



BRAINWARE UNIVERSITY
Class Test 1 (2nd Semester) – March, 2025
Program Name – Bachelor of Computer Applications
BCA47111(T) – Design and Analysis of Algorithm

Time - 60 minutes

Full Marks: 20

(Multiple Choice Type Question)

1. Choose the correct alternative from the following: -**[8 x 1= 8]**

- i) Define Complexity of the recurrence relation $T(n) = T(n-1) + 1$
a) $O(n^2)$ b) $O(n)$ c) $O(1)$ d) $O(n-1)$
- ii) O - notation provides an asymptotic
a) Upper bound b) Lower bound c) One that is sandwiched between the two bounds d) None of these
- iii) What is the result of the recurrences which fall under case-1 of Master's theorem? Let the recurrence be given by $T(n)=aT(n-b)+f(n)$ and $f(n)=nc$?
a) $T(n) = O(n^{k+1})$ b) $T(n) = O(nc \log n)$ c) $T(n) = O(f(n))$ d) $T(n) = O(n^2)$
- iv) In recurrence relations, which method solves $T(n) = 2T(n/2) + O(n)$?
a) Substitution Method b) Recursion Tree Method c) Master Theorem d) Iterative Method
- v) What is the average-case time complexity of Quick Sort?
a) $O(n^2)$ b) $O(n \log n)$ c) $O(n)$ d) $O(\log n)$
- vi) Which sorting algorithm is the most efficient for large datasets?
a) Bubble Sort b) Merge Sort c) Selection Sort d) Insertion Sort
- vii) If an array of size 1000 is sorted, how many comparisons does binary search need in the worst case?
a) 10 b) 20 c) 30 d) 40
- viii) If Quick Sort is applied to a sorted array and always selects the last element as the pivot, what will be its time complexity?
a) $O(n \log n)$ b) $O(n)$ c) $O(n^2)$ d) $O(\log n)$

(Short Answer Type Question)

Answer all questions of the following :-

[6 x 2 = 12]

2. Define Big- Ω notation with a proper diagram and example.
3. Explain the recursive method with an example.
4. Differentiate between Merge Sort and Quick Sort.
5. Given an already sorted array, Explain which sorting algorithm is most efficient and why.
6. Solved using the Substitute Method: $T(n) = T(n-1) + \log n$
7. Solved using the Master Theorem: $T(n) = 3T(n/2) + n^2$