DAYANANDA SAGAR ACADEMY OF TECHNOLOGY & MANAGEMENT

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6 Programs Accredited by NBA
(CSE, ISE, ECE, EEE, MECH, CIVIL) NBA

QUESTION BANK

Subject	Analysis and Design of Algorithms
Subject Code	BCS401
Semester	4
Academic Year	2023-24(Even)

Module 1
INTRODUCTION

1. Write an algorithm to find the maximum element in an array of n element. Give the mathematical analysis of this non recursive algorithm. ***(08 Marks, June 2019)*** ***(06 Marks, June 2018)***
2. Explain the of asymptotic notations Big θ, Big Ω, Big O used to compare orders of growth of an algorithm. ***(08 Marks, June 2019)*** ***(06 Marks, June 2018)***
3. Explain with an example how a new variable count introduced in a program can be used to find the number of steps needed by a program to solve a particular problem instance ***(04 Marks, June 2018)***
4. Solve the recurrence relation: M(n)=2M(n-1)+1. Take M(1)=1, M(n) is given for n>1. ***(04 Marks, June 2018)***
5. Write a recursive function to find and print all possible permutations of a given set of n elements ***(04 Marks, June 2018)***
6. What is an algorithm? Explain the notion of an algorithm with an example. ***(08 Marks, June 2013) (06 Marks, Dec 2015)***
7. Explain the method of comparing the order of the growth of 2 functions using limits. Compare order of growth of $\log_2$ n and $\sqrt{\boldsymbol{n}}$. ***(06 Marks, Jan 2010)***
8. Compare the order of growth of $\frac{1}{2}$n(n -1) and $\theta(n^2)$. ***(04 Marks, Dec 2014)***
9. Explain the analysis framework of algorithms. Explain the worst case, best case and average case efficiencies, with an algorithm. ***(10 Marks, Dec 2011)***
10. Explain the concept of asymptotic notations and basic efficiency classes, with examples. Explain O, θ, and Ω, with an examples. ***(10 Marks, Dec 2011)(08 Marks, June 2017)***
11. Explain asymptotic notations with examples. ***(06 Marks, June 2014, Dec 2015)(10 Marks, June 2016)***
12. Define three asymptotic notations and express the following assertions using three asymptotic notations with proof from its definition ***(06 Marks, Dec 2016)***

    i) $\frac{1}{2}$ n(n -1)

    ii) $6*2^n+n^2$

iii) 100n+5

13. If $t_1(n) \epsilon\ 0\ (g_1(n))$ and $t_2(n) \epsilon\ 0(g_2(n))$, prove **that $t_1(n) + t_2(n) \epsilon 0(\max \{g_1(n), g_2(n)\})$.**

    (10 Marks Jan 2020 06 Marks, June 2012, June 2015)

    (06 Marks, Dec 2017)

14. If M(n) denotes the number of moves in tower of Hanoi puzzle when n disks are involved, give a recurrence relation for M(n) and solve this recurrence relation. ***(08 Marks, June 2017)***

15. Design a recursive algorithm for solving tower of hanoi problem and give the general plan of analyzing that algorithm. Show that the time complexity of tower of hanoi algorithm is exponential in nature.

    (06 Marks, June 2019)(08 Marks, June 2014)

16. Give general plan of analyzing recursive algorithm. Mathematically analyze the tower of Hanoi problem and find its complexity. ***(08 Marks, Dec 2016)***

17. Explain the mathematical analysis of fibonacci recursive algorithm. ***(06 Marks, Dec 2014)***

18. Algorithm X(int N)

```
{
int P;
for i  ←1 to N
   {
Printf("\n%d\t * \t %d= %d", N, i, P);
         P=P + N;
   }  }
```

    i) What does this algorithm compute?
    ii) What is the basic operation?
    iii) How many times the basic operation is executed?
    iv) What is the efficiency class of this algorithm? ***(04 Marks, Dec 2012)***

19. Consider the following algorithm

```
Algorithm Mystery (n)
        //input: A non negative integer n
        S ←0
        for i←1 to n do
                S ← S + i * i
        return S
```

    i) What does this algorithm compute?
    ii) What is its basic operation?
    iii) How many times is the basic operation executed?
    v) What is the efficiency class of this algorithm? ***(04 Marks, June 2015)***

20. Define an algorithm. Discuss the criteria of an algorithm with an example. ***(06 Marks, Jan 2018)***

21. Consider the following algorithm

```
        Algorithm GUESS(A[][])
                for i←0 to n-1
                for j← 0 to i
                        A[i][j] ← 0
```

        i) What does the algorithm compute?
        ii) What is basic operation?

iii) What is the efficiency of this algorithm? ***(03 Marks, Jan 2018)***

22. Design an algorithm for checking whether all elements in a given array are distinct or not ***(08 Marks, June 2017)***
23. Illustrate mathematical analysis of recursive algorithm for towers of Hanoi ***(08 Marks, June 2017)***
24. Define time and space complexity. Explain important problem types. ***(08 Marks, June 2017)*** ***(06 Marks, Jan 2018)***
25. Design an algorithm to search an element in an array using sequential search. discuss the worst case, best case and average case analysis of this algorithm ***(10 Marks Mar 2020, 08 Marks, June 2019)***
26. Explain general plan of mathematical analysis of non recursive algorithms with example.
27. Give the mathematical analysis of non recursive Matrix Multiplication Algorithm**.** ***(05 Marks Aug 2022***)
28. Give the recursive algorithm to find maximum and minimum element from the list and apply the algorithm to find maximum and minimum to the list ***(10 Marks Aug 2022)***
    [31 22 12 -7 75 -6 17 47 60]
29. Design an algorithm to sort a list in an array using Bubble sort with an example. discuss the worst case, best case and average case analysis of this algorithm
30. Design an algorithm to sort a list in an array using Selection sort with an example. discuss the worst case, best case and average case analysis of this algorithm
31. Design an algorithm for the brute force string matching with an example.