

**AKAL UNIVERSITY, TALWANDI SABO**  
**END SEMESTER EXAMINATION, MAY 2022**  
**2205231**

Course: BCA(Hons.)/B.Tech.-CSE  
Semester: 4th  
Name of the Paper: Design and Analysis of Algorithms  
Course Code: CSN05C401/CSE05C401  
Time Allowed: 3 hours

Maximum Marks: 50

Note: -

(1) Attempt FIVE questions in all by selecting **ONE** question from each of **FOUR** units.

**Question No. 1 is compulsory.**

(2) Each question carries 10 marks.

**SECTION-A**

Q1. Write short notes on the following: - (2 marks each)

- (i) What is big O notation?
- (ii) Differentiate linear search and binary search.
- (iii) Why does the complexity of an algorithm need to be analyzed?
- (iv) What is dynamic programming?
- (v) What is Depth First Search? Give an example.

**SECTION-B**

**UNIT-I (10 Marks)**

Q2. What are the steps in the design of an algorithm? What do you mean by space complexity and time complexity?

Q3. What do you mean by asymptotic notation? Explain with suitable examples.

**UNIT-II (10 Marks)**

Q4. Discuss the working of Merge Sort technique with an example. Also explain its complexity.

Q5. What is a Binary Search Tree? Give algorithms for insertion, deletion and searching of a node in a binary search tree.

**UNIT-III (10 Marks)**

Q6. What are the various methods for Graph representation and its traversal? Explain with the help of algorithm.

Q7. Elaborate with an example the Dijkstra's algorithm for shortest path in a graph. *Source / destination*

**UNIT-IV (10 Marks)**

Q8. Describe divide and conquer strategy for multiplying two n-bit numbers.

Q9. What are the major characteristics of NP hard and NP complete problem? Explain with example.

2205231  
AKAL UNIVERSITY  
Department of Computer Science  
Design & Analysis of Algorithms  
PROGRAM: BCA/BTECH Semester: IV  
COURSE CODE: CSN05C401/CSE05C401

Time: 20 Minutes

Max mark: 20

1. What is an algorithm?
- (a) A flow chart
  - (b) A flowchart or pseudocode
  - (c) A decision
  - (d) Step by step instructions used to solve a problem

(a) 48

(b) 49 ✓

(c) 50

(d) 51

2. An algorithm has two phases. The first phase, initialization, takes time  $O(n^3)$ . The second phase, which is the main computation, takes time  $O(n^2)$ . What is the most accurate description of the complexity of the overall algorithm?

(a)  $O(n^2)$

(b)  $O(n^3)$

(c)  $O(n^3)$

(d)  $O(n^4)$

3. How many times is the comparison  $i \leq n$  performed in the following program?

```
int i = 60, n = 300;
main() {
    while (i <= n) {
        i = i + 2;
        n = n - 3;
    }
}
```

4. Time of complexity of  $f(x) = 4x^2 - 5x + 3$  is:

(a)  $O(x)$

(b)  $O(x^2)$

(c)  $O(x^{3/2})$

(d)  $O(x^{0.5})$

5. Choose the following functions from positive integers to real numbers

$10, \sqrt{n}, n, \log_2 n, 100/n$

The correct arrangement of the above functions in increasing order of asymptotic complexity is

(a)  $\log_2 n, 10, \sqrt{n}, n, 100/n$

(b)  $100/n, 10, \sqrt{n}, n, \log_2 n$

(c)  $100/n, 10, \log_2 n, \sqrt{n}, n$

(d)  $10, \sqrt{n}, n, \log_2 n, 100/n$

6. The worst-case occur in linear search algorithm when

(a) Item is somewhere in the middle of the array



- (b) Item is not in the array at all
- (c) Item is the last element in the array
- (d) Item is the last element in the array or item is not there at all
7. If the records are small then which sort is more efficient
- Selection Sort
  - Bubble Sort
  - Insertion Sort
  - Heap Sort
8. The complexity of bubble sort algorithm is
- $O(n)$
  - $O(\log n)$
  - $O(n^2)$
  - $O(n \log n)$
9. The complexity of merge sort algorithm is
- $O(n)$
  - $O(\log n)$
  - $O(n^2)$
  - $O(n \log n)$
10. Which of the following sorting algorithm is of divide and conquer type?
- Bubble sort
  - Insertion Sort
  - Heap sort
  - Merge sort
11. The data structure required for breadth first traversal on a graph is
- queue
  - stack
  - array
  - trees
12. Which of the following ways can be used to represent a graph?
- Adjacency List and Adjacency Matrix
  - Incidence Matrix
  - Adjacency List, Adjacency Matrix as well as Incidence Matrix
  - No way to represent
13. The number of elements in the adjacency matrix of a graph having 7 vertices is
- 7
  - 14
  - 21
  - 49
14. The time complexity to calculate the number of edges in a graph whose information is stored in form of an adjacency matrix is
- $O(V)$
  - $O(E^2)$
  - $O(E)$
  - $O(V^2)$

15. For the adjacency matrix of a directed graph the row sum is the \_\_\_\_\_ degree and the column sum is the \_\_\_\_\_ degree.

- (a) int,out
- (b) out,in
- (c) in,total
- (d) total,out

16. Problems that can be solved in polynomial time are known as

- (a) Intractable
- (b) Tractable
- (c) Decision
- (d) complete

17. \_\_\_ is a class of decision problems that can be solved by non-deterministic polynomial algorithms

- (a) ~~NP~~
- (b) P

- (c) Hard
- (d) Complete

18. Problem that cannot be solved by any algorithm are called

- (a) tracable problem
- (b) intraceable problem
- (c) undecidable problems
- (d) decidable problems

19. The Euler's circuit problem can be solved in

- (a)  $O(N)$
- (b)  $O(N \log N)$
- (c)  $O(\log N)$
- (d)  $O(N^2)$

20. The easy problem solved in \_\_\_

- (a) P class
- (b) NP class
- (c) NPC class
- (d) NPH class