the shortest path from C₁ to C₂ using Dijkstra Algorithm.



7. Write short notes on: (Any two)

- Deterministic and Non-Deterministic algorithm
- Quick Sort
- Tree traversal.

POKHARA UNIVERSITY

Semester: Spring

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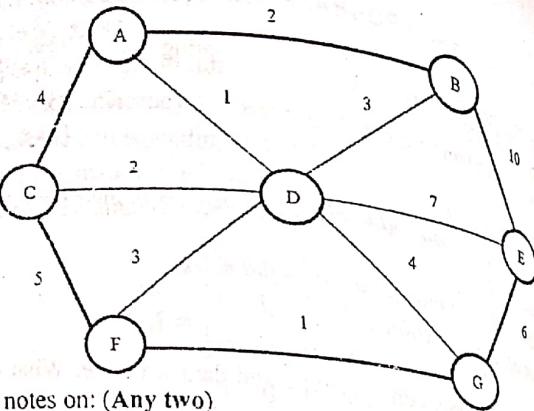
Level: Bachelor
Programme: BE

Course: Data Structure and Algorithm

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.

- a) Differentiate between data type and data structure. What are the two parts of ADT definition? Explain. 7
- b) Differentiate between infix, prefix and postfix expression. Write an algorithm to evaluate an arithmetic expression in Postfix string. 8
2. a) Define Circular Queue. Write an algorithm to add and delete an item in the circular queue. 8
- b) List basic five operations of linked list. Write code for inserting new node at beginning of the list. 7
3. a) What are the advantages and disadvantages of linked list implementation over array implementation? Write algorithm for enqueue and dequeue operations on Queue using linked list. 8
- b) Explain B+ trees giving some of its application. Write the algorithm to delete an element from B+ tree. 7
4. a) Mention advantages and disadvantages of recursive algorithms over iterative solutions. 5
- b) Trace quick sort algorithm for the data: 10, 22, 31, 4, 15, 28, 17, 6. 10
- i. a) Discuss the efficiency of binary searching. 5
- b) Define hashing and collision. Illustrate three types of collision resolution techniques with an example. 10
- a) Differentiate between Graph and Tree. Write an algorithm for Depth-First Traversal of graph. 7
- b) What is minimum spanning tree? Explain Kruskal's algorithm to get minimum cost spanning tree of following graph. 8



7. Write short notes on: (Any two)

- Priority Queue
- Mean Vs Max Heap
- Big O notation

सुगम स्टेसनरी सलार्स एजड फोटोकपी सर्विस
बालकुमारी, ललितपुर ९८४९५९५९५९२
NCIT College

POKHARA UNIVERSITY

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

Semester: Fall

Year : 2017
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.

- a) What is Abstract Data Types (ADT)? Explain the different primitive operations to be performed on the data structures. 5
- b) How data structure is different from data types? Explain the meaning of linear and nonlinear data structure with suitable example. 5
- c) List the applications of stack in computing as well as non-computing world. Write down the condition to check whether the element in linear queue is last element or not. Also mention how do you find the number of elements present in any queue? 5
- a) Write an algorithm to convert infix expression to postfix expression. Convert the following postfix expression into infix expression: abc+de-fg-h+/* 7
- b) What is double ended queue? How does circular queue overcome the shortcoming of linear queue? Write an algorithm for traversing in circular queue. 8
- a) What are the advantages and disadvantages of Linked list? Write an algorithm to delete a node in specified position of singly linked list. 7
- b) What are the applications of linked list? Explain with suitable example to perform the addition of two polynomials using linked list. 8
- a) Construct a BST from the following elements inserted in an order. 39, 45, 30, 60, 42, 35, 25, 32, 44. Also perform different tree traversals. 7
- b) What is weight balanced tree? Perform the AVL algorithm for following words are inserted in an order in an empty tree. BRIJESH, FIZZA, IMRAN, NAVIN, LOVELY, PRITY, SAMIT 8
- a) How recursion is different from iteration. Present your argument with 7

- suitable example for following statement: "Solving Fibonacci series using recursion is not efficient as compare with iteration".
- b) What is stable and unstable sorting? Trace the quick sort algorithm for following unordered list.
- 25, 30, 18, 16, 45, 40, 60, 20, 10, 7, 30, 100, 12, 14.
6. a) Compare set, matrix and linked list representation of graph. What are the difference between traversing in graph and traversing in tree? Explain with suitable example.
- b) 76, 26, 37, 59, 21, 65, 75, 49, 11. From above data, store the values into hash table with 10 positions, using division method (key% table size) of hashing and the linear probing and chaining method for resolving collision.
7. Write short notes on: (Any two)
- Heap sort
 - Transitive closure
 - Big OH notation

POKHARA UNIVERSITY

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Semester: Spring

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The figures in the margin indicate full marks.

Attempt all the questions.

1. a) Why data structure is needed? Explain the advantages of abstract data typing. 7
- b) Write an algorithm to evaluate an arithmetic expression in Postfix string. Apply the algorithm to evaluate: AB + C - BA + C\$ - (assume A = 1, B = 2, C = 3). 8
2. a) Write an algorithm to insert an element into the queue and to delete an item from queue. 7
- b) Define doubly linked list. Explain the advantages and disadvantages of linked list over array. 8
3. a) Write a program to implement a stock using array. (you can use any programming language such as C or C++ or Java) 8
- b) Write recursive function/algorithms for Binary Tree Traversals. 7
4. a) Define an AVL tree. Why do you balance a tree? Explain with an example. 7
- b) Why is quick sort better than other sorting algorithms? What might be the cases where quick sort isn't better? 8
5. a) Given input {1, 16, 49, 36, 25, 64, 0, 81, 4, 9} and a hash function $h(x) = x \bmod 10$.
 - i. Draw Hash table using open addressing
 - ii. Draw Hash table using chaining 8
- b) What is external sorting? Write a C function to sort a given array of positive integers using bubble sort. 8
6. a) What do you mean by Shortest Path? Write Dijkstra's shortest path algorithm and explain the algorithm with suitable example. 8

- b) Explain adjacency matrix and adjacency list representation of graph
7. Write short notes on: (Any two)
- Recursion and ToH
 - Big O Notation
 - Minimum Spanning Tree

POKHARA UNIVERSITY

Semester: Fall

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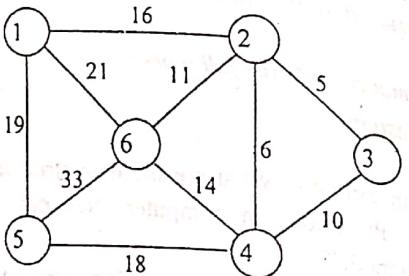
Course: Data Structure and Algorithm

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 ADT with example. What are the data structures used in the following areas: Print jobs in computer, Network data model & Hierarchical data model? 7
1. b) What is the advantage of postfix expression over infix expression? 8
1. b) Evaluate the given expression using prefix notation.
$$A * (B + C) - (D / E)$$

(Assume A = 5, B = 6, C=2, D=12 and E=4) 8
2. a) Write differences between linear queue and circular queue. Write an algorithm for insert and delete operations for circular queue. 8
2. b) How many steps are required to solve TOH problem? Write the steps to solve TOH problem for 4 discs giving pictorial illustrations. 7
3. a) Differentiate between static and dynamic list. Write an algorithm to insert a node at the end doubly linked list. 7
3. b) What is circular linked list? Write an algorithm for push and pop operations on Stack using linked list. 8
4. a) Suppose the following list of letters is inserted in order into an empty binary search tree. J R D T G E A M H F Q U B. Find the final tree and perform different tree traversals. 7
4. b) Write a structure definition to represent AVL tree. Create an AVL tree from the given set of values. 3,5,11,8,4,1,12,7,2 8

5. a) Trace quick sort for following set of values.
43, 16, 11, 89, 35, 47, 1, 92.
- b) Define collision. What are the techniques used for collision resolution in hashing. Explain with example.
6. a) What do you mean by spanning tree of graph? Find the minimum spanning tree of the following graph using Kruskal's algorithm.



- b) Explain with suitable example, BFS and DFS traversal of a graph.
7. Write short notes on: (Any two)

- a) Divide and Conquer Algorithm
b) Radix Sort
c) Worst Case Complexity

POKHARA UNIVERSITY

Semester: Spring

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Level: Bachelor
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Course: Data Structure and Algorithm

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 abstract data type? Justify the statement "Data Structure is the backbone of software programming". 8
- b) Write the advantages of Postfix expression over the Infix expression. 7
- c) Convert the given expression into Postfix expression showing the content of stack at each step. $(A+B*C/D)+E*F-(G*H+I-J)$. 7
2. a) Differentiate between recursion and iteration. Write recursive mechanism (algorithm) for solving Tower of Hanoi problem. 7
- b) Explain the advantages of doubly linked list implementation. Write algorithm for insertion and deletion in stack as linked list. 8
3. a) Explain with example the different cases of balancing AVL tree after inserting a node that violates the property. 7
- b) Construct a BST from the following data and show VLR, LVR, LRV and RVL traversals 14,10,17,12,11,20,18,25,20,8,22,23. 8
4. a) Define Queue. Mention the primitive operations of Queue and write the module for enqueue and dequeue in Circular Queue. 8
- b) Generate the Huffman Code and also draw the Huffman tree for the following unique Character "POKHARAUNIVERSITY". 7
5. a) What is sorting? Write the algorithm for quick sort. 8
- b) What is collision in hashing? What are the collision resolving techniques in hashing? Explain about separate chaining. 8
6. a) Define graph and digraphs. Explain Adjacency matrix representation of graph with examples in undirected and directed graph. 8
- b) Define the minimum spanning tree. Explain Kruskal's algorithm for finding the minimum spanning tree. 7

7. Write short notes on: (Any two)

- a) TOH problem
- b) Deterministic and non-deterministic algorithm
- c) Static vs dynamic list

POKHARA UNIVERSITY

Semester: Fall

Year : 2019

Full Marks: 100

Pass Marks: 45

Time : 3hrs.

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

Candidates are required to give their answers in their own words as far as practicable.
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Attempt all the questions.

1. a) Give ADT of matrix. Show a sample product function to find product of two matrices. 7
- b) What is the condition of stack overflow & stack underflow? Write down the module for stack pop & push operation. 8
2. a) What are the limitations of circular queue? Write an algorithm to enqueue and dequeue in circular queue. 8
- b) Write a module function to insert and delete an item in the queue in circular representation. You must state assumption clearly that are needed. 7
3. a) Define recursion. Illustrate the steps to solve Tower of Hanoi (TOH) problem with its solution for 3 discs. 7
- b) Explain Algorithm and its types. 8
4. a) Construct a Binary search tree after inserting the following values. 7
12 5 15 13 17 3 7 1 9
Show your binary tree after deletion of
7 15 8
- b) What is the benefit of having a binary tree that is Height Balanced? Explain all possible rotations while constructing a height balanced tree using example for each. 8
5. a) Write an algorithm for insertion and deletion of the node in the end of the singly Linked list. 7
b) Construct a heap from the following data and illustrate heap sort. 8
56, 103, 88, 24, 77, 89, 53, 47, 90.
6. a) What do you mean by transitive closure of the graph? How warshall's algorithm is used to find the transitive closure of a graph. Clarify with suitable example. 8

- b) What do you mean by spanning tree? Explain Dijkstra's algorithm to find the shortest path in graph with suitable example.
7. Write short notes on: (Any two)
- Explain efficiency of Sorting
 - AVL Tree
 - Link list as an ADT

POKHARA UNIVERSITY

Semester: Spring

Year : 2019

Full Marks: 100

Pass Marks: 45

Time : 3hrs.

Level: Bachelor
Programme: BE

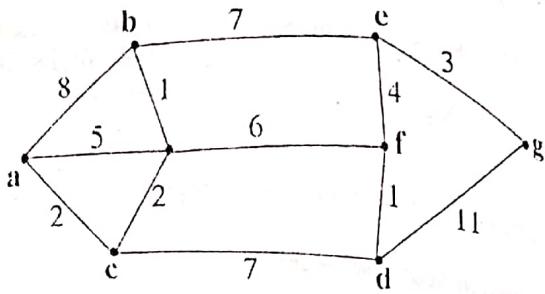
Course: Data Structure and Algorithm

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Attempt all the questions.

- a) Differentiate Linear and non-linear data structures with their traversal methods. 7
- b) Define infix and postfix expression. In an application, the client request you to process their data in a particular format. The format states that the in the data count of 1000, first data entered in the application is the last data that comes out of the application. Write down the insert & delete mechanism for manipulation of data. 8
- a) What is double ended queue? Write down the algorithm to implement circular queue for both insertion & deletion approach. 8
- b) What is the best condition of the recursive function? Derive the explicit equation of ToH using Recursive Relation. 7
- a) Let LIST be a linked list in memory. Write a procedure which adds a given value k to each element in LIST. 8
- b) Define list. List down the operations performed in list. Explain dynamic implementation of list with suitable example. 7
- a) Suppose the following letters is inserted in order into an empty binary search tree: U, V, P, Q, M, N, O, R, K, W, C, D.
 - Find the final tree T and
 - Find the post order traversal of T 7
- b) Explain the Huffman algorithm. Show your own example of Huffman algorithm. 7
- i) Distinguish linear and binary search. Show steps to search 46 from the given data 7, 13, 36, 42, 43, 46, 85. 7
- j) Write a program to sort the set of strings in ascending order by using bubble sort method. 8
- k) Explain various collision resolution techniques in hashing with example. 8
- l) Define graph traversing? Find the shortest path from a to g using Dijkstra's algorithm. 7



7. Write short notes on: (Any two)
- Adjacency matrix and Path matrix
 - Divide and Conquer algorithm
 - Radix Sort

POKHARA UNIVERSITY
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Semester: Fall

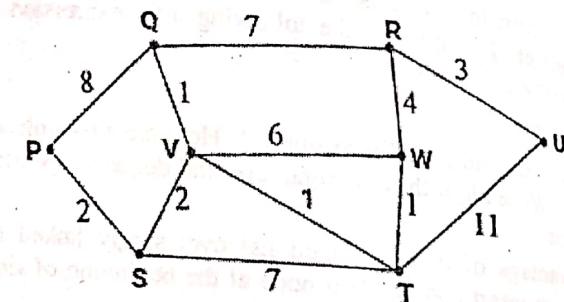
Year : 2020
Full Marks: 100
Pass Marks: 45
Time : 3 hrs.

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.

- Why do you need data structure? Data Structure is an abstract data type. Do you agree with this Statement? If so, explain with example.
 - Why do you convert infix expression to postfix expression? Explain how do you use stack to convert the following infix expression into postfix: $A + (B * C - (D / E^F) * G) * H$
Where $^$ is power operator.
- What are the shortcomings of linear queue? How are they solved in circular queue? Write algorithms for enqueue and dequeue operations in circular queue.
 - What is the advantage of doubly linked list over singly linked list? Write algorithms to insert and delete a node at the beginning of singly linked list.
- Write a simple program in C or C++ to create a singly linked list containing three nodes. The first node stores 11, second node stores 22 and third node stores 33. Also display the data of nodes.
 - Write the cases in which you will use iteration and recursion. Explain how you will solve the Tower of Hanoi problem.
- Why do you need a balanced tree? Create an AVL tree from the given set of values: 5, 7, 13, 9, 6, 3, 14, 10, 4.
 - What is the advantage of variable length encoding? Construct Huffman tree and generate code for the following symbol with their frequency given below.

Symbol	C	D	E	K	L	M	U	Z
Frequency	32	42	120	7	42	24	37	2

5. a) Explain how you use divide and conquer strategy to sort the following list using quick sort : 7,9,45,12,56,90,3,8,50.
 Also write the best, average and worst case time complexity of quick sort for simple partition case.
- b) What is the purpose of hashing? For given input {2, 17, 49, 37, 25, 82, 4, 9, 3} and a hash function $h(x) = x \bmod 10$ show the resulting i. Hash table using linear probing
 ii. Hash table using chaining
6. a) What is directed and undirected graph? Explain adjacency matrix representation of graph, with suitable example.
 b) Write Dijkstra's Algorithm. Find the shortest path from P to U using Dijkstra's algorithm.



7. Write short notes on: (Any two)
- Binary search
 - Kruskal's Algorithm
 - Big O Notation

POKHARA UNIVERSITY
 Semester - Spring

Level: Bachelor
 Program: BE
 Course: Data Structure and Algorithm

Year: 2020
 Full Marks: 70
 Pass Marks: 31.5
 Time: 2 hrs

Candidates are required to answer in their own words as far as practicable.
 The figures in the margin indicate full marks.
 Attempt all the questions.

Group - A: (5x10=50)

- Q N 1 Justify the statement "Data Structure is the backbone of software programming". Convert the given expression into Postfix expression showing the content of stack at each stack. $(A+B*C/D)+E*F-G*H+I-J$ 4+6
- Q N 2 Mention and judge partition algorithm of recursive Merge sort and Quick sort OR 10
- Construct a BST from the following data and show VLR, LVR, LRV and RVL traversals 14, 10, 17, 12, 11, 20, 18, 25, 20, 8, 22, 23. 10
- Q N 3 Differentiate between a perfectly balanced tree and AVL tree. Detect the effects of an insertion of a node on both the trees. 10
- Q N 4 Is it true that we can implement Stack and Queue using static and Dynamic memory allocation? Justify your understanding. Judge efficiently which of the memory allocation techniques are better in terms of contiguous list and linked list. 10
- Q N 5 Consider a table size 11 and elements are 28, 18, 23, 10, 36, 23, 40, 43 and hash function is $H(x)=x \bmod 11$. Find separate chaining, linear probing and quadratic probing. Why rehashing is needed? Explain with example. 6-4

Group - B: (1x20=20)

- Q N 6 a) Define graph and diagraph?

Let G be the graph represented by this adjacently list

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

- i) Draw G
 ii) Is G a directed graph?

POKHARA UNIVERSITY

Semester: Fall

Year : 2021

Full Marks: 100

Pass Marks: 45

Time : 3hrs.

Level: Bachelor

Programme: BE

Course: Data Structure and Algorithms

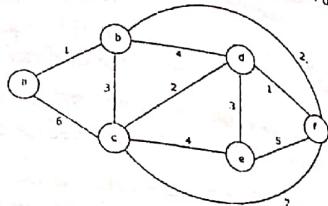
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- Attempt all the questions.
1. a) Define Abstract Data type with example. Explain which data structure are suitable for the following problems with proper reasons 8
 - i. Evaluating the arithmetic expression
 - ii. Process scheduling by operating systems.
 - iii. Developing the social networks.
 - b) Write the advantages of Postfix expression over the Infix expression, while processing by computer system. Convert the given expression into Postfix expression showing the content of stack at each step. $(A+B^*C/D)+E^*F-(G^*H+I-J)$ 7
 2. a) Write algorithms to en-queue and de-queue in a circular queue. 8
 - b) What is the advantage of an array over linked list and what is the advantage of linked list over an array? Implement a simple singly linked list with three nodes containing data 11, 22 and 33 using C or C++ code. 7
 3. a) Write algorithms for push and pop operations on a stack using linked list implementation. 7
 - b) Write algorithms to insert and delete a node at the end of singly linked list. 8
 4. a) Explain the necessity of balancing a tree. How are the four different rotations applied to rebalance the AVL tree? Explain with example. 8
 - b) Generate the Huffman Code for the following character with the given frequency. 7

Character	a	b	c	d	e
Frequency	8	6	3	4	15

- iii) Is G weakly connected?
iv) Give the adjacency matrix for G

- b) Write Dijkstra's algorithm to find the shortest path of the following diagram from a to f.



5. a) Explain the insertion sort with an appropriate example. Also state its time complexity.
- b) What is collision in hashing? What are the collision resolving techniques in hashing? Explain about separate chaining.
6. a) Define graph and digraphs. Explain Adjacency matrix representation of graph with examples in undirected and directed graph.
- b) Define the minimum spanning tree. Explain Kruskal's algorithm for finding the minimum spanning tree.
7. Write short notes on: (Any two)
- TOH problem
 - Divide and conquer algorithm
 - Big O Notation

POKHARA UNIVERSITY

Level: Bachelor
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Semester: Spring

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 Attempt all the questions.*

- a) Explain the role of Data Structure in computer programming. Explain how you can represent a stack as an ADT. 8
- b) What are the advantages of postfix expression over infix expression? Write an algorithm to convert postfix expression to prefix expression. Convert the following postfix expression into prefix expression $AB+CD*$. 7
- a) Explain the application area of queue. What will happen if front is equal to rear in linear queue? Demonstrate the concept of enqueue, dequeue and traverse operation in a linear queue with suitable example and supporting algorithm. 8
- b) Differentiate between singly circular linked list and singly linked list. Implement queue using Linked list. 7
- a) How are the higher order polynomials represented using linked list? With necessary supporting figures, write an algorithm to insert a node in given position of doubly linked list. 8
- b) In which conditions recursive algorithms are suitable? Explain with the problem of printing Fibonacci series. 7
- a) Construct an AVL tree by inserting the following data:
 $14, 17, 11, 7, 53, 4, 13, 12, 8, 60$.
 Also delete the item 8, 7, 14, 17 from the constructed tree showing every step. 8
- b) What is B-Tree? What are the features of B-Tree? Discuss on the importance of B-Tree. 8

5. a) Sort the following data using quick sort explaining every step
21,43,51,32,20,35,8,12
- b) What is the principle of hash function in searching? For the data {1,16,49,25, 64,0,81,4,9} and a hash function $h(x) = x \bmod 10$, find the resulting:
 i) Hash Table using linear and quadratic probing.
 ii) Hash table using chaining.
6. a) What is a graph? Mention any two applications of graph in real life examples.
 b) Define graph traversal. Differentiate between DFS and BFS with example.

7. Write short notes on: (Any two)

- a) Priority Queue
 b) Bubble Sort
 c) Big O notation

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 Programme: BE
 Course: Data Structure and Algorithm

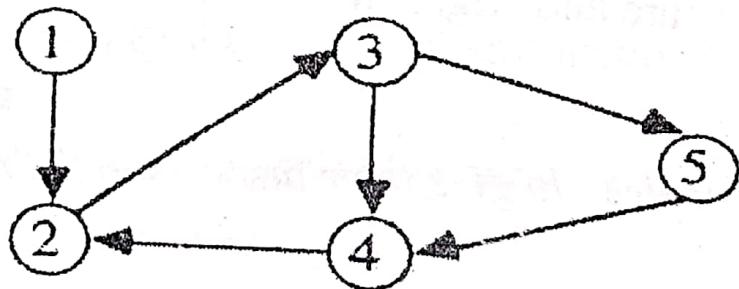
Semester: Fall

Year : 2022
 Full Marks: 100
 Pass Marks: 45
 Time : 3 hrs.

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 the role of data structures for algorithms? Create an ADT for Stack using C or C++ code. 7
- b) Why do you need to convert an infix expression to postfix? How do you use stack to convert the following expression to postfix notation?
 $(A+B)*C-(D^E)/F$ 8
2. a) How does circular queue solve the problem of a linear queue?
 Implement the enqueue and dequeue operations in circular queue using C or C++ code. 8
- b) In which condition you use linked list implementation of a queue?
 Explain with example. 7
3. a) Write an algorithm to insert a node at the beginning of a singly linked list. Also illustrate with an example. 7
- b) What is the advantage of using recursive algorithms? Implement the recursive algorithms to solve the Tower of Hanoi problems using C or C++ code. 8
4. a) Construct an AVL tree in which elements are inserted in the following order. 50, 72, 96, 94, 107, 26, 12, 11, 9, 2. Show how the tree would look after the deletion of 26, 50, 16, and 10 respectively. Explain each steps of deletion. 7
- b) Why do you need to balance binary search tree? Generate the Huffman code for the following character with the given frequency: 7
- | Character | K | O | P | R | H | A |
|-----------|----|---|----|----|---|---|
| Frequency | 20 | 9 | 17 | 12 | 1 | 7 |
5. a) Use insertion-sort to sort the following data: 1
 24, 11, 49, 35, 98, 72, 34, 44

- b) How is the divide and conquer strategy used to search an item using binary search? Explain with a suitable example.
6. a) What do you mean by transitive closure of a graph? Find the transitive closure of the given graph.



- b) What is the purpose of Krushkal's algorithm? Explain with a suitable example.
7. Write short notes on: (Any two)
- Hash Table and Hash Function
 - Big O Notation
 - B Tree

POKHARA UNIVERSITY

Level: Bachelor Semester : Spring
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Attempt all the questions.

1. a) Why do you use Abstract Data Type (ADT)? Which data structure would you prefer to implement the following features? Justify with your reasons.
 - i. CPU Scheduling
 - ii. History on a Browser
 - iii. File Management System
 - iv. Display route on GPS
 - v. Representation of Polynomial equations
- b) Explain how you use stack in conversion of the following infix expression to a postfix expression using stack.

$$A + B - C / (D * F) - H * I$$
2. a) What is a double ended queue? Explain a real world scenario in which the double ended queue can be applied.
- b) Write an algorithm to delete the last node in a singly circular linked list and also implement it using C or C++ code.
3. a) What are the advantages and disadvantages of linked list implementation over array implementation? Explain the linked implementation of a stack.
- b) How is a divide and conquer strategy used to recursively solve the Tower of Bhrahma (also called Tower of Hanoi)? Explain in detail. Also implement it using C or C++ code.
4. a) How do you keep the cost of searching an item in an binary search tree to $O(\log_2 n)$? Explain with an example.
- b) Construct a Huffman tree and generate Huffman codes for the following characters:

7

8

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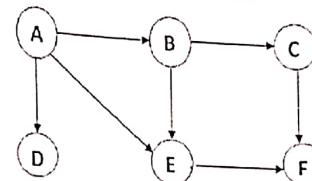
1

Character	C	D	E	K	L	M	U	Z
Frequency	32	42	120	7	42	24	37	2

5. a) Apply the radix sort algorithm to sort the numbers:
 712, 205, 632, 377, 149, 877, 432, 317, 44 and 599

- b) For the given data: 1, 16, 49, 36, 25, 64, 0, 81, 4, 9 and hash function:
 $h(x) = x \bmod 10$.
- i) Build a Hash table using quadratic probing
 - ii) Build a Hash table using chaining.

6. a) Perform the Breadth First Search (BFS) on the following graph explaining each step in detail. 7



- b) What is Dijkstra's algorithm? Explain the algorithm with a suitable example. 8

7. Write short notes on: (Any two) 2×5

- a) Priority Queue
- b) Doubly linked list
- c) Asymptotic Notation

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