Enrollment No._____

NAVRACHANA UNIVERSITY
a UGC recognized University

School: School of Engineering and Technology
Program/s: B.Tech (CSE)
Year: 2nd **Semester:** 4th
Examination: End Semester Examination
Examination year: May - 2023

Course Code: CS312 **Course Name:** Design & Analysis of Algorithms
Date: 15/05/2023
Time: 10:00 am to 12:00 am

Total Marks: 40
Total Pages: 03

Instructions:

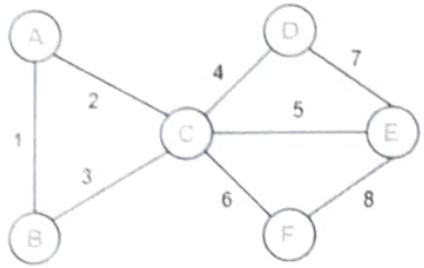
1. *Examination will be of 60 Minutes.*
2. *There are 30 questions. 20 questions are of 1 mark and 10 questions are of 2 marks.*
3. *Total Marks for the examination is 40.*
4. *One question is optional in 2 marks and 1 mark questions each.*

Q. No.	Details	Marks	CO	BTLO
	Attempt All the Questions.	40		
Q.1	Which of the following is the most suitable definition of radix sort? a) It is a non-comparison based integer sort b) It is a comparison based integer sort c) It is a comparison based non integer sort d) It is a non-comparison based non integer sort	1	CO2	BT1
Q.2	Which of the given options provides the increasing order of asymptotic complexity of functions F_1, F_2, F_3 and F_4? $F_1(n) = 2^n$ $F_3(n) = n \log n$ $F_2(n) = n^(3/2)$ $F_4(n) = n ^ (\log n)$ a) F_3, F_2, F_1, F_4 b) F_2, F_3, F_1, F_4 c) F_2, F_3, F_4, F_1 d) F_3, F_2, F_4, F_1	2	CO1, CO2, CO4	BT3, BT4, BT5
Q.3	Strassen's algorithm is a/an_____ algorithm. a) Accurate b) Recursive c) Approximation d) Non- recursive	1	CO2	BT1

Q.4	The time complexity of following function is (assume n>0):
	int recursive (int n)
	{
	if (n==1)
	return (1);
		1	CO1, CO2, CO5	BT2, BT4, BT5

	else
	return (recursive (n-1) + recursive (n-1));
	}
	
	a) O (n log n)
	b) O (n)
	c) O (2^n)
	d) O (n^2)			

Q.5	The execution time of quick sort is highly dependent on _____. a) Number of passes b) Arrangements of the input elements c) Selection of Pivot elements d) Number of input elements	1	CO2	BT1
Q.6	Which of the following data structures is best suited for implementing a hash table? a) Linked list b) Array c) Stack d) Queue	1	CO4	BT1, BT2
Q.7	The measure of the longest amount of time possibly taken to complete an algorithm is expressed as _____. a) Little-O b) Little-Omega c) Big-Omega d) Big-O	1	CO2, CO3	BT1
Q.8	Identify the true and false statements from the following with respect to measuring the running time of an algorithm. 1. Firstly, recognize the basic operation of an algorithm. 2. Identifying the basic operation of an algorithm is difficult. a) 1-True, 2- False b) 1-True, 2- True c) 1-False, 2- True d) 1-False, 2- False	1	CO2	BT2, BT3
Q.9	The time complexity of binary search is defined by_____ function. a) Constant b) Quadratic c) Exponential d) None of the mentioned	1	CO2	BT1
Q.10	Consider the given graph:	2	CO5	BT5, BT6

	 What is total cost of minimum spanning tree? a) 18 Units b) 20 Units c) 19 Units d) 22 Units			
Q.11	Which of the following statements is true? a) Recursion is always better than iteration b) Recursion uses more memory compared to iteration c) Recursion uses less memory compared to iteration d) Iteration is always better and compact to implement than recursion	1	CO2, CO4	BT1
Q.12	In counting sort, two standard variables are used that is 'r' and 'n'. Which one of the following is the correct assumption about the value of 'r' and 'n'? a) 'r' and 'n' should be equal b) 'r' should be less than 'n' c) 'n' should be less than 'r' d) There is no correlation between the value of 'r' and 'n'	1	CO2, CO3	BT3, BT4
Q.13	Identify the best case time complexity of selection sort? a) O (n log n) b) O (n) c) O (n^2) d) O (log n)	1	CO2	BT1, BT3
Q.14	If the recursive function is written to implement the program for Fibonacci series, then the order of recurrence relation for Fibonacci series is ____. a) 1 b) 2 c) 3 d) 4	1	CO5	BT4, BT5, BT6
Q.15	The efficient method for sorting in case if the input has less number of elements to sort and the elements are distributed over very large rang is _____. a) Merge sort b) Heap Sort c) Quick Sort d) Bubble Sort	1	CO3, CO4	BT1, BT2

Q.16	The input array is in descending order and expected output of sorting is an array in ascending order. Which of the following algorithms will have lowest time complexity in this case? a) Bubble Sort b) Bucket Sort c) Quick Sort d) Heap Sort	1	CO2	BT1
Q.17	The efficient algorithm to merge two sorted lists of size m and n into a single sorted list of size m+n will make _____ number of comparisons in worst case. a) O(m) b) O(n) c) O(m+n) d) O(log(m) + log(n))	1	CO2, CO3	BT2, BT3
Q.18	Which of the following statements is true for optimization problems? a) Average case time-complexity is more important than the worst case time-complexity b) Worst case time-complexity is more important than the average case time-complexity c) Time analysis is not important d) Best case time complexity is important	1	CO4	BT1
Q.19	Which of the following statement is false about randomized algorithms? a) Randomized algorithms are time efficient b) Randomized algorithms produce output accurately c) Randomized algorithms produce output inaccurately d) Randomized algorithms are of two types – optimization and decision	1	CO2, CO4	BT1
Q.20	The formula to calculate the probability of correctness in Fermat Primality test is: a) $1-(2^{-k})$ b) $1-(2^{k})$ c) $1-(K^{-2})$ d) $1-(K^{2})$	1	CO5	BT4, BT5
Q.21	Probability of correctness in Fermat primality test will be _____ if the value of 'k' is 4. a) 0.875 b) 0.9375 c) 0.666 d) 0.0625	2	CO5	BT5, BT6
Q.22	For the recurrence relation given below, the equivalent relation is ____. $F_n=5.F_{n-1}-6.F_{n-2}$, with $F_0=1$ and $F_1=4$ a) $2.3^n+(-1).2^n$ b) 2.3^n+2^n c) $3^n+(-1).2^n$ d) $3^n+(-1).3^n$	2	CO2, CO5	BT4, BT5, BT6

Q.23	Following elements are inserted in binary max heap one by one: 2, 7, 26, 25, 19, 17, 1, 90, 3, 36. This heap is stored in an array. The order in which the elements will be stored in an array is: a) 90, 36, 17, 25, 26, 7, 1, 2, 3, 19 b) 90, 36, 26, 25, 19, 17, 7, 3, 2, 1 c) 90, 36, 17, 26, 25, 7, 1, 2, 3, 19 d) 90, 36, 17, 25, 26, 7, 19, 2, 3, 1	2	CO2	BT4, BT5, BT6
Q.24	Which one of the following is a binary max-heap if max-heap is implemented using an array? a) 30, 17, 21, 18, 15, 13, 19 b) 30, 17, 21, 18, 15, 13, 19 c) 30, 19, 21, 18, 15, 13, 17 d) 30, 19, 17, 18, 15, 13, 21	2	CO1, CO2	BT4, BT5, BT6
Q.25	If the input elements to counting sort algorithm is 6, 2, 2, 3, 4, 3, 4, 3 then the array 'C' generated in initial phase will have values _____ . The range of possible input values is from 1 to 6. a) 0, 2, 3, 2, 0, 1 b) 0, 0, 2, 3, 2, 0, 0, 1 c) 0, 0, 2, 2, 3, 0, 0, 1 d) 0, 2, 2, 3, 0, 1	2	CO2, CO4	BT4, BT5, BT6
Q.26	If linear search is implemented recursively as well as iteratively, then which of the following statement describes the best about the speed of execution a) Linear search (recursive) will be slower b) Both execute at same speed c) Linear search(Iterative) will be slower d) Can't be said without knowing the input	1	CO1	BT1
Q.27	In case of binary search algorithm, if the search is performed for unsuccessful case, then the best case time complexity is _____. a) $\log_2 n$ b) $\log_2 n + 1$ c) $n \log_2 n$ d) Cons tan t	1	CO2	BT5
Q.28	Which one of the following is true about a priori analysis? a) It doesn't use asymptotic notations to represent the time complexity of an algorithm. b) If the time taken by the algorithm is less, then the credit will go to compiler and hardware. c) It is independent of language of compiler and types of hardware. d) It will give exact answer.	1	CO1, CO5	BT1, BT2
Q.29	Big-O does not allow us to I. Eliminate lower order terms II. Eliminate constants III. Eliminate more than one variable IV. Eliminate variables	2	CO2, CO4	BT1

	a) (i) and (iii) b) (iii) and (iv) c) (i), (ii) and (iii) d) (i), (ii), (iii) and (iv)			
Q.30	Given a sorted array of integers, what can be the minimum worst case time complexity to find floor of a number 'key' in given array? Floor of a 'key' is the largest element present in array which is smaller than or equal to 'key'. Floor does not exist if the 'key' is smaller than the smallest element in the array. For example, if the given array is {14, 65, 80, 95, 200, 299} and 'key' = 100, then output should be 95. a) O(Log(Log(n))) b) O(n Log (n)) c) O(Log (n)) d) O(Log(n)*Log(n))	2	CO1, CO2, CO5	BT4, BT5, BT6
Q.31	The array consists of natural numbers up to 1000 and we want to search for the number 365. Which of the following sequences will not be the sequence of nodes visited if binary search is implemented? a) 4,254,403,400,332,346,399,365 b) 926,222,913,246,900,260,364,365 c) 927,204,913,242,914,247,365 d) 4,401,389,221,268,384,383,280,365	2	CO4, CO5	BT4, BT5, BT6

Q.32	The time complexity of the following piece of code will be:
	ans = 0
	for (i = n; i >= 1; i /= 2):
	for (j = 1; j <= m; j *= 2):
	ans += (i * j)
	print(ans)
	a) O(n*m)
	b) O(log (m)*log (n))
	c) O(m*log (n))
	d) O(n*log (m))
		2	CO2	BT5

**********End of Question Paper**********