United College of Engineering and Research, Allahabad

Department of Computer Science & Engineering

B.Tech CSE- V Semester

Set-1

Course Name: Design and Analysis of Algorithm **AKTU Course Code:** KCS-503

Q. No.	Questions
1	How many passes does an insertion sort algorithm consist of? a) N b) N-1 c) N+1 d) N^2
2	What is the average case running time of an insertion sort algorithm? a) O(N) b) O(N log N) c) O(log N) d) $O(N^2)$
3	What is the running time of an insertion sort algorithm if the input is pre-sorted? a) $O(N^2)$ b) O(N log N) c) O(N) d) O(M log N)
4	What is the worst case complexity of selection sort? a) O(nlogn) b) O(logn) c) O(n) d) $O(n^2)$
5	What is the advantage of selection sort over other sorting techniques? a) It requires no additional storage space b) It is scalable c) It works best for inputs which are already sorted

	d) It is faster than any other sorting technique
6	The given array is arr = {3,4,5,2,1}. The number of iterations in bubble sort and selection sort respectively are _____ a) 5 and 4 b) 4 and 5 c) 2 and 4 d) 2 and 5
7	What is the best case complexity of selection sort? a) O(nlogn) b) O(logn) c) O(n) d) $O(n^2)$
8	Merge sort uses which of the following technique to implement sorting? a) backtracking b) greedy algorithm c) divide and conquer d) dynamic programming
9	What is the average case time complexity of merge sort? a) O(n log n) b) $O(n^2)$ c) $O(n^2 \log n)$ d) $O(n \log n^2)$
10	What is the auxiliary space complexity of merge sort? a) O(1) b) O(log n) c) O(n) d) O(n log n)
11	What will be the best case time complexity of merge sort? a) O(n log n) b) $O(n^2)$ c) $O(n^2 \log n)$ d) $O(n \log n^2)$
12	Which of the following is not in place sorting algorithm by default? a) merge sort b) quick sort c) heap sort

	d) insertion sort
13	What is the worst case time complexity of a quick sort algorithm? a) O(N) b) O(N log N) c) $O(N^2)$ d) O(log N)
14	What is the average running time of a quick sort algorithm? a) $O(N^2)$ b) O(N) c) O(N log N) d) O(log N)
15	Which of the following methods is the most effective for picking the pivot element? a) first element b) last element c) median-of-three partitioning d) random element
16	Find the pivot element from the given input using median-of-three partitioning method. 8, 1, 4, 9, 6, 3, 5, 2, 7, 0. a) 8 b) 7 c) 9 d) 6
17	Which is the safest method to choose a pivot element? a) choosing a random element as pivot b) choosing the first element as pivot c) choosing the last element as pivot d) median-of-three partitioning method
18	Quick sort is a _____ a) greedy algorithm b) divide and conquer algorithm c) dynamic programming algorithm d) backtracking algorithm
19	The best case behaviour occurs for quick sort is, if partition splits the array of size n into _____ a) n/2 : (n/2) – 1

	b) n/2 : n/3 c) n/4 : 3n/2 d) n/4 : 3n/4
20	Consider the Quick sort algorithm in which the partitioning procedure splits elements into two sub-arrays and each sub-array contains at least one-fourth of the elements. Let T(n) be the number of comparisons required to sort array of n elements. Then T(n)<=? a) T(n) <= 2 T(n/4) + cn b) T(n) <= T(n/4) + T(3n/4) + cn c) T(n) <= 2 T(3n/4) + cn d) T(n) <= T(n/3) + T(3n/4) + cn
21	Consider the Quick sort algorithm which sorts elements in ascending order using the first element as pivot. Then which of the following input sequence will require a maximum number of comparisons when this algorithm is applied on it? a) 22 25 56 67 89 b) 52 25 76 67 89 c) 22 25 76 67 50 d) 52 25 89 67 76
22	On which algorithm is heap sort based on? a) Fibonacci heap b) Binary tree c) Priority queue d) FIFO
23	In what time can a binary heap be built? a) O(N) b) O(N log N) c) O(log N) d) $O(N^2)$
24	What is the typical running time of a heap sort algorithm? a) O(N) b) O(N log N) c) O(log N) d) $O(N^2)$
25	What is the time taken to perform a delete min operation in minheap? a) O(N) b) O(N log N) c) O(log N)

	d) $O(N^2)$
26	Which one of the following is false? a) Heap sort is an in-place algorithm b) Heap sort has O(nlogn) average case time complexity c) Heap sort is stable sort d) Heap sort is a comparison-based sorting algorithm
27	What is its wort case time complexity of Heap sort? a) O(nlogn) b) $O(n^2 logn)$ c) $O(n^2)$ d) $O(n^3)$
28	How many elements can be sorted in O(logn) time using Heap sort? a) O(1) b) O(n/2) c) O(logn/log(logn)) d) O(logn)
29	What is the worst case complexity of binary search using recursion? a) O(nlogn) b) O(logn) c) O(n) d) $O(n^2)$
30	Binary Search can be categorized into which of the following? a) Brute Force technique b) Divide and conquer c) Greedy algorithm d) Dynamic programming
31	Solution of the following recurrence relation: $T(n) = 7T(n/2) + 3n^2 + 2$ is (a) $O(n^{2.8})$ (b) $O(n^3)$ (c) $\theta(n^{2.8})$ (d) $\theta(n^3)$
32	Sort the following functions in the decreasing order of their asymptotic (big-O) complexity: $f_1(n) = n^{\sqrt{n}}$, $f_2(n) = 2^n$, $f_3(n) = (1.000001)^n$, $f_4(n) = n^{10} * 2^{(n/2)}$

	(a) f2> f4> f1> f3 (b) f2> f4> f3> f1 (c) f1> f2> f3> f4 (d) f2> f1> f4> f3
33	f(n) = $2^{(2n)}$ Which of the following correctly represents the above function? (a) O(2^n) (b) Ω(2^n) (c) Θ(2^n) (d) None of these
34	T(n) = 3T(n/2+ 47) + $2n^2$ + 10*n – 1/2. T(n) will be (a) O(n^2) (b) O(n^(3/2)) (c) O(n log n) (d) None of these
35	Consider the following recurrence relation T(n) = T(n\2) + T(2n\5) + 7n Which one of the following options is correct? (a) T(n) = Θ($n^{5/2}$) (b) T(n) = Θ(n logn) (c) T(n) = Θ(n) (d) T(n) = Θ((log n)$^{5/2}$)
36	For parameters a and b, both of which are w(1), T(n) = T($n^{1/a}$) + 1 T(b) = 1 Then T(n) is (a) Θ($\log_a \log_b$ n) (b) Θ($\log_{ab}$ n) (c) Θ($\log_b \log_a$ n) (d) Θ($\log_2 \log_2$ n)
37	The running time of an algorithm is given by:- T(n) = T(n-1)+T(n-2)-T(n-3) , if n>3 = n , otherwise Then what should be the relation between T(1),T(2), T(3), so that the order of the algorithm is constant?

	(a) T(1)=T(2)= T(3) (b) T(1)+T(3)=2T(2), (c) T(1)-T(3)= T(2), (d) T(1)+T(2)=T(3),
38	The recurrence relation for the binary search is:- (a) T(n) = 2T(n/2) + k, k is some constant (b) T(n) = 2T(n/2) + k, k is some constant (c) T(n) = T(n/2) + log n (d) T(n) = T(n/2) + n
39	Consider the recurrence function $T(n) = 2T(n^{1\backslash 2}) + 1$, if n>2 = 2 , 0<n<2 Then T(n) in terms of Θ-notation is (a) Θ(loglogn) (b) Θ(logn) (c) $\Theta(n^{1\backslash 2})$ (d) Θ(n)
40	Consider the following recurrence relation T(n) = 2T(n\2) + log n Which one of the following options is correct? (a) Θ(n) (b) Θ(n logn) (c) $\Theta(n^2)$ (d) Θ(logn)
41	Consider the following array. 23 | 32 | 45 | 69 | 72 | 73 | 89 | 97 Which algorithm out of the following options uses the least number of comparisons (among the array elements) to sort the above array in ascending order? A. Selection sort B. Mergesort C. Insertion sort D. Quicksort using the last element as pivot

42	Consider the following three functions. $f_1=10^n$ $f_2=n^{logn}$ $f_3=nv^n$ Which one of the following options arranges the functions in the increasing order of asymptotic growth rate? A. f_3,f_2,f_1 B. f_2,f_1,f_3 C. f_1,f_2,f_3 D. f_2,f_3,f_1
43	Of the following sort algorithms, which has execution time that is least dependant on initial ordering of the input? A. Insertion sort B. Quick sort C. Merge sort D. Selection sort
44	What is the complexity of the following code? 1. sum=0; 2. for(i=1;i<=n;i*=2) 3. for(j=1;j<=n;j++) 4. sum++; Which of the following is not a valid string? A. O(n2) B. O(nlog n) C. O(n) D. O(n logn logn)
45	There are n unsorted arrays: A1,A2,…,An. Assume that n is odd. Each of A1,A2,…,An contains n distinct elements. There are no common elements between any two arrays. The worst-case time complexity of computing the median of the medians of A1,A2,…,An is A. O(n) B. O(nlogn)

	C. $O(n^2)$ D. $\Omega(n^2 \log n)$
46	An array of 25 distinct elements is to be sorted using quicksort. Assume that the pivot element is chosen uniformly at random. The probability that the pivot element gets placed in the worst possible location in the first round of partitioning (rounded off to 2 decimal places) is (a) 0.08 (b) 0.0016 (c) 0.04 (d) 0.0008
47	Given two sorted list of size m and n respectively. The number of comparisons needed the worst case by the merge sort algorithm will be: a. m×n b. maximum of m and n c. minimum of m and n d. m+n−1
48	The number of swapping needed to sort the numbers 8 , 22, 7, 9, 31, 5, 13 in ascending order using bubble sort is A. 11 B. 12 C. 13 D. 10
49	Which one of the following in-place sorting algorithms needs the minimum number of swaps? A. Insertion Sort B. Quick Sort C. Heap Sort D. Selection Sort

50	Consider the following C function
	
	`int fun(int n) {`
	`  int i, j;`
	`  for(i=1; i<=n; i++) {`
	`  for (j=1; j<n; j+=i) {`
	`  printf("%d %d", i, j);`

```
    }
  }
}
```

Time complexity of fun in terms of Θ notation is

A. $\Theta(n^n)$
B. $\Theta(n^2)$
C. $\Theta(n \log n)$
D. $\Theta(n^2 \log n)$

Answer

1-b	2-d	3-c	4-d	5-a	6-a	7- d	8-c	9-a	10-c
11-a	12-a	13-c	14-c	15-c	16-d	17- a	18-b	19-a	20-b
21-a	22-c	23-a	24-b	25-c	26-c	27- a	28-c	29-b	30-b
31-a,b,c	32-b	33-b	34-a	35-c	36-a	37- a	38-b	39-b	40-a
41-c	42-d	43-c	44-c	45-c	46-a	47- d	48-d	49-d	50-c