

Note :Open Ended Assignment DAA:

Dear Students, Kindly attempt the set number, mentioned in front of your Roll Number.

Sr No	PRN	Roll no	seat_num	Problem Set no
1	120190007	237	T218001	SET1
2	120190032	236	T218002	SET2
3	120190044	235	T218003	SET3
4	120190064	234	T218004	SET4
5	120190079	233	T218005	SET5
6	120190083	232	T218006	SET6
7	120190092	231	T218007	SET7
8	120190103	241	T218008	SET8
9	120190107	230	T218009	SET9
10	120190133	229	T218010	SET10
11	120190143	228	T218011	SET1
12	120190154	227	T218012	SET2
13	120190157	226	T218013	SET3
14	120190158	225	T218014	SET4
15	120190160	224	T218015	SET5
16	120190162	223	T218016	SET6
17	120190164	222	T218017	SET7
18	120190165	221	T218018	SET8
19	120190174	220	T218019	SET9
20	120190176	219	T218020	SET10
21	120190179	218	T218021	SET1
22	120190207	217	T218022	SET2
23	120190216	216	T218023	SET3
24	120190219	215	T218024	SET4
25	120190230	214	T218025	SET5
26	120190240	213	T218026	SET6
27	120190245	212	T218027	SET7
28	120190255	211	T218028	SET8
29	120190265	210	T218029	SET9
30	120190267	209	T218030	SET10
31	120190277	208	T218031	SET1
32	120190281	207	T218032	SET2
33	120190284	206	T218033	SET3
34	120190290	205	T218034	SET4
35	120190291	204	T218035	SET5
36	120190299	203	T218036	SET6
37	120190312	202	T218037	SET7
38	120190314	201	T218038	SET8

39	120190325	200	T218039	SET9
40	120190337	199	T218040	SET10
41	120190352	198	T218041	SET1
42	120190357	197	T218042	SET2
43	120190368	196	T218043	SET3
44	120190391	195	T218044	SET4
45	120190414	194	T218045	SET5
46	120190419	193	T218046	SET6
47	120190625	238	T218068	SET7
48	120190630	239	T218069	SET8
49	120190634	240	T218070	SET9
50	220200017	243	T218072	SET10
51	220200026	244	T218073	SET1
52	220200070	247	T218074	SET2
53	220200076	250	T218075	SET3
54	220200078	245	T218076	SET4
55	220200086	249	T218077	SET5
56	220200151	248	T218078	SET6
57	220200160	246	T218079	SET7
58	220200179	251	T218080	SET8
59	220200210	252	T218081	SET9
60	220200229	253	T218082	SET10
61	520180025	242	T218414	SET1
62		255		SET2
63		258		SET3

SET1		
Q1	<p>Apply quick sort to sort your first name and last name in alphabetical order.</p> <p>Draw the tree of the recursive calls made.</p> <p>Rubrics 4 Marks for Correct sorting for first and last name.</p> <p>2 marks for recursive calls</p>	6M
Q2	<p>Sarita wants to sell her items in a market which is located 50 kilometres away from her house. She wants to carry only those items which will give a higher profit. Help the sarita to choose the items that will give her the highest possible profit. The items are Panner, Chees, Shrikand, Milk, Tofu. The quantity and price pair are (5,500), (6,900), (8,2000), (12,700), (8,300),. (Quantity is in kg) .The weight of the box to carry all item is 30.</p> <p>Rubrics:</p> <p>2 marks for stepwise fractional value calculation.</p> <p>2 marks for the calculation of Profit(stepwise).</p>	4M

Q3	<p>Write an Algorithm for the case where you have n different number challenge is to find all the pairs of two integers in an unsorted array that sum up to a given number S. Which strategy is suitable to solve this problem. Also analyze the time complexity of the Algorithm.</p> <p>Rubrics:</p> <p>3 marks for writing the correct and efficient Algorithm</p> <p>1 mark for identifying correct strategy.</p> <p>1marks for the Complexity Analysis.</p>	5M

SET2		
Q4	<p>You are given a collection of nuts of different size and corresponding bolts. You can choose any nut & any bolt together, from which you can determine whether the nut is larger than bolt, smaller than bolt or matches the bolt exactly. However there is no way to compare two nuts together or two bolts together. Suggest an algorithm to match each bolt to its matching nut. Compute time complexity of your algorithm.</p> <p>Rubrics 2 Marks for Correct algorithm.</p> <p>3 marks for time complexity.</p>	5M
Q5	<p>Find out the character encoding for the following message using Huffman coding and its transmission cost. Message: "THIS IS MIT AOE". (Do not consider the double quotes in the message.)</p> <p>Rubrics:</p> <p>Criteria 1: 3 Marks for the correct Huffam Tree</p> <p>Criteria 2: 2 Marks for the correct code for each character along with no bits per code.</p>	5M
Q6	<p>Given a rod of length n and a list of rod prices of length i, where $1 \leq i \leq n$, find the optimal way to cut the rod into smaller rods to maximize profit. Identified the correct Strategy and Write the efficient Algorithm for the same.</p> <p>3 marks for writing the correct and efficient Algorithm</p> <p>1 mark for identifying correct strategy.</p> <p>1 mark for the Complexity Analysis.</p>	5M

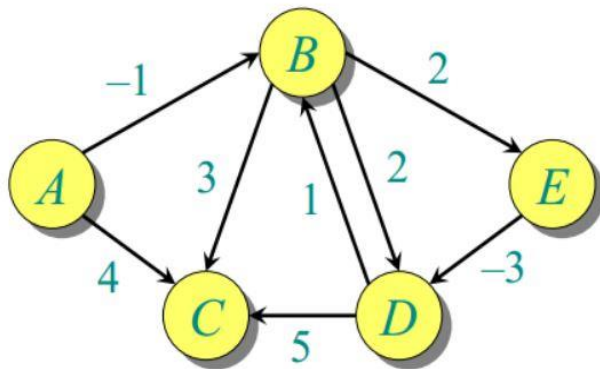
SET3		
Q7	<p>Consider variation of the binary search algorithm so that it splits the input not only into two sets of almost equal sizes, but into two sets of sizes approximately one-third and two-thirds. Write down the recurrence for this search algorithm and find the asymptotic complexity of this algorithm?</p> <p>Rubrics: 2 marks for writing correct recurrence, 3 marks for deriving time complexity correctly.</p>	5M
Q8	<p>Let say a machine needed 3 minutes to perform any task and suppose there are n task ($t_1, t_2, t_3, \dots, t_n$) to be performed. Consider the following case for the start and end time of the activities.</p> <ol style="list-style-type: none"> 1. Start time of even activity (t_2, t_4, \dots) will be finish time of previous activity - 1 and start time of odd activity (t_3, t_5, \dots) will be the finish previous activity + 1. Let the start time and finish time of first activity is 2 and 5 respectively and there are is total 10 activities. Find out which activities a machine can perform. 2. Start time of even activity (t_2, t_4, \dots) will be finish time of previous activity + 1 and start time of odd activity (t_3, t_5, \dots) will be the finish previous activity. Let the start time and finish time of first activity is 1 and 4 respectively and there are is total 10 activities. Find out which activities a machine can perform. <p>Solve both the cases using greedy approach.</p> <p>Rubrics: Criteria 1: 3 marks for the stepwise correct calculation of number of activity perform by the machine in case 1. Criteria 2: 3 marks for the stepwise correct calculation of number of activity perform by the machine in case 2</p>	6M
Q9	<p>Consider 4 elements $a_1 < a_2 < a_3 < a_4$ with $q_0 = 0.25, q_1 = 3/16, q_2 = q_3 = q_4 = 1/16$ $p_1 = 1/4, p_2 = 1/8, p_3 = p_4 = 1/16$</p> <ol style="list-style-type: none"> a) Construct the Optimal Binary search tree as a minimum cost tree. b) construct the table of values w_{ij}, C_{ij}, and r_{ij}, computed by the algorithm to compute the roots of optimal sub trees. <p>Rubric: computing w_{ij}, C_{ij}, and r_{ij} using formula: 2 mark, correct table of values w_{ij}, C_{ij}, and r_{ij}: 1 Mark, Correct Optimal Binary search Tree : 1 Mark</p>	4M

SET 4		
Q10	<p>Solve the recurrence for the number of additions required by Strassen's algorithm. Assume that n is a power of 2.</p> <p>Rubrics 1 Marks for Correct recurrence relation</p> <p>4 marks for solving the recurrence by using substitution method.</p>	5M
Q11	<p>Find out the character encoding of your full name (first name middle name and last name only) using Huffman coding and its transmission cost.</p> <p>Rubrics:</p> <p>Criteria 1: 2 Marks for the correct Huffam Tree</p> <p>Criteria 2: 2 Marks for the correct code for each character.</p> <p>Criteria 3: 1 mark for the transmission cost.</p>	5M
Q12	<p>Given coins of different denominations and a total, in how many ways can we combine these coins to get the total? Let's say we have coins = { 1, 2, 3 } and a total = 5, we can get the total in 5 ways. Assume that we have unlimited supply of coins.</p> <p>3 marks for writing the correct and efficient Algorithm</p> <p>1 mark for identifying correct strategy.</p> <p>1 mark for the Complexity Analysis.</p>	5M

SET 5		
Q13	<p>Find the order of growth for solutions of the following recurrences.</p> <p>a. $T(n) = 4T(n/2) + n$, $T(1) = 1$</p> <p>b. $T(n) = 4T(n/2) + n^2$, $T(1) = 1$</p> <p>c. $T(n) = 4T(n/2) + n^3$, $T(1) = 1$</p> <p>Rubrics 2 Marks for each Correct order of growth.(2*3=6)</p>	6M
Q14	<p>Consider a scenario of a Multiple Assignment Submissions where Maximum Time is denoted by T, and each question is associated with their mark M_i and Time bound T_i. Schedule or select the question in such a way that student should get maximum mark and also he should utilize the maximum time limit. Which strategy is useful to solve this problem? Write an Algorithm for this problem.</p> <p>Rubrics: 3 Mark for writing an Algorithm 1 marks for identifying correct strategy.</p>	4M
Q15	<p>Write a Dynamic Programming Approach to find the Longest common subsequence of a given text. Also explain the complexity of this problem.</p>	5M

	<p>Rubrics: 3 Marks for the Algorithm 1 Mark for example 1 for Time Complexity.</p>	
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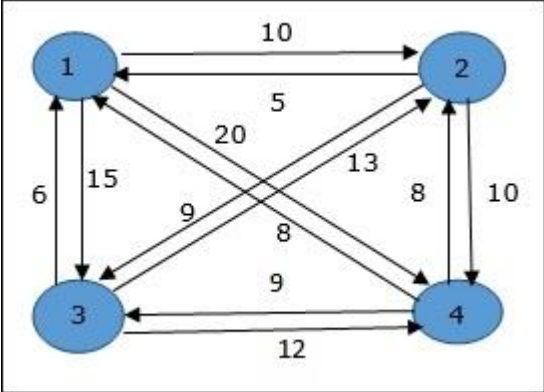
SET 6		
Q16	<p>An adaptation of the well known critical thinking task includes introducing individuals with a variety of 42 pictures-seven lines of six pictures each-and inquiring them to recognize the objective picture by asking questions that can be responded to yes or no. Further, individuals are then expected to recognize the image with as couple of inquiries as could be expected. Suggest the most efficient algorithm for this problem and indicate the largest number of questions that may be necessary.</p> <p>Rubrics: 2 marks for correct identification of algorithm. 3 Marks for correct number for largest number of questions.</p>	5M
Q17	<p>Marc loves cupcakes, but he also likes to stay fit. Each cupcake has a calorie count, and Marc can walk a distance to expend those calories. If Marc has eaten cupcakes so far, after eating a cupcake with calories he must walk <i>at least</i> $2^j * c$ miles to maintain his weight. Write an algorithm to achieve the above task. Also find the time complexity. Input should n: number of cupcakes and array of calories for a cupcake.</p> <p>Rubrics: 3 marks for the algorithm. 2 marks or time complexity.</p>	5M
Q18	<p>Why Bellman ford Algorithm is preferred over Dijkstra's Algorithm. Write the Algorithm of Bellman Ford. Find the shortest path from Source vertex 1 to remaining all vertices.</p>	5M



Rubrics: 1 Mark for justification of Bellman ford over Dijkstra's
 2 Marks for the Algorithm
 2 Marks for finding shortest path

SET 7

Q19	<p>What is the largest number of key comparisons made by binary search in searching for a key in the following array? List all the keys of this array that will require the largest number of key comparisons when searched for by binary search. 3 14 27 31 39 42 55 70 74 81 85 93 98 .</p> <p>Rubrics: 1 Marks for correct key comparisons 3 Marks for all list of keys</p>	4M
Q20	<p>Given arrival and departure times of all trains that reach a railway station, Write an Algorithm to find the minimum number of platforms required for the railway station so that no train waits. Also find the complexity.</p> <p>Rubrics: 3 marks for the algorithm. 2 marks or time complexity</p>	5M
Q21	<p>Postman need to visit all cities from a list. The distance between each city is given. The postman has started from head office and visit to each city once and go back to head office. Find the shortest route that he visits each city exactly once and returns to the Postoffice?</p>	6M

	 <p>Rubric: Cost Function 1 Mark. Calculation 4 Mark . Correct minimized path 1 Mark</p>	
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SET 8		
Q22	<p>List the following functions according to their order of growth from the lowest to the highest: $n^2, n^2-n, n^3, n^3+234, n^2+99, n$</p> <p>Rubrics: 4 Marks for correct table for the comparison values (at least contains 6 values in the table)</p> <p>1 Mark for the correct sequence</p>	5M
Q23	<p>Given an array of jobs where every job has a deadline and associated profit if the job is finished before the deadline. It is also given that every job takes a single unit of time, so the minimum possible deadline for any job is 1. How to maximize total profit if only one job can be scheduled at a time. Write an Algorithm for above task. Also find the time complexity.</p> <p>Rubrics: 3 marks for the algorithm. 1 marks or time complexity</p>	4M
Q24	<p>In flow shop, m different machines should process n jobs. Each job contains exactly n operations. The ith operation of the job must be executed on the ith machine. Operations within one job must be performed in the specified order. The first operation gets executed on the first machine, then the second operation on the second machine, and so on. Jobs can be executed in any order. The problem is to determine the optimal such arrangement, i.e. the one with the shortest possible total job execution makespan. Write the Algorithm for above Dynamic Programming Problem</p> <p>Rubrics: 4 Marks for Correct Algorithm 2 Marks for Explanation of problem statement with example</p>	6M

SET 9		
Q25	<p>Prove that the Worst case time complexity of quick sort is $O(n^2)$ and Average case Time complexity is $O(n \log n)$</p> <p>Rubrics: 2 marks for each Complexity Analysis.</p>	4M
Q26	<p>Consider a scenario of a Multiple Assignment Submissions where Maximum Time is denoted by T, and each question is associated with their mark M_i and Time bound T_i. Schedule or select the question in such a way that student should get maximum mark and also he should utilize the maximum time limit. Which strategy is useful to solve this problem? Write an Algorithm for this problem.</p> <p>Rubrics: 3 Mark for writing an Algorithm 2 marks for identifying correct strategy.</p>	5M
Q27	<p>Computing binomial coefficient is very fundamental problem of mathematics and computer science. Binomial coefficient $C(n, k)$ defines coefficient of the term x^n in the expansion of $(1 + x)^n$. Write the Dynamic Programming Approach to Find Binomial Coefficient.</p> <p>Rubrics: 4 marks for Algorithm 2 Mark for Example.</p>	6M

SET 10		
Q28	<p>Write an algorithm to find the smallest missing element from a sorted array. Example: Input: $A[] = [0, 1, 2, 6, 9, 11, 15]$ Output: The smallest missing element is 3</p> <p>Rubrics: 5Marks for writing correct algorithm</p>	5M
Q29	<p>You are given a set of N schedules of lectures for a single day at a university. The schedule for a specific lecture is of the form (s time, f time) where s time represents the start time for that lecture and similarly, the f time represents the finishing time. Given a list of N lecture schedules, we need to select maximum set of lectures to be held out during the day such that none of the lectures overlap with one another i.e. if lecture L_i and L_j are included in our selection then the start time of j \geq finish time of i or vice versa .</p> <p>Write an algorithm to achieve task.</p> <p>Rubrics: 3 marks for the algorithm. 2 marks or time complexity</p>	5M
Q30	<p>You are given a set of n types of rectangular 3-D boxes, where the i^{th} box has height $h(i)$, width $w(i)$ and depth $d(i)$ (all real numbers). You want to create a stack of boxes which is as tall as possible, but you can only stack a box on top of another box if the dimensions of the 2-D base of the lower box are each strictly larger than those of the 2-D base of the higher box. Solve this Box Stacking Problem with Dynamic Programming Approach.</p> <p>Rubrics: 5 Marks For correct and efficient Algorithm</p>	5M

