Subject Code **2044** COMUTER SCIENCE (Core - 14) Question Booklet No.

	To be filled in by candidate by ball-point pen only	OMR Sl. No.
	Roll No. _____	_____
Signature of Invigilator	**Declaration : I have read and understood the instructions given below.**	
Time of Examination	Full Signature of Candidate	**Full Marks : 80/50**
Date of Examination	Name of Candidate	**Time : 1 hour**

Number of Questions in the Booklet } **50/40**

UU 6th Semester Examination, 2020

INSTRUCTIONS TO CANDIDATES

- Immediately after getting the booklet read instructions carefully mentioned on the front and back page of the Question Booklet. Do not open the seals unless asked by the Invigilator.
- Write your Roll No., OMR Response Sheet No., in the specified places given above and put your signature.
- Write the subject code of the booklet in your OMR Sheet.
- Make all entries in the OMR Response Sheet as per the given instructions; otherwise OMR Response Sheet will not be evaluated.
- After opening the seals, ensure that the Question Booklet contains total no. of pages as mentioned above and printing of all the **50 / 40** questions are proper. If any discrepancy is found, inform the invigilator within **15** minutes and get the correct Question Booklet.
- For each question in the Question Booklet choose the correct option from the given four alternatives and darken the same circle in the OMR Response Sheet with Black or Blue ball-point pen.
- Darken the circle of correct answer properly; otherwise answers will not be evaluated. The candidate will be fully responsible for it.
- If more than one option is darken foe a particular question, then it will be treated as wrong answer.
- After completion of the examination, only OMR Response Sheet is to be handed over to the invigilator.

THERE IS NO NEGATIVE MARKING FOR WRONG ANSWER

COMUTER SCIENCE (Core-14)

DESIGN AND ANALYSIS OF ALGORITHMS

(Answer any 40 questions)

1. If N number of elements are sorted in verse order, then _____ of comparisons are required in case of insertion sort to sort the elements.
   (A) N2
   (B) N
   (C) N-1
   (D) N/2

2. The worst-case time complexity of Quick Sort is_____.
   (A) O (n^2)
   (B) O (log n)
   (C) O (n)
   (D) O (n logn)

3. The worst-case time complexity of Selection Exchange Sort is_____.
   (A) O (n^2)
   (B) O (log n)
   (C) O (n)
   (D) O (n logn)

4. Consider the recurrence relation as T(n)= T(3n/4)+1. The complexity of T(n)= _____.
   (A) $\theta(n^2)$
   (B) θ(logn)
   (C) θ(nlogn)
   (D) none of these

5. The concept of order Big O is important because _____.
   (A) It can be used to decide the best algorithm that solves a given problem
   (B) It determines the maximum size of a problem that can be solved in a given time
   (C) It is the lower bound of the growth rate of algorithm
   (D) Both A and B

6. The complexity of matrix multiplication using Strassen's method is _____.
   (A) On^2)
   (B) $O(n^{2.31})$
   (C) $O(n^{2.81})$
   (D) $O(n^3)$

7. State which option is most applicable for the statement "Heap tree is a _____".
   (A) complete binary tree
   (B) binary tree
   (C) tree structure
   (D) None of the above

8. If the recurrence relationship for Mater's method implementation is $T(n)=3T(n/2)+n^3$, then the value of a=_____ and b=_____.
   (A) 3, 3
   (B) 2,3
   (C) 3,2
   (D) 3/2,2/3

9. The complexity of log(n!) = _____.

(A) O (log n)

(B) O (n logn)

(C) O (n^2)

(D) O(n^n)

10. The increasing growth rate of the following functions "nlogn, $\sqrt{n}$, $\log_2 n$, n^2" is _____.

(A) n log n, $\sqrt{n}$, $\log_2 n$, n^2

(B) $\sqrt{n}$, $\log_2 n$, n^2, nlogn

(C) $\log_2 n$, $\sqrt{n}$,nlogn, , n^2

(D) nlogn, $\log_2 n$,$\sqrt{n}$, n^2

11. The algorithm like Quick sort does not require extra memory for carrying out these sortingprocedure. This technique is called _____.

(A) stable

(B) unstable

(C) in-place

(D) in-partition

12. Quick sort is the fastest available method of sorting because of _____.

(A) low overhead

(B) O(n log n) comparisons

(C) both A and B

(D) None of the above

13. 4-Queen problem uses _____ algorithm.

(A) divide and conquer

(B) backtracking

(C) branch and bound

(D) None of these

14. Which of the following is not true about comparison based sorting algorithms?

(A) The minimum possible time complexity of a comparison based sorting algorithm is O(nLogn) for a random input array.

(B) Any comparison based sorting algorithm can be made stable by using position as criteria when two elements are compared

(C) Counting Sort is not a comparison based sorting algorithm

(D) Heap Sort is not a comparison based sorting algorithm.

15. The best case and worst case complexity of Quick sort is _____ and _____

(A) θ(nlogn), O(n^2)

(B) θ(n^2), O(nlogn)

(C) θ(nlogn), O(nlogn)

(D) θ(n^2), O(n^2)

16. The time complexity of heap sort is _____.

(A) O(n^2)

(B) O(nlogn)

(C) O(n^2logn)

(D) O(logn)

17. Counting sort will use _____ number of comparisons to sort the array arr={1,5,3,8,2}.

(A) 5

(B) 7

(C) 9

(D) 0

18. _____ uses the largest amount of auxiliary space for sorting.

(A) Bubble sort

(B) Counting sort

(C) Quick sort

(D) Heap sort

19. What is a randomized QuickSort?

(A) The leftmost element is chosen as the pivot

(B) The rightmost element is chosen as the pivot

(C) Any element in the array is chosen as the pivot

(D) A random number is generated which is used as the pivot

20. The given array is arr = {2,6,1}. After subsequent partitioning the pivots is/are _____.

(A) 1 and 6

(B) 6 and 1

(C) 2 and 6

(D) 1

21. _____ is a type of amortized analysis method.

(A) Aggregate Analysis

(B) Accounting Analysis

(C) Potential Analysis

(D) All of the above

22. 2-3-4 tree is a special form of _____

(A) B tree

(B) B+ tree

(C) AVL tree

(D) Heaptree

23. Given a heap of n nodes. The maximum number of tree for building the heap is ___.

(A) n

(B) n-1

(C) n/2

(D) logn

24. Choose the option with function having same complexity for a Fibonacci heap.

(A) Insertion, Deletion

(B) Insertion, Union

(C) extract_min, insertion

(D) Union, delete

25. _____ is/are the operations that could be performed in O(logn) time complexity by red-black tree.

(A) insertion, deletion, finding predecessor, successor

(B) only insertion

(C) only finding predecessor, successor

(D) for sorting

26. Red-black trees are preferred over hash tables because _____.

(A) no they are not preferred

(B) resizing issues of hash table and better ordering in red-black trees

(C) they can be implemented using trees

(D) they are balanced

27. In hashing, if several elements are competing for the same bucket in the hash table,it is called _____.

(A) Diffusion

(B) Replication

(C) Collision

(D) Duplication

28. If the union operation is performed by height, the depth of tree will be_____.

(A) O(N)

(B) O(log N)

(C) O(N log N)

(D) O(M log N)

29. _____ is the most flexible in amortized analysis.

(A) Aggregate method

(B) accounting method

(C) potential method

(D) both a and b

30. The best case complexity in building a heap is _____.

(A) O(nlogn)

(B) $O(n^2)$

(C) O(n*logn*logn)

(D) O(n)

31. Consider the two matrices P and Q which are 10 x 20 and 20 x 30 matrices respectively. The number of multiplications required to multiply the two matrices is _____.

(A) 10*20

(B) 20*30

(C) 10*30

(D) 10*20*30

32. Longest Common Subsequence is a _____ algorithm.

(A) Greedy

(B) Dynamic Programming

(C) Divide and Conquer

(D) None of these

33. Applications of Longest Common Subsequence are _____.

i. Molecular Biology

ii. File Comparison

iii. Screen Display

iv. Pattern matching

Choose the appropriate answer.

(A) ii and iv

(B) i, ii, iii

(C) All of the above

(D) None of the above

34. The recursive solution for Matrix Chain multiplication is _____.

a. $M[i,j] = \begin{cases} 0 & , i=j \\ \min i \le k < j \, (M[i,k] + M[k,j] + P_{i-1}P_kP_j) & , i<j \end{cases}$

b. $M[i,j] = \begin{cases} 0 & , i=j \\ \min i \le k < j \, (M[i,k] + M[k+1,j] + P_{i-1}P_kP_j), & i<j \end{cases}$

c. $M[i,j] = \begin{cases} 0 & , i=j \\ \min i \le k < j \, (M[i,k-1] + M[k,j] + P_{i-1}P_kP_j), & i<j \end{cases}$

d. $M[i,j] = \begin{cases} 0 & , i=j \\ \min i \le k < j \, (M[i,k] + M[k+1,j] + P_iP_kP_j) & , i<j \end{cases}$

35. Huffman code uses _____ data structure.

(A) complete binary tree

(B) binary tree

(C) Strictly binary tree

(D) general tree

36. Complexity of Huffman coding is _____.

(A) $O(n^2)$

(B) O(nlogn)

(C) O(logn)

(D) $O(n^2 logn)$

37. _____ is used for finding minimum spanning tree.

i. Krushkal's Algorithm

ii. Prim's Algorithm

iii. Dijsktra's Algorithm

iv. Ford-Fulkerson Algorith

Choose appropriate answer.

(A) i and ii

(B) i, ii and iii

(C) iii and iv

(D) All of these

38. 0-1 knapsack problem is solved most efficiently by _____ algorithm?

(A) Dynamic programming

(B) Greedy Algorithm

(C) Decision tree

(D) Backtracking

39. The main objective of the knapsack problem is _____.

(A) to get maximum total value in the knapsack

(B) to get minimum total value in the knapsack

(C) to get maximum weight in the knapsack

(D) to get minimum weight in the knapsack

40. Time complexity of fractional knapsack problem is _____

(A) O(n log n)

(B) O(n)

(C) $O(n^2)$

(D) None of these

41. _____ is the class of decision problems that can be solved by non-deterministic polynomial algorithms?

(A) P

(B) NP

(C) NP-Hard

(D) NP-Complete

42. 3-SAT is a _____type problem.

(A) P

(B) NP

(C) NP-Hard

(D) NP-Complete

43. The number of unique colors will be required for proper vertex coloring of an empty graph having n vertices is _____.

(A) 0

(B) 1

(C) 2

(D) n

44. _____ is an NP complete problem.

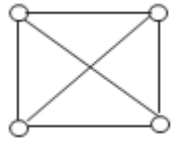
(A) Hamiltonian cycle

(B) Travelling salesman problem

(C) Matrix Chain Multiplication

(D) Finding maximum element in an array

45. _____ number of unique colorsare required for vertex coloring the following graph



(A) 2

(B) 3

(C) 4

(D) 5

46. The travelling salesman problem can be solved using _____

(A) A spanning tree

(B) A minimum spanning tree

(C) Bellman–Ford algorithm

(D) None of these

47. _____ can be used to solve the Hamiltonian path problem efficiently.

(A) Branch and bound

(B) Iterative improvement

(C) Divide and Conquer

(D) Greedy Algorithm

48. Hamiltonian path problem is a _____ type problem.

(A) NP

(B) P

(C) NP Complete

(D) NP Hard

49. The time complexity of the recursive solution of the subset sum problem has _____ time complexity.

(A) exponential

(B) linear

(C) logarithmic

(D) $O(n^2)$

50. The problem of finding a subset of positive integers whose sum is equal to a given positive integer is called as _____.

(A) n-queen problem

(B) subset sum problem

(C) knapsack problem

(D) hamiltonian circuit problem