



UNIVERSITY OF MINES AND TECHNOLOGY, TARKWA
FIRST SEMESTER EXAMINATIONS, NOV/DEC 2018

COURSE NO: CE 373
COURSE NAME: DATA STRUCTURE AND ALGORITHM
CLASS: CE III **TIME:** 3 HOURS

Name: _____ Index Number: _____

Answer all questions in Section A (Circle your answers) and any other two in Section B

- What is the value of the postfix expression $6\ 3\ 2\ 4\ +\ -\ *$:
 - Something between -5 and -15
 - Something between -5 and -5
 - Something between -5 and 15
 - Something between 15 and 100
- What is the worst-case run-time complexity of binary search algorithm?
 - $O(n^2)$
 - $O(n^{\log n})$
 - $O(n^3)$
 - On
- Which of the following uses FIFO method?
 - Queue
 - Stack
 - Hash Table
 - Binary Search Tree
- Two main measures for the efficiency of an algorithm are
 - Processor and memory
 - Complexity and capacity
 - Time and space
 - Data and Space
- Which one of the below is not divide and conquer approach?
 - Insertion Sort
 - Merge Sort
 - Shell Sort
 - Heap Sort
- Prefix notation is also known as
 - Reverse Polish Notation
 - Reverse Notation
 - Polish Reverse Notation
 - Polish Notation
- In order traversal of binary search tree will produce
 - Unsorted list
 - Reverse of input
 - Sorted list
 - None of the above
- Here is an infix expression: $4 + 3*(6*3-12)$. Suppose that we are using the usual stack algorithm to convert the expression from infix to postfix notation. The maximum number of symbols that will appear on the stack AT ONE TIME during the conversion of this expression?
 - 1
 - 2
 - 3
 - 4
- Entries in a stack are “ordered”. What is the meaning of this statement?
 - A collection of stacks is sortable
 - Stack entries may be compared with the '<' operation
 - The entries are stored in a linked list
 - There is a Sequential entry that is one by one

10. For a binary search algorithm to work, it is necessary that the array *list* must be
- Sorted
 - Unsorted
 - in a heap
 - Popped out of stack
11. The time factor when determining the efficiency of algorithm is measured by
- Counting microseconds
 - Counting the number of key operations
 - Counting the number of statements
 - Counting the kilobytes of algorithm
12. Queue data structure works on
- LIFO
 - FIFO
 - FILO
 - None of the above
13. Maximum number of nodes in a binary tree with height k , where root is height 0, is
- $2^k - 1$
 - $2^{k+1} - 1$
 - $2^{k-1} + 1$
 - $2^k - 1$
14. Which of the following case does not exist in complexity theory
- Best Case
 - Worst Base
 - Average Case
 - Null Case
15. What data structure is used for depth first traversal of a graph?
- Queue
 - Stack
 - List
 - None of the above
16. Which of the following data structure is not linear data structure?
- Arrays
 - Linked Lists
 - Both of the above
 - None of the above
17. What data structure can be used to check if a syntax has balanced parenthesis ?
- Queue
 - Tree
 - List
 - Stack
18. Postfix expression is just a reverse of prefix expression
- True
 - False
19. Which of the following data structure is linear data structure?
- Trees
 - Graphs
 - Arrays
 - All of the above
20. A circular linked list can be used for
- Stack
 - Queue
 - Both Stack & Queue
 - Neither Stack or Queue
21. A linked-list is a dynamic structure
- True
 - False
22. Minimum number of moves required to solve a *Tower of Hanoi* puzzle is
- 2^n
 - 2^{n-1}
 - $2^n - 1$
 - $2n - 1$
23. Arrays are best data structures

- a. for relatively permanent collections of data
 - b. for the size of the structure and the data in the structure are constantly changing
 - c. for both of above situation
 - d. for none of above situation
24. The following formula will produce $F_n = F_{n-1} + F_{n-2}$
- a. Armstrong Number
 - b. Fibonacci Series
 - c. Euler Number
 - d. Prime Number
25. Minimum number of queues required for priority queue implementation?
- a. 5
 - b. 4
 - c. 3
 - d. 2
26. Linked lists are best suited
- a. for relatively permanent collections of data
 - b. for the size of the structure and the data in the structure are constantly changing
 - c. for both of above situation
 - d. for none of above situation
27. A graph is a mathematical object that is used to model different situations such as
- a. City Map
 - b. Tree
 - c. Linked List
 - d. All of the above
28. What are the Approaches to Search?
- a. Sequential and list methods (lists, tables, arrays)
 - b. Tree indexing methods
 - c. Direct access by key value (hashing)
 - d. All of the above
29. The Θ notation in asymptotic evaluation represents
- a. Base case
 - b. Average case
 - c. Worst case
 - d. NULL case
30. A balance factor in AVL tree is used to check
- a. What rotation to make
 - b. If all child nodes are at same level
 - c. When the last rotation occurred
 - d. If the tree is unbalanced

SECTION B

- 1 a. *Define the following terms in Data structure and algorithm*
 - i. *Head*
 - ii. *Tail*
 - iii. *Current Node*
 - iv. *Empty List*
 - b. Write down the array *merge-sort* algorithm. Assume that an array merging algorithm is already available.
 - c. What is data-structure?
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- 2 a.. *Classify Functions by Their Asymptotic Growth*
 - b. Compare the quick-sort and merge-sort algorithms in terms of their time and space complexity. Which is better in terms of time complexity? Which is better in terms of space complexity?
 - c. What is a balanced Tree? Hence, Calculate the number of nodes of binary tree of height 6
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- 3 a. What are the basic operations needed to Sort an array of numbers?
 - b. Let $comps(n)$ be the number of comparisons performed by the algorithm when sorting an array of n components. Assume that step 1.1 performs $n-1$ comparisons. Write down equations defining $comps(n)$ when $n \leq 1$ and when $n > 1$:
 - (i) in the best case, and
 - (ii) in the worst case.Write down the time complexity of the quick-sort algorithm:
 - (i) in the best case, and
 - (ii) in the worst case.When does the best case arise? When does the worst case arise?).
 - c. Using Horner's Method, Compute the Hash Function of VERYLONGKEY

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