BRAINWARE UNIVERSITY

Term End Examination 2023
Programme – MCA-2020/MCA-2021
Course Name – Design and Analysis of Algorithms
Course Code - MCA204
(Semester II)

Full Marks : 60 **Time : 2:30 Hours**

[The figure in the margin indicates full marks. Candidates are required to give their answers in their own words as far as practicable.]

Group-A

(Multiple Choice Type Question) 1 x 15=15

1. *Choose the correct alternative from the following :*

(i) Define the complexity the recurrence relation T(n) = 8T(n/2) +n2

a) O (n) b) O (n2)
c) O (log2 n) d) O (n3)

(ii) State the complexity of Tower of Hanoi problem is

a) O (n) b) O (n2)
c) O (2n) d) None of these

(iii) Select the correct option:o (g(n)) is [Read as small oh of g (n)] is

a) asymptotically loose b) asymptotically tight
c) same as Big Oh d) None of these

(iv) Select the correct word for the blank:There are _____steps to solve the problem

a) Seven b) Four
c) Six d) Two

(v) Tell the complexity of searching an element from a set of n elements using Binary search algorithm is

a) O(n log n) b) O(log n)
c) O(n2) d) O(n)

(vi) Report the case of Master's theorem tthat is applicable in the recurrence relation T(n)=0.5*T(n/2)+1/n?

a) Case 3 b) Case 1
c) Master's theorem is not applicable d) Case 2

(vii) The recurrence relation capturing the optimal time of the Tower of Hanoi problem with n discs is.

a) $T(n) = 2T(n-2) + 2$
b) $T(n) = 2T(n-1) + n$
c) $T(n) = 2T(n/2) + 1$
d) $T(n) = 2T(n-1) + 1$

(viii) Identify the result of the recurrences that fall under first case of Master's theorem (let the recurrence be given by $T(n)=aT(n/b)+f(n)$ and $f(n)=nc$?

a) $T(n) = O(nlogba)$
b) $T(n) = O(nc \log n)$
c) $T(n) = O(f(n))$
d) None of mentioned

(ix) Predict the case of Master's theorem where the recurrence relation of binary search will fall?

a) 1
b) 2
c) 3
d) It cannot be solved using master's theorem

(x) Decide the objective of tower of Hanoi puzzle.

a) To move all disks to some other rod by following rules
b) To divide the disks equally among the three rods by following rules
c) To move all disks to some other rod in random order
d) To divide the disks equally among three rods in random order

(xi) Predict the minimum number of moves required to solve a tower of Hanoi problem with n disks is _____

a) 2n
b) 2n-1
c) n2
d) n2-1

(xii) Focus the two main measures for the efficiency of an algorithm are

a) Processor and memory
b) Complexity and capacity
c) Time and space
d) Data and space

(xiii) Predict the fact:Ω - notation provides an asymptotic

a) Upper bound
b) Lower bound
c) One that is sandwiched between the two bounds
d) None of these

(xiv) Calculate the time complexity of the expression $f(n) = 6*2n + n7$ using big-O notation is

a) O(2n)
b) O(n7)
c) O(n log2 n)
d) O(n)

(xv) Calculate the average successful search time taken by binary search on a sorted array of 10 item is

a) 2.6
b) 2.8
c) 2.7
d) 2.9

Group-B

(Short Answer Type Questions) 3 x 5=15

2. Judge the following statement: Tower of Hanoi Problem can be solved using recursion. (3)
3. Describe the algorithm of matrix chain problem. (3)
4. Predict CDP to find clique number for the given graph. (3)
5. Report the optimal solution for the fractional Knapsack problem with capacity 50 is given below: w = {5, 7, 12, 23, 30} v = {30, 20, 100, 90, 160} (3)
6. Compare P, NP, NP complete, NP hard classes. (3)

OR

Explain asymptotic analysis. (3)

Group-C

(Long Answer Type Questions) 5 x 6=30

7. Consider the input String for applying Naive String: "ABAAABCDBBABCDDEBCABC", pattern: "ABC" Justify the matching algorithm weather sub-string found or not, If found give the position. (5)
8. Distinguish between the approach of merge sort and quick sort (5)
9. Evaluate the time complexity of merge sort using an example. (5)
10. Describe Knuth Morris Pratt (KMP) algorithm. (5)
11. Differentiate the step between merge and quick sort using a proper example. (5)
12. Consider the following optimal parameterization of a Matrix-Chain product whose sequence of dimensions is <2, 3, 4, 3> (5)

OR

Explain Floyd Warshall Algorithm to solve All Pair Shortest Path using a suitable example. (5)

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