Sample Question Format

KIIT Deemed to be University
Online Re-Mid Semester Examination(Autumn October-2021)

Subject Name & Code: **Applicable to Courses:**

Design & Analysis of Algorithms (DAA)
(CS-2012)

Full Marks=20 **Time:1 Hour**

SECTION-A(Answer All Questions. All questions carry 2 Marks)

Time:20 Minutes **(5×2=10 Marks)**

Question No	Question Type (MCQ/ SAT)	Question	Answer Key (if MCQ)	CO Mapping

Q.No:1 (a)	MCQ	What is time complexity of the following function fun()?
		int fun(int n)
		{
		int i, j, k=0;
		for (i = n; i > 0; i /= 2)
		for (j = 0; j < i; j++)
		k = k + 1;
		return k;
		}
		A. O(n)
		B. O(n²)
		C. O(log n)
		D. O(n log n)
		E. NONE
			A	1

	SAT	What is the time complexity of the following function fun()?
		int fun(int n)
		{
		int i, j, k=0;
		for (i = n; i > 0; i /= 2)
		for (j = i; j > n; j--)
		k = k + 1;
		return k;
		}
		A. O(n)
		B. O(n²)
		C. O(log n)
		D. O(n log n)
		E. NONE
			C	1

	SAT	What is the time complexity of the following function fun()? int fun(int n)	B	1

		{
		int i, j, k=0;
		for (i = 0; i < n; i++)
		for (j = i; j > 0; j--)
		k = k + 1;
		return k;
		}
		A. O(n)
		B. O(n²)
		C. O(log n)
		D. O(n log n)
		E. NONE		

	SAT	What is the time complexity of the following function fun()?
		int fun(int n)
		{
		int i, j, k=0;
		for(i = 1; i<= n; i++)
		for(j=1; j<n; j += i)
		k = k + 1;
		return k;
		}
		A. O(n)
		B. O(n²)
		C. O(log n)
		D. O(n log n)
		E. NONE
			D	1

Q.No:1 (b)	**MCQ**	Which of the following is correct recurrence for worst case of Binary Search? A. T(n) = 2T(n/2) + 1 and T(1) = 1 B. T(n) = T(n-1) + 1 and T(1) = 1 C. T(n) = T(n/2) + 1 and T(1) = 1 D. T(n) = T(n-1) + n and T(1) = 1	C	3
	MCQ	Which of the following is correct recurrence for worst case of Quick Sort? A. T(n) = 2T(n/2) + n and T(1) = 1 B. T(n) = T(n-1) + 1 and T(1) = 1 C. T(n) = T(n/2) + 1 and T(1) = 1 D. T(n) = T(n-1) + n and T(1) = 1	D	3
	MCQ	Which of the following is correct recurrence for best case of Quick Sort? A. T(n) = 2T(n/2) + n and T(1) = 1 B. T(n) = T(n-1) + 1 and T(1) = 1 C. T(n) = T(n/2) + 1 and T(1) = 1 D. T(n) = T(n-1) + n and T(1) = 1	A	3
	MCQ	Which of the following is correct recurrence for worst case of Linear Search? A. T(n) = 2T(n/2) + 1 and T(1) = 1 B. T(n) = T(n-1) + 1 and T(1) = 1 C. T(n) = T(n/2) + 1 and T(1) = 1 D. T(n) = T(n-1) + n and T(1) = 1	B	3
Q.No: 1(c)	**MCQ**	If the given input array is sorted or nearly sorted, which of the following algorithm gives the best performance? A. Insertion sort B. Selection sort	A	4

		C. Quick sort D. Heap sort E. NONE		
	MCQ	Which of the following algorithms has lowest worst case time complexity? A. Insertion sort B. Selection sort C. Quick sort D. Heap sort E. NONE	D	4
	MCQ	In a binary max heap containing n numbers, the smallest element can be found in time_____. A. θ(n) B. θ(logn) C. θ(loglogn) D. θ(1) E. NONE	A	4
	MCQ	In a binary min heap containing n numbers, the largest element can be found in time_____. A. θ(1) B. θ(n) C. θ(logn) D. θ(loglogn) E. NONE	**B**	4
Q.No:1 (d)	**MCQ**	Consider two strings X = "10122" and Y = "0102120". Let p be the length of the longest common subsequence between X and Y and let n be the number of such longest common subsequences between X and Y. What is the value of n*p? A. 6 B. 7 C. 9 D. 12 E. NONE	D	5
	MCQ	Consider two strings X = "210120" and Y = "0012122". Let p be the length of the longest common subsequence between X and Y and let n be the number of such longest common subsequences between X and Y. What is the value of n*p? A. 6 B. 7 C. 9 D. 12 E. NONE	C	5
	MCQ	Consider two strings X = "10122" and Y = "0102120". Let p be the length of the longest common subsequence between X and Y and let n be the number of such longest common	B	5

		subsequences between X and Y. What is the value of n+p? A. 6 B. 7 C. 9 D. 12 E. NONE		
	MCQ	Consider two strings X = "210120" and Y = "0012122". Let p be the length of the longest common subsequence between X and Y and let n be the number of such longest common subsequences between X and Y. What is the value of n+p? A. 6 B. 7 C. 9 D. 12 E. NONE	A	5
Q.No:1 (e)	**MCQ**	Let A1, A2, A3 and A4 be four matrices of dimensions 2x3, 3x4, 4x5, 5x2 respectively. The number of scalar multiplications required to find the product like ((A1A2)A3)A4) is _____ using the basic matrix multiplication method. A. 84 B. 110 C. 124 D. 205 E. NONE	A	2
	MCQ	Let A1, A2, A3 and A4 be four matrices of dimensions 2x5, 5x4, 4x5, 5x3 respectively. The number of scalar multiplications required to find the product like ((A1A2)(A3A4)) is _____ using the basic matrix multiplication method. A. 84 B. 110 C. 124 D. 205 E. NONE	C	2
	MCQ	Let A1, A2, A3 and A4 be four matrices of dimensions 3x5, 5x4, 4x5, 5x2 respectively. The number of scalar multiplications required to find the product like (A1(A2(A3A4))) is _____ using the basic matrix multiplication method. A. 84 B. 110 C. 124 D. 205 E. NONE	B	2
	MCQ	Let A1, A2, A3 and A4 be four matrices of	D	2

		dimensions 3x5, 5x4, 4x5, 5x2 respectively. The number of scalar multiplications required to find the product like ((A1(A2A3))A4) is _____ using the basic matrix multiplication method. A. 84 B. 110 C. 124 D. 205 E. NONE		

SECTION-B(Answer Any One Question. Each Question carries 10 Marks)

Time: 30 Minutes **(1×10=10 Marks)**

Question No	Question	CO Mapping
Q.No:2	a) Solve the recurrence T(n) = T(n-1) + n using master method by changing variable first to transfer the recurrence to an appropriate master theorem form. b) Write a recursive algorithm to add first n natural numbers. Write an appropriate recurrence relation for this algorithm & then solve the recurrence.	5
Q.No: 3	a) Write the MERGE-SORT-NEW(A, p, r) procedure where at each step it divides the the array/sub-array into two parts such that first part contains elements thrice of second part instead of dividing at middle. b) For array A={35, 45, 15, 40, 10, 20, 40, 25, 10}, MERGE-SORT-NEW(A, 9) is applied to sort the array in ascending order. Show in diagram how this procedure is applied to this array.	4
Q.No:4	a) Write a function INSERT-MAX-HEAP(A, n, x) to insert a new element x into a max. Heap A of size n. b) Construct a max. heap with each digits of your roll number and then apply the INSERT-MAX-HEAP function by inserting two new values 5 & 7 sequentially to the max. heap constructed with digits of your roll number. Show the resultant max. heap tree.	4
Q.No:5	Suppose a file to be transferred through the network contains the following characters with their number of occurrences as < a: 10, b: 20, c: 15, d: 35, e: 20 >. Determine an efficient strategy that can minimize the total cost of transferring that file of 500 characters. Find out the total cost of transfer if transferring cost for 1-bit of data is 4 units.	6
Q.No:6	a) Write an algorithm to find out the longest palindromic subsequence of a given sequence using LCS algorithms. b) Apply the algorithm to the string “abaabbab”.	6
Q.No:7	Given two halls and 12 activities, A=<A1, A2,….,A12> along with their start time (si) and finish time (fi) as Si=<4, 8, 5, 7, 8, 12, 9, 6, 10, 12, 13, 14, > and fi=<6, 10, 7, 10, 9, 15, 11, 8, 11, 14, 14, 15>. Determine an efficient strategy where largest number of activities can be scheduled in these two halls.	6