Roll No.													

PRESIDENCY UNIVERSITY
BENGALURU

SCHOOL OF ENGINEERING

TEST 1

Sem: Odd Sem 2019-20 | **Date:** 30.09.2019

Course Code: CSE212 | **Time:** 2:30PM to 3:30PM

Course Name: ANALYSIS OF ALGORITHMS | **Max Marks:** 40

Program & Sem: B. Tech (CSE) & V | **Weightage:** 20%

Instructions:

(i) *Read the question properly and answer accordingly.*

(ii) *Question paper consists of 3 parts.*

(iii) Scientific and Non-programmable calculators are permitted.

Part A [Memory Recall Questions]

Answer all the Questions. Each Question carries one mark. (4Qx1M=4M)

1. The complexity of Bubble sort algorithm is (C.O.NO.1)[Knowledge]

   a. O(n)
   b. O(log n)
   c. O(n^2)
   d. O(n log n)

2. In linear search algorithm the Worst case occurs when (C.O.NO.1)[Knowledge]

   a. The item is somewhere in the middle of the array
   b. The item is not in the array at all
   c. The item is the last element in the array
   d. The item is the last element in the array or is not there at all

3. Two main measures for the efficiency of an algorithm are (C.O.NO.1)[Knowledge]

   a. Processor and memory
   b. Complexity and capacity
   c. Time and space
   d. Data and space

4. Which of the following case does not exist in complexity theory
(C.O.NO.1)[Knowledge]

a. Best case
b. Worst case
c. Average case
d. Null case

5. Match the following with there respective efficiencies: **(5Qx1M=5M)**

a) Linear Search	i) (2^n)-1
b) Tower of Honai	ii) n^2
c) Selection Sort	iii) nm
d) String Matching	iv) 2^n
e)Knap Sack	v) n

Part B [Thought Provoking Questions]

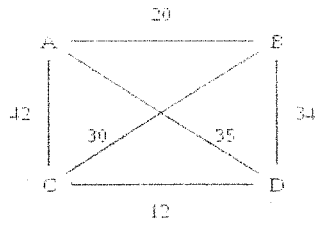
Answer all the Questions. Each Question carries seven marks. (3Qx7M=21M)

6. Design selection sort algorithm to perform sorting and analyze its time efficiency.
(C.O.NO.1)[Knowledge]
7. Explain the concept of various asymptotic notations, with examples?
(C.O.NO.1)[Knowledge]
8. Suggest a general plan for analyzing the efficiency of recursive algorithm Tower of honai ?
(C.O.NO.1)[Knowledge]

Part C [Problem Solving Questions]

Answer both the Questions. Each Question carries five marks. (2Qx5M=10M)

9. Apply Exhaustive Search procedure to find the shortest path for the given Travelling Salesperson Problem
(C.O.NO.2)[Comprehension]



10. Find the solution to the given Knapsack problem using exhaustive search method.
Knapsack capacity W=5
(C.O.NO.2.)[Comprehension]

item	weight	value
1	2	120
2	1	100
3	3	200
4	2	150

SCHOOL OF Engineering

GAIN MORE KNOWLEDGE
REACH GREATER HEIGHTS

Semester: 5th SEM

Course Code: CSE212

Course Name: Analysis of Algorithms

Date: 30/09/2019

Time: 2:30 to 3:30

Max Marks: 40

Weightage: 20%

Extract of question distribution [outcome wise & level wise]

Q.NO.	C.O.NO	Unit/Module Number/Unit /Module Title	Memory recall type [Marks allotted] Bloom's Levels			Thought provoking type [Marks allotted] Bloom's Levels			Problem Solving type [Marks allotted]			Total Marks
			K			C			A			
1	1	1	1*1	=	1							1
2	2	2	1*1	=	1							1
3	1	1	1*1	=	1							1
4	1	1	1*1	=	1							1
5	1	1	5*1	=	5							5
6	2	2	7*1	=	7							7
7	1	1	7*1	=	7							7
8	1	1	7*1	=	7							7
9	2	2				5*1	=	5				5
10	2	2				5*1	=	5				5
	Total Marks				30			10				40

K =Knowledge Level C = Comprehension Level, A = Application Level

Note: While setting all types of questions the general guideline is that about 60%

Of the questions must be such that even a below average students must be able to attempt, About 20% of the questions must be such that only above average students must be able to attempt and finally 20% of the questions must be such that only the bright students must be able to attempt.

I here certify that All the questions are set as per the above lines Sunil kumar R M]

Annexure- II: Format of Answer Scheme

SCHOOL OF ENGINEERING

SOLUTION

GAIN MORE KNOWLEDGE REACH GREATER HEIGHTS

Semester: 5th sem

Course Code: CSE212

Course Name:

Date: 30/09/2019

Time: 2:30 to 3:30

Max Marks:40

Weightage: 20%

Part A (Q x M = Marks)

Q No	Solution	Scheme of Marking	Max. Time required for each Question
1	**C**	**MCQ**	**2**
2	**D**	**MCQ**	**2**
3	**C**	**MCQ**	**2**
4	**D**	**MCQ**	**2**
5	**V,I,II,III,IV**	**Marks to be given if the answer is right.**	**2**

Part B (Q x M = Marks)

Q No	Solution	Scheme of Marking	Max. Time required for each Question

6	Selection sort Algorithm
	ALGORITHM *SelectionSort*(*A*[0..*n* – 1])
	//Sorts a given array by selection sort
	//Input: An array *A*[0..*n* – 1] of orderable elements
	//Output: Array *A*[0..*n* – 1] sorted in ascending order
	for *i* ← 0 **to** *n* – 2 **do**
	min ← *i*
	for *j* ← *i* + 1 **to** *n* – 1 **do**
	if *A*[*j*] < *A*[*min*] *min* ← *j*
	swap *A*[*i*] and *A*[*min*]
		Definition -2 marks
		Algorithm-4 marks
		Efficiency -1 Marks
			10

7	Asymptotic notations	2 marks each for big O, big omega and big theta(graph and expression) 1 marks for example	10

8	Tower of Honai
	Algorithm
	
	START
	Procedure Hanoi(disk, source, dest, aux)
	
	IF disk == 1, THEN
	move disk from source to dest
	ELSE
	Hanoi(disk - 1, source, aux, dest) // Step 1
	move disk from source to dest // Step 2
	Hanoi(disk - 1, aux, dest, source) // Step 3
	END IF
	
	END Procedure
	STOP
		Definition -2 marks
		Algorithm-4 marks
		Efficiency -1 Marks
			10

Part C (Q x M = Marks)

Q No	**Solution**	**Scheme of Marking**	**Max. Time required for each Question**
9	Travelling Sales Person	Problem definition -1m Problem solution for writing all steps-4m	10
10	Knapsack	Problem definition -1m Problem solution for writing all steps- -4m	10

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SCHOOL OF ENGINEERING

Test – 2

Sem & AY: Odd Sem 2019-2020
Course Code: CSE 212
Course Name: ANALYSIS OF ALGORITHMS
Program &Sem: B.Tech (CSE) & V sem

Date: 18.11.2019
Time: 2.30 PM to 3.30 PM
Max Marks: 40
Weightage: 20%

Instructions:

i. Answer all the questions.

Part A (Memory Recall Questions)

Answer all the Questions. Each Question carries one marks. (9Qx1M=9M)

1. (C.O.NO.3, 4) [Knowledge]

I. Which of the following sorting algorithm is of divide-and-conquer type?
a. Bubble sort b. Insertion sort c. Quick sort d. All of above

II. The running time of quick sort depends on the selection of ----------
a. Selection of pivot elements b. Number of input
c. Number of passes d. Arrangements of the elements

III. The worst case running times of Insertion sort, Merge sort and Quick sort, respectively, are:
a. $\Theta(n \log n)$, $\Theta(n \log n)$ and $\Theta(n^2)$ b. $\Theta(n^2)$, $\Theta(n^2)$ and $\Theta(n \text{ Log } n)$
c. $\Theta(n^2)$, $\Theta(n \log n)$ and $\Theta(n \log n)$ d. $\Theta(n^2)$, $\Theta(n \log n)$ and $\Theta(n^2)$

IV. The complexity of Binary search algorithm is
a. O(n) b. O(log n) c. $O(n^2)$ d. O(n log n)

V. Suppose we have a O(n) time algorithm that finds median of an unsorted array. Now consider a Quick Sort implementation where we first find median using the above algorithm, then use median as pivot. What will be the worst case time complexity of this modified QuickSort.
a. O(n^2 Logn) b. O(n^2) c. O(n Logn Logn) d. O(nLogn)

VI. In the development of dynamic programming the value of an optimal solution is computed in ----------:
a. Top up fashion b. Bottom up fashion c. In any way

VII. The time complexity of computing the transitive closure of a binary relation on a set of n elements is known to be
a. O(nlogn) b. $O(n^{3/2})$ c. $O(n^3)$ d. O(n)

VIII. Which of the following algorithm design technique is used in finding all pairs of shortest distances in a graph?

a. Dynamic programming b. Backtracking

c. Greedy d. Divide and Conquer

IX. What is the time complexity of Floyd–Warshall algorithm to calculate all pair shortest path in a graph with n vertices?

a. O(n^2logn) b. Theta(n^2logn) c. Theta(n^4) d. Theta(n^3)

Part B (Thought Provoking Questions)

Answer all the Questions. Each Question carries seven marks. (3Qx7M=21M)

2. Demonstrate the procedure of merge sort algorithm and apply it to sort the list S, O, R, T, I, N, G in alphabetical order. (C.O.NO.3)[Comprehension]
3. Compute the time efficiency of Binomial Co-efficient algorithm and find Binomial Co-efficient for the value C=6, k=4. (C.O.NO.4)[Comprehension]
4. Demonstrate the procedure to find the solution to the given Knapsack problem using dynamic programming. (C.O.NO.4)[Application]

item	weight	value
1	3	$25
2	2	$20
3	1	$15
4	4	$40
5	5	$50

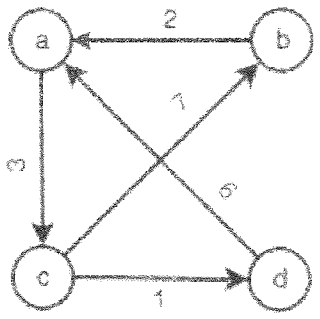
capacity W = 6

Part C (Problem Solving Questions)

Answer the Question. The Question carries ten marks. (1Qx10M=10M)

5. (a) Explain the procedure of dynamic programming and generate the Fibonacci series using that. (C.O.NO.4)[Application]

   (b) Apply Floyd's algorithm for the following weighted digraph to find the shortest path of all pairs. (C.O.NO.4)[Application]



GAIN MORE KNOWLEDGE
REACH GREATER HEIGHTS

SCHOOL OF ENGINEERING

Semester: 5Th

Course Code: CSE212

Course Name: Analysis of algorithms

Date: 18-11-19

Time: 1 Hour

Max Marks: 40

Weightage: 20%

Extract of question distribution [outcome wise & level wise]

Q.NO.	C.O.NO	Unit/Module Number/Unit /Module Title	Memory recall type [Marks allotted] Bloom's Levels			Thought provoking type [Marks allotted] Bloom's Levels			Problem Solving type [Marks allotted]			Total Marks
			K			C			A			
1 to 5	3	III		4	L1							5
5 to 9	4	IV		5	L1							4
10	3	III					7	L2				7
11	4	IV					7	L2				7
12	4	IV					7	L3				7
13(a)	3	III								5	L3	5
13(b)	4	IV								5	L3	5
	Total Marks			9			21			10		40

K =Knowledge Level C = Comprehension Level, A = Application Level

Note: While setting all types of questions the general guideline is that about 60%

Of the questions must be such that even a below average students must be able to attempt, About 20% of the questions must be such that only above average students must be able to attempt and finally 20% of the questions must be such that only the bright students must be able to attempt.

Annexure- II: Format of Answer Scheme

GAIN MORE KNOWLEDGE
REACH GREATER HEIGHTS

SCHOOL OF -ENGINEERRING

SOLUTION

Semester: 5TH

Course Code: CSE 212

Course Name: Analysis of algorithms

Date:

Time: 1 HOUR

Max Marks: 40

Weightage: 20%

Part A (9Q x 1M = 9 Marks)

Q No	Solution	Scheme of Marking	Max. Time required for each Question
Part A	Multi choice 1-c , 2-a, 3-d , 4-d , 5-b , 6-b, 7-c, 8-a, 9-d,	9	**15 Minutes**

Part B (2Q x 7M = 14 Marks)

(1Q x 6M = 6 Marks)

Q No	Solution	Scheme of Marking	Max. Time required for each Question
10	a. Procedure b. Solution & Time complexity	2 5 (4+1)	**11 Minutes**
11	a. Algorithm+ Time complexity b. C(6,4) Solution	3 4	**11 Minutes**

12	a) Procedure b) Solution .	2 5	**9 Minutes**

Part C (1Q x 10M = 10Marks)

Q No	**Solution**	**Scheme of Marking**	**Max. Time required for each Question**
13(a)	DP Procedure Algorithm- Example series	2 2 1	7 Minutes
b)	Procedure of Floyd's problem Solution	1 4	7 Minutes

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SCHOOL OF ENGINEERING

END TERM FINAL EXAMINATION

Semester: Odd Sem. 2019-20 | **Date**: 26 December 2019

Course Code: CSE 212 | **Time**: 9:30 AM to 12:30 PM

Course Name: ANALYSIS OF ALGORITHMS | **Max Marks**: 80

Program & Sem: B.Tech (CSE) & V | **Weightage**: 40%

Instructions:

(i) Answer all questions.

Part A [Memory Recall Questions]

Answer all the Questions. Each Question carries 4 marks. (5Qx4M=20M)

1. Explain the concept of various asymptotic notations, with examples? (C.O.No.1) [Knowledge]
2. Define Master theorem and Calculate the time complexity for the given recurrence relation.
   a. $T(n)= 4T(n/2)+n^2$
   b. $T(n)=4T(n/2) + n^3$
   c. $T(n)=4T(n/2)+n$ (C.O.No.3) [Knowledge]
3. Define sequential search with an example. Calculate the time efficiency.

   (C.O.No.2) [Knowledge]
4. Define decision tree? Obtain the decision tree for 3 numbers to sort the elements using Insertion Sort. (C.O.No.5) [Knowledge]
5. Explain Krushkal's algorithm. (C.O.No.4) [Knowledge]

Part B [Thought Provoking Questions]

Answer all the Questions. Each Question carries 10 marks. (3Qx10M=30M)

6. Explain with example a sorting algorithm that uses divide and conquer technique which Splits the problem size by considering position. Give the corresponding algorithms an analyze the time complexity. (C.O.No.3) [Comprehension]

GAIN MORE KNOWLEDGE
REACH GREATER HEIGHTS

SCHOOL OF ENGINEERING

Semester: Odd Semester : 2019-20
Course Code: CSE 212
Course Name: Analysis of Algorithms
Program & Sem: B.TECH & 5th

Date: 26 December 2019
Time: 9:30 AM to 12:30 PM
Max Marks: 80
Weightage: 40%

Extract of question distribution [outcome wise & level wise]

Q.NO.	C.O.NO	Unit/Module Number/Unit /Module Title	Memory recall type [Marks allotted] Bloom's Levels			Thought provoking type [Marks allotted] Bloom's Levels			Problem Solving type [Marks allotted]			Total Marks
			K			C			A			
1	CO1	Module 1	4	K								20 Marks
2	CO3	Module 3	4	K								
3	CO2	Module 2	4	K								
4	CO5	Module 5	4	K								
5	CO4	Module 4	4	K								
6	CO3	Module 3				10	C					30 Marks
7	CO4	Module 4				10	C					
8	CO5	Module 5							10	A		
9	CO4	Module 4				10	C					30 Marks
10	CO4	Module 4				10	C					
11	CO3	Module 3				10	C					
	Total Marks		20			50			10			80 Marks

GAIN MORE KNOWLEDGE
REACH GREATER HEIGHTS

SCHOOL OF ENGINEERING

SOLUTION

Semester: 5TH

Course Code: CSE 212

Course Name: Analysis of Algorithms

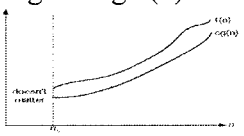
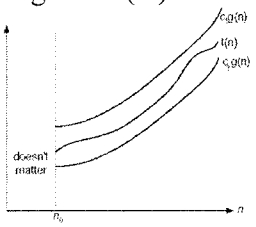
Date: 26 December 2019

Time: 3 Hour

Max Marks: 80

Weightage: 40%

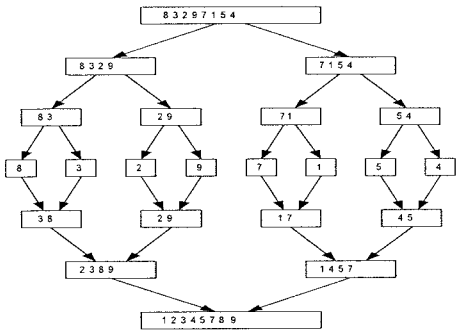
Part A (5Qx4=20 Marks)

No	Solution	Scheme of Marking	Max. Time required for each Question
1	Asymptotic Notations types: 3 types are: 1. Big Oh(O)  • O($g(n)$): class of functions $f(n)$ that grow no faster than $g(n)$ • t(n)<=c*g(n), where c>0 and n>=1 2. Big Omega (Ω)  • Ω($g(n)$): class of functions $f(n)$ that grow at least as fast as $g(n)$ • t(n)>=c*g(n), where c>0 and n>=1 3. Big Theta(Θ) 	1*3=3	15 Minutes

	Applications: • minimum spanning tree (MST) • single-source shortest paths • simple scheduling problems • Huffman codes	1	

	ALGORITHM Prim(G) //Prim's algorithm for constructing a minimum spanning tree
	//Input: A weighted connected graph $G = \_ V, E \_$
	//Output: ET, the set of edges composing a minimum spanning tree of G
	$VT \leftarrow \{ v\ 0\}$ //the set of tree vertices can be initialized with any vertex
	$ET \leftarrow$NULL
	for $i \leftarrow 1$ to $\lvert V \rvert - 1$ do
	find a minimum-weight edge $e^* = (v^*, u^*)$ among all the edges (v, u)
	such that v is in VT and u is in $V - VT$
	$VT \leftarrow VT \cup \{ u^*\}$
	$ET \leftarrow ET \cup \{ e^*\}$
	return ET.
		6	

	Time efficieny is $O(n^2)$ for weight matrix representation of graph and array implementation of priority queue O(m log n) for adjacency lists representation of graph with n vertices and m edges and min-heap implementation of the priority queue	2	
8	Definition for Backtracking: A given problem has a set of constraints and possibly an objective function. Algorithm State space tree for 4 Queens problem	1 4 5	20 Minutes

7	1. Divide instance of problem into two or more smaller instances 2. Solve smaller instances recursively 3. Obtain solution to original (larger) instance by combining these solutions Any Example Sorting the elements in tree structure  	2 1 7	20 Minutes