



**JARAMOGI OGINGA ODINGA UNIVERSITY OF SCIENCE AND TECHNOLOGY**

**SCHOOL OF INFORMATICS AND INNOVATIVE SYSTEMS**

**UNIVERSITY EXAMINATION FOR THE BACHELOR OF SCIENCE IN ACTUARIAL  
SCIENCE 3<sup>rd</sup> YEAR 1<sup>st</sup> SEMESTER**

**MAIN CAMPUS**

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**COURSE CODE: ITB 9207**

**COURSE TITLE: DATA STRUCTURES AND ALGORITHMS**

**EXAM VENUE:**

**STREAM:**

**DATE:**

**EXAM SESSION:**

**TIME: 2.00 HOURS**

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**INSTRUCTIONS:**

- 1. Answer ALL questions in Section A and B and ANY other TWO questions in Section C**
- 2. Tick the most correct alternative in Section A**
- 3. Answers to Questions in Section B and C must be written in the spaces provided on the question paper.**

**QUESTION ONE 20 MARKS**

1. Which one of the following is the process of returning the top element from a stack without deleting it?
  - a. Insert
  - b. Peek
  - c. Pop
  - d. None of the above
2. How can we describe an array in the best possible way?
  - (a) The Array shows a hierarchical structure.
  - (b) Arrays are immutable.
  - (c) Container that stores the elements of similar types
  - (d) The Array is not a data structure
3. Which of the following statement(s) about stack data structure is/are NOT correct?
  - a) Linked List are used for implementing Stacks
  - b) Top of the Stack always contain the new node
  - c) Stack is the FIFO data structure
  - d) Null link is present in the last node at the bottom of the stack
4. Which of the following highly uses the concept of an array?
  - (a) Binary Search tree
  - (b) Caching
  - (c) Spatial locality
  - (d) Scheduling of Processes
5. Which of the following is the disadvantage of the array?
  - (a) Stack and Queue data structures can be implemented through an array.
  - (b) Index of the first element in an array can be negative
  - (c) Wastage of memory if the elements inserted in an array are lesser than the allocated size
  - (d) Elements can be accessed sequentially.
6. Which one of the following is the process of remove an element from a stack?
  - (a) Insert
  - (b) Add
  - (c) Pop

- (d) None of the above
7. When the user tries to add an element in a full stack then the condition is said to be a \_\_\_\_\_
- (a) Underflow
  - (b) Garbage collection
  - (c) Overflow
  - (d) None of the above
8. Which data structure is mainly used for implementing the recursive algorithm?
- (a) Queue
  - (b) Stack
  - (c) Binary tree
  - (d) Linked list
9. If the elements '1', '2', '3' and '4' are added in a stack, so what would be the order for the removal?
- (a) 1234
  - (b) 2134
  - (c) 4321
  - (d) None of the above
10. If the elements '1', '2', '3' and '4' are inserted in a queue, what would be order for the removal?
- (a) 1234
  - (b) 4321
  - (c) 3241
  - (d) None of the above
11. Which of the following is not an inherent application of stack?
- a) Reversing a string
  - b) Evaluation of postfix expression
  - c) Implementation of recursion
  - d) Job scheduling
12. Which of the following principle does Queue use?
- (a) LIFO principle
  - (b) FIFO principle

- (c) Linear tree
- (d) Ordered array

13. Which one of the following is not the type of the Queue?

- (a) Linear Queue
- (b) Circular Queue
- (c) Double ended Queue
- (d) Single ended Queue

14. Which one of the following is not the application of the Queue data structure?

- (a) Resource shared between various systems
- (b) Data is transferred asynchronously
- (c) Load balancing
- (d) Balancing of symbols

15. The necessary condition to be checked before deletion from the Queue is \_\_

- (a) Overflow
- (b) Underflow
- (c) Rear value
- (d) Front value

16. Which data structure is the best for implementing a priority queue?

- (a) Stack
- (b) Linked list
- (c) Array
- (d) Heap

17. Which of the following principle is used if two elements in the priority queue have the same priority?

- (a) LIFO
- (b) FIFO
- (c) Linear tree
- (d) None of the above

18. If the elements "A", "B", "C" and "D" are placed in a stack and are deleted one at a time, what is the order of removal?

- a) ABCD
- b) DCBA

- c) DCAB
- d) ABDC

19. Which of the following traversing algorithm is not used to traverse in a tree?

- a) Post order
- b) Pre order
- c) Post order
- d) Randomized

20. Advantages of linked list representation of binary trees over arrays?

- a) dynamic size
- b) ease of insertion/deletion
- c) ease in randomly accessing a node
- d) both dynamic size and ease in insertion/deletion

## SECTION TWO 30 MARKS

1. Write short note on Fundamentals of Algorithmic Problem Solving
2. Explain the concept of binary trees
3. Explain Asymptotic Notations
4. Explain factors that influence the choice of an algorithm
5. Draw the stack structure when the following operations are performed one after another on an empty stack.

A. Push 1, 2, 6, 17, 100

B. Pop three numbers

C. Peek

D. Push 50, 23, 198, 500

E. Display

6. Compute the running time of the following code segment

```
for(int k =1 ; i<=n ; i++)
{
    for(int i =1; i<=n; i++)
    {
        for(int j =1; j<=n; j++)
        {
            cout<<j;
        }
    }
}
```

```
}  
}
```

### **SECTION THREE 20 MARKS**

1. Explain in detail about binary search.
2. Explain the working of bubble sort with a suitable example. Why is bubble sort called “bubble”?
3. Explain the difference between Merge Sort and Quick Sort.