



United International University (UIU)

Dept. of Computer Science & Engineering (CSE)

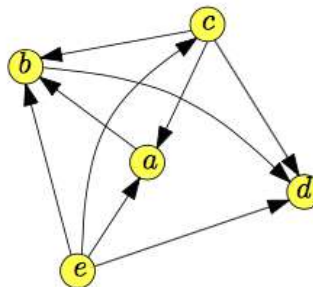
Final Exam Year: 2017

Trimester: Spring

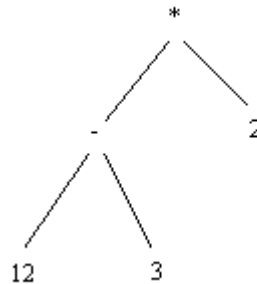
Course: CSI 217 Data Structures, Marks: 40, Time: 2 hours

There are SIX questions. Answer any FOUR. Figures in the right-hand margin indicate full marks.

1.
 - a. What are the merits of linear circular linked list over linear linked list? [2]
 - b. Develop an algorithm to delete middle element from a doubly linked list. [2]
 - c. Design two algorithms to insert and delete first element to/from a linear circular linked list. [4]
 - d. Write an algorithm to display elements of doubly linked list in reverse order. [2]
2.
 - a. Define STACK and QUEUE. Distinguish between them. [2]
 - b. Design an algorithm using STACK to check whether the given string "UIU" is palindrome or not. [3]
 - c. What are the applications of a QUEUE in real life? Suppose, you have to implement a QUEUE data structure using only one STACK. Can you give an idea how can we do that? [2]
 - d. Write an algorithm to display all the integer elements stored in a QUEUE implemented by a linear linked list. [3]
3.
 - a. Convert the following infix expression into postfix using STACK and evaluate the postfix expression for the given values. [5]
Infix expression: $a * a - (b + c / d) + e * f$
Given values: $a=2, b=3, c=4, d=2, e=3$ and $f=2$
 - b. Given, double $A[100]$, which represents a one dimensional array of type double. If $\text{loc}(A[0])=6FADE$ then, find $\text{loc}(A[60])$. [1]
 - c. Design a recursive algorithm for TOWER OF HANOI using one intermediate pillar/peg and show simulation for $n = 3$, where n is the number of disks. [2]
 - d. Design an iterative algorithm for TOWER OF HANOI assuming two intermediate pillars/pegs. [2]
4.
 - a. What are the applications of a graph in real life? [1]
 - b. Show the mechanism of topological ordering algorithm for the following directed acyclic graph. [3]



- c. Write an algorithm for Breadth First Search (BFS) in a graph. [2]
- d. Write algorithm to perform the following operations: [3]
- To take input for a simple graph
 - To find adjacent vertices of a given vertex in the graph
 - To determine the highest degree among vertices.
5. a. Write an algorithm for the POST ORDER traversal technique in a binary tree. [2]
- b. Construct binary search tree from the following given tree traversal sequences. [3]
- Preorder: ABDEF CGH
- Inorder: DBFEACHG
- c. Define complete binary tree. Find the total number of nodes in a complete TERNARY tree if the height of the tree is h. [3]
- d. For question no. 5 (b) above, find external and internal path length. [2]
6. a. Suppose you are waiting for having a train ticket in a railway station. The station manager tells you to maintain a line for ticket. Answer the following questions based on this scenario. [3]
- Which data structure are appropriate for maintaing a line?
 - Implement a line using your data structure.
 - How will you track the start and end of a line?
- b. Which data structures are more appropriate for the following cases and why? [3]
- For implementing the binary search tree.
 - For reducing the memory wastage in a sparse matrix.
 - For storing student information like name, id, birthday, marks.
- c. Write an algorithm to construct binary tree in memory. [2]
- d. Design an algorithm to evaluate the following Binary Expression Tree (BET). [2]



Explanation: For the above BET, calculation will be in the following order:

$$\begin{aligned}
 &= (12-3) * 2 \\
 &= 9 * 2 \\
 &= 18, \text{ which is the final answer.}
 \end{aligned}$$