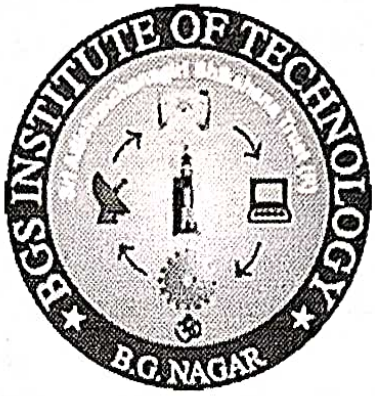
||Jai Sri Gurudev||

B G S INSTITUTE OF TECHNOLOGY

BG Nagara-571448, Mandya

Department of Computer Science and Engineering



COURSE FILE

Course Coordinator	:	Swetha K R
Designation	:	Assistant Professor
Course Name	:	Design and Analysis of Algorithms
Course Code	:	17CS43
Academic Year	:	2018-2019
For the period	:	01/02/2019 to 23/05/2019

Swetha KR

Signature of Course Coordinator

Signature of HOD

H O D
Dept. of Computer Science & Engg.
B.G.S. Institute of Technology,
B.G. Nagar - 571 448,
Nagamangala Tq, Mandya Dist
Karnataka (INDIA)

CONTENTS

Shalini

H O D
Dept. of Computer Science & Engg
B.G.S. Institute of Technology
B.G. Nagar - 571 448.
Nagamangala Tq, Mandya Dist
Karnataka (INDIA)

B G S Institute of Technology

BG Nagara-571448, Mandya

VISION

BGSIT is committed to the cause of creating tomorrow's engineers by providing quality education inculcating ethical values

MISSION

- Imparting quality technical education by nurturing a conducive learning environment.
- Offering professional training to meet industry requirements.
- Providing education with a moral - cultural base and spiritual touch

DEPARTMENT

OF

COMPUTER SCIENCE AND ENGINEERING

VISION

To produce engineers by possessing good technical knowledge and ethics through quality education and research.

MISSION

M1: Achieve excellence by providing good infrastructure and competent faculty.

M2: Strengthening the technical, soft skills, leadership qualities and ethical values to meet the industry requirements.

M3: Facilitate experimental learning through research projects

HOD
Dept. of Computer Science & Engg.
B.G.S. Institute of Technology
B.G. Nagar - 571 448.
Nagamangala Tq, Mandya Dist
Karnataka (INDIA)

PROGRAM OUTCOMES (POs)

1. **Engineering knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
2. **Problem analysis:** Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
3. **Design/development of solutions:** Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
4. **Conduct investigations of complex problems:** Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
5. **Modern tool usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
6. **The engineer and society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
7. **Environment and sustainability:** Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
8. **Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
9. **Individual and team work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
10. **Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
11. **Project management and finance:** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
12. **Life-long learning:** Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change

HOD
Dept. of Computer Science & Engg.
B.G.S. Institute of Technology.
B.G. Nagar - 571 448.
Nagamangala Tq, Mandya Dist
Karnataka (INDIA)

PROGRAM EDUCATIONAL OBJECTIVES (PEOs)

PEO 1: Graduates will be pursuing successful career and higher education.

PEO 2: Graduates will be able to apply the knowledge of programming skills to solve the real-world problems.

PEO 3: Graduates will display professional ethics to work in a team and lead the team by effectively communicating the ideas.

PEO 4: Graduates will practice lifelong learning.

PROGRAM SPECIFIC OUTCOMES (PSOs)

PSO 1: Ability to apply Mathematical Methodologies, Management Principles and Ethics, Electronics and Embedded Systems and Programming Technologies to solve real time problems.

PSO 2: Ability to apply software design and development practices to develop software in emerging areas such as Internet of Things, Data Management, Social Networking and Security, Cloud and High-Performance Computing.

Shalini

H O D
Dept. of Computer Science & Engg
B.G.S. Institute of Technology
B.G. Nagar - 571 448.
Nagamangala Tq, Mandya Dist
Karnataka (INDIA)

Revised Academic Calendar of VTU, Belagavi for EVEN Semester of 2018-2019 (Feb 2019 – July 2019)

	II Sem B. E. / B. Tech. / B. Arch	IV & VI Sem B. E. /B. Tech. IV, VI,VIII Sem B. Arch.	VIII Sem B.E / B.Tech & X Sem B. Arch	IV Sem MCA	VI Sem MCA	IV Sem MBA	IV Sem M. Tech.	IV Sem M. Arch.	II Sem M. Tech.	II Sem MCA	II Sem MBA	II Sem M. Arch.
Commencement of EVEN Semester	25.02.2019	01.02.2019	01.02.2019	01.02.2019	01.02.2019	18.02.2019	28.12.2018	01.02.2019	01.03.2019	01.03.2019	25.02.2019	25.02.2019
Last Working day of EVEN Semester	17.06.2019	23.05.2019	23.05.2019	18.05.2019	18.05.2019	01.06.2019	13.04.2019	18.05.2019	21.06.2019	21.06.2019	17.06.2019	17.06.2019
Practical Examination	19.06.2019 To 29.06.2019	27.05.2019 To 07.06.2019	-	21.05.2019 To 25.05.2019	-	-	-	-	24.06.2019 To 29.06.2019	24.06.2019 To 29.06.2019	-	-
Theory Examinations	01.07.2019 To 16.07.2019	10.06.2019 To 16.07.2019	27.05.2019 To 07.06.2019	27.05.2019 To 15.06.2019	-	03.06.2019 To 28.06.2019	27.05.2019 To 31.05.2019	-	01.07.2019 To 12.07.2019	01.07.2019 To 12.07.2019	20.06.2019 To 04.07.2019	20.06.2019 To 04.07.2019
Viva Voce		-	11.06.2019 To 17.06.2019	-	-	-	-	-	-	-	-	-
Summer Project / Professional training /	-	-	-	-	20.05.2019 To 29.05.2019 [Submission of report to VTU]	01.04.2019 To 15.04.2019 [Submission of report to VTU]	03.06.2019 To 18.06.2019 [Submission of report to VTU]	-	-	-	-	-
Commencement of ODD Semester	22.07.2019	22.07.2019	-	22.07.2019	-	-	-	-	26.08.2019	22.07.2019	08.08.2019	22.07.2019

NOTE

1. College Time Table shall be arranged for five and a half week days and planned to accommodate EDUSAT transmission slots, the schedule of which will be notified separately.
2. The faculty/staff shall be available to undertake any work assigned by the university.
3. If any of the above date is declared to be a holiday then the corresponding event will come into effect on the next working day.
4. Notification regarding Calendar of Events relating to the conduct of University Examination will be issued by the Registrar (Evaluation) from time to time

REGISTRAR

HOD
Dept. of Computer Science & Engg.
B.G.S. Institute of Technology,
B.G. Nagar - 571 448.
[illegible] Tq. Mandya Dist

II Jai Sri Gurudev II

Sri Adichunchanagiri Shikshana Trust (R.)

BGS INSTITUTE OF TECHNOLOGY

B G Nagara, Nagamangala Taluk, Mandya District, Karnataka State, INDIA - 571448

CALENDAR OF EVENTS FOR THE ACADEMIC YEAR 2018 - 2019 (EVEN SEMESTER) 1yr BE, MBA & MTech

Week No.	Month	Week Days							Working Days			Events
		Mon	Tue	Wed	Thu	Fri	Sat	Sun	BE	MBA	M Tech	
1	Feb-19					1	2	3				
2	Feb-19	4	5	6	7	8	9	10				
3	Feb-19	11	12	13	14	15	16	17	6			11th - Registration and Commencement of 2nd Sem BE, 11th to 23rd Induction Training Program
4	Feb-19	18	19	20	21	22	23	24	6			11th to 23rd Induction Training Program
5	Feb/Mar-19	25	26	27	28	1	2	3	6	2	2	1st - Registration and Commencement of 2nd Sem MBA / MTech
6	Mar-19	4	5	6	7	8	9	10	5	5	5	4th - Mahashivarathri, 5th to 7th - VTU Kho-Kho Mysore Zone
7	Mar-19	11	12	13	14	15	16	17	6	6	6	14th and 15th - AATA 2K19
8	Mar-19	18	19	20	21	22	23	24	6	6	6	
9	Mar-19	25	26	27	28	29	30	31	6	6	6	28th, 29th and 30th Test One for 2nd Sem BE, 30th - Ethnic Day
10	Apr-19	1	2	3	4	5	6	7	5	5	5	3rd, 4th and 5th Test One for 2nd Sem MBA / Mtech, 6th - Ugadi
11	Apr-19	8	9	10	11	12	13	14	6	6	6	
12	Apr-19	15	16	17	18	19	20	21	4	4	4	16th - Prajwalana, 17th - Mahaveer Jayanthi, 19th - Good Friday
13	Apr-19	22	23	24	25	26	27	28	6	6	6	27th, 29th and 30th Test Two for 2nd Sem BE
14	Apr/May-19	29	30	1	2	3	4	5	5	5	5	1st - May Day, 2nd, 3rd and 4th - Test Two for 2nd Sem MBA / MTech
15	May-19	6	7	8	9	10	11	12	5	5	5	7th - Basava Jayanthi
16	May-19	13	14	15	16	17	18	19	6	6	6	
17	May-19	20	21	22	23	24	25	26	6	6	6	
18	May/Jun-19	27	28	29	30	31	1	2	6	6	6	30th, 31st and 1st Test Three for 2nd Sem BE
19	Jun-19	3	4	5	6	7	8	9	5	5	5	3rd, 4th and 6th - Test Three for 2nd Sem MBA / Mtech, 5th - Kuthub - A - Ramjan, 8th - Last Working Day for 2nd Sem BE
20	Jun-19	10	11	12	13	14	15	16	95	6	6	12th - Commencement of Partical Examination for 2nd Sem BE, 15th - Last Working Day for 2nd Sem MBA / MTech
21	Jun-19	17	18	19	20	21	22	23		85	85	17th - Commencement of Pratical Examination for 2nd Sem MTech
22	Jun-19	24	25	26	27	28	29	30				24th - Commencement of Theory Examination for 2nd Sem BE / MBA /MTech
23	Jul-19	1	2	3	4	5	6	7				
24	Jul-19	8	9	10	11	12	13	14				

Meetings | Holidays | Test | Commencement of EVEN Semester | Registration, Examinations & Last Working Day

Commencement of ODD Semester Classes for BE, MBA & M Tech on 1ST August 2019

BGSIT IS DEDICATED TO CREATE TOMORROW'S ENGINEERS BY PROVIDING QUALITY ENGINEERING EDUCATION WITH HUMAN VALUES

Dr. T. Mahadevaiah
Academic Incharge

Dr. B. K. Narendra
Principal

|| Jai Sri Gurudev||

B G S INSTITUTE OF TECHNOLOGY, B G NAGARA - 571448

DEPARTMENT OF COMPUTER SCEINCE & ENGINEERING

INDIVIDUAL TIME TABLE

ACADEMIC YEAR : 2018-2019
Name of the Course Coordinator: SWETHA K R
CLASS : IV 'A', 'B'

EVEN SEMESTER
LECTURE HALL: 210

DAY	9:00 am to 9:55 am	9:55 am to 10:50 am	10:50 am to 11:00 am	11:00 am to 11:55 am	11:55 am to 12:50 pm	12:50 pm to 01:45 pm	01:45 pm to 02:40 pm	02:40 pm to 03:35 pm	03:35 pm to 04:30 pm
MONDAY	DAA(B)		TEA BREAK			LUNCH BREAK	DAA(B)	<---DAA LAB A1--->	
TUESDAY		DAA LAB A2		<---DAA LAB A2--->			DAA(A)		
WEDNESDAY		DAA(A)		DAA(B)			<---DAA LAB A3--->		
THURSDAY	DAA(A)			DAA(B)	DAA(A)				
FRIDAY		DAA(A)			DAA(B)				
SATURDAY									

CODE	SUBJECT	STAFF
17CS43	Design and analysis of algorithms	Swetha K R

Swetha K R

Signature of Course Coordinator

Signature of HoD

H O D
Dept. of Computer Science & Engg.
B G.S. Institute of Technology,
B.G. Nagar - 571 448.
Nagamangala Tq. Mandya Dist
Karnataka (INDIA)

DESIGN AND ANALYSIS OF ALGORITHMS

[As per Choice Based Credit System (CBCS) scheme]

(Effective from the academic year 2017 -2018)

SEMESTER – IV

Subject Code	17CS43	IA Marks	40
Number of Lecture Hours/Week	04	Exam Marks	60
Total Number of Lecture Hours	50	Exam Hours	03

CREDITS – 04

Module 1	Teaching Hours
Introduction: What is an Algorithm? **(T2:1.1)**, Algorithm Specification **(T2:1.2)**, Analysis Framework **(T1:2.1)**, **Performance Analysis**: Space complexity, Time complexity **(T2:1.3)**. **Asymptotic Notations:** Big-Oh notation (O), Omega notation (Ω), Theta notation (Θ), and Little-oh notation (o), Mathematical analysis of Non-Recursive and recursive Algorithms with Examples **(T1:2.2, 2.3, 2.4)**. **Important Problem Types:** Sorting, Searching, String processing, Graph Problems, Combinatorial Problems. **Fundamental Data Structures:** Stacks, Queues, Graphs, Trees, Sets and Dictionaries. **(T1:1.3,1.4)**	**10 Hours**
Module 2	
Divide and Conquer: General method, Binary search, Recurrence equation for divide and conquer, Finding the maximum and minimum **(T2:3.1, 3.3, 3.4)**, Merge sort, Quick sort **(T1:4.1, 4.2)**, Strassen's matrix multiplication **(T2:3.8)**, Advantages and Disadvantages of divide and conquer. **Decrease and Conquer Approach:** Topological Sort. **(T1:5.3)**	**10 Hours**
Module 3	
Greedy Method: General method, Coin Change Problem, Knapsack Problem, Job sequencing with deadlines **(T2:4.1, 4.3, 4.5)**. **Minimum cost spanning trees:** Prim's Algorithm, Kruskal's Algorithm **(T1:9.1, 9.2)**. **Single source shortest paths:** Dijkstra's Algorithm **(T1:9.3)**. **Optimal Tree problem:** Huffman Trees and Codes **(T1:9.4)**. **Transform and Conquer Approach:** Heaps and Heap Sort **(T1:6.4)**.	**10 Hours**
Module 4	
Dynamic Programming: General method with Examples, Multistage Graphs **(T2:5.1, 5.2)**. **Transitive Closure:** Warshall's Algorithm, **All Pairs Shortest Paths:** Floyd's Algorithm, Optimal Binary Search Trees, Knapsack problem **((T1:8.2, 8.3, 8.4)**, Bellman-Ford Algorithm **(T2:5.4)**, Travelling Sales Person problem **(T2:5.9)**, Reliability design **(T2:5.8)**.	**10 Hours**
Module 5	
Backtracking: General method **(T2:7.1)**, N-Queens problem **(T1:12.1)**, Sum of subsets problem **(T1:12.1)**, Graph coloring **(T2:7.4)**, Hamiltonian cycles **(T2:7.5)**. **Branch and Bound:** Assignment Problem, Travelling Sales Person problem **(T1:12.2)**, **0/1 Knapsack problem (T2:8.2, T1:12.2):** LC Branch and Bound solution **(T2:8.2)**, FIFO Branch and Bound solution **(T2:8.2)**. **NP-Complete and NP-Hard problems:** Basic concepts, non-deterministic algorithms, P, NP, NP-Complete, and NP-Hard classes **(T2:11.1)**.	**10 Hours**
Course Outcomes: After studying this course, students will be able to	
• Describe computational solution to well known problems like searching, sorting etc. • Estimate the computational complexity of different algorithms.	

HOD
Dept. of Computer Science & Engg.
B G.S. Institute of Technology,
B G Nagar 571 448
Nagamangala Tq Mandya Dist

• Develop an algorithm using appropriate design strategies for problem solving.
Question paper pattern:
The question paper will have ten questions. There will be 2 questions from each module. Each question will have questions covering all the topics under a module. The students will have to answer 5 full questions, selecting one full question from each module.
Text Books:
T1. Introduction to the Design and Analysis of Algorithms, Anany Levitin:, 2rd Edition, 2009. Pearson. T2. Computer Algorithms/C++, Ellis Horowitz, Satraj Sahni and Rajasekaran, 2nd Edition, 2014, Universities Press
Reference Books:
1. Introduction to Algorithms, Thomas H. Cormen, Charles E. Leiserson, Ronal L. Rivest, Clifford Stein, 3rd Edition, PHI 2. Design and Analysis of Algorithms , S. Sridhar, Oxford (Higher Education)

Shalini

H O D
Dept. of Computer Science & Engg.
B.G.S. Institute of Technology
B.G. Nagar - 571 448
Nagamangala Tq. Mandya Dist
Karnataka (INDIA)

||Jai Sri Gurudev||

BGS INSTITUTE OF TECHNOLOGY, B G NAGAR

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

COURSE OUTCOMES AND CO-PO MAPPING

Course Coordinator: Swetha K R
Sem & Sec: IV & 'A'
Academic Year: 2018-2019
COURSE CODE: 17CS43
COURSE NAME: DESIGN AND ANALYSIS OF ALGORITHMS

CO1	Determine and explore the asymptotic run time complexity of algorithm by using Mathematical Relation between Recursive and Non recursive functions
CO2	Analyze the time complexities using Divide and Conquer approach for various problems
CO3	Apply the decrease and conquer approach to solve various problems
CO4	Apply the greedy & dynamic programming technique to solve various problems
CO5	Apply back tracking, Branch and Bound techniques to solve various problem
PSO1	Ability to apply Mathematical Methodologies, Management Principles and Ethics, Electronics and Embedded Systems and Programming Technologies to solve real time problems.
PSO2	Ability to apply software design and development practices to develop software in emerging areas such as Internet of Things, Data Management, Social Networking and Security, Cloud and High-Performance Computing.

CO/PO'S	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	1										3	
CO2	2	3	1		2								3	
CO3	2	3	1		2								3	
C04	2	3	1		2								3	
CO5	2	3	1		2								3	
AVG	2.2	2.8	1		2								3	

Sample:

CO-PO MAP	MAPPED VALUE	REASON
CO1-PO1	3	The asymptotic notation problems can be solved using engineering knowledge.
CO1-PO2	2	Solve the problems by analysing the recursive and non-recursive functions. To solve the complex problems.
CO1-PO3	1	apply the different approaches to solve the problems
CO1-PSO1	3	Able to learn programming technologies to solve real time problems.
CO2-PO1	2	Sorting problems can be solved using engineering knowledge
CO2-PO2	3	Sorting problems can be analysed and to calculate the time efficiency of the algorithm.
CO2-PO3	1	Students can apply the divide and conquer technique to solve the problems
CO2-PO5	2	Divide and conquer technique can be applied to solve the sorting problems.
CO2-PSO1	3	Able to learn divide and conquer techniques to solve real time problems.
CO3-PO1	2	Strassen's matrix multiplication can be solved using mathematical equation
CO3-PO2	3	Searching problem can be analysed and to calculate the time efficiency of the algorithm

HOD
Dept. of Computer Science & Engg.
B.G.S. Institute of Technology,
B.G. Nagar - 571 448.
Nagamangala Tq, Mandya Dist
Karnataka (INDIA)

CO3-PO3	1	Students can solve the sorting and searching problems
CO3-PO5	2	Binary search problem can be solved using decrease and conquer technique
CO3-PSO1	3	Able to learn to solve sorting and searching problems.
CO4-PO1	2	To find the shortest path using prims algorithm can be solved using mathematical equation.
CO4-PO2	3	Shortest path problems can be calculate the time efficiency of the algorithm
CO4-PO3	1	Students can solve the different types of algorithms to find out shortest paths
CO4-PO5	2	Greedy technique can be applied to solve shortest path problems.
CO4-PSO1	3	Able to learn to solving the problems.
CO5-PO1	2	Multistage graph problem can be solved using mathematical equation. Back tracking problems can be solved using mathematical equation.
CO5-PO2	3	Analyse the warshal's and Floyd's algorithm and to compute efficiency of an algorithm
CO5-PO3	1	Students can solve the different types of algorithms to find out shortest path and backtracking method
CO5-PO5	2	Dynamic programming technique can be applied to solve overlapping sub problems. Analyse the n-queens problem to solve back tracking method. Apply the backtracking techniques to solve the problem
CO5-PSO1	3	Able to learn to solving the problems.

Signature of Course Coordinator **Signature of Reviewer** **Signature of HOD**

H O D
Dept. of Computer Science & Engg
B.G.S. Institute of Technology,
B.G. Nagar - 571 448
Nagamangala Tq, Mandya Dist
Karnataka (INDIA)

15CS43

Fourth Semester B.E. Degree Examination, Dec.2017/Jan.2018
Design and Analysis of Algorithms

Time: 3 hrs. Max. Marks: 80

Note: Answer any FIVE full questions, choosing one full question from each module.

Module-1

1 a. Define an algorithm. Discuss the criteria of an algorithm with an example. **(06 Marks)**

b. Prove that : If $t_1(n) \in O(g_1(n))$ and $t_2(n) \in O(g_2(n))$ then
$t_1(n) + t_2(n) \in O(\max\{g_1(n), g_2(n)\})$ **(06 Marks)**

c. Explain the two common ways to represent a graph with an example **(04 Marks)**

OR

2 a. Consider the following algorithm
Algorithm GUESS (A[ ][ ])
for i ← 0 to n – 1
  for j ← 0 to i
    A [i] [j] ← 0
  i) What does the algorithm compute?
  ii) What is basic operation?
  iii) What is the efficiency of this algorithm? **(03 Marks)**

b. List and explain important problem types that are solved by computer. **(07 Marks)**

c. Design an algorithm for checking whether all elements in a given array are distinct or not. Derive its worst complexity. **(06 Marks)**

Module-2

3 a. Explain divide and conquer technique. Write a recursive algorithm for finding the maximum and minimum element from a list. **(08 Marks)**

b. Apply quick sort to sort the list E, X, A, M, P, L, E in alphabetical order. Draw the tree of the recursive calls made. **(08 Marks)**

OR

4 a. Discuss Strassen's matrix multiplication and derive its time complexity. **(08 Marks)**

b. Design merge sort algorithm and discuss its best-case, average-case and worst-case efficiency. **(08 Marks)**

Module-3

5 a. Solve the greedy knapsack problem where
m = 10, n = 4, P = (40, 42, 25, 12), W = (4, 7, 5, 3). **(06 Marks)**

b. What is job sequencing with deadlines problem? Let n = 5, profits [10, 3, 33, 11, 40] and deadlines [3, 1, 1, 2, 2] respectively. Find the optimal solution using greedy algorithm. **(05 Marks)**

c. Define minimum cost spanning tree (MST). Write Prim's algorithm to construct minimum cost spanning tree. **(05 Marks)**

Shalini

HOD
Dept. of Computer Science & Engg.
B.G.S. Institute of Technology,
B.G. Nagar - 571 448.
Nagamangala Tq, Mandya Dist
Karnataka (INDIA)

OR

6 a. Design Dijkstra's algorithm and apply the same to find the single source shortest path for graph taking vertex 'a' as source of Fig. Q6(a). **(08 Marks)**

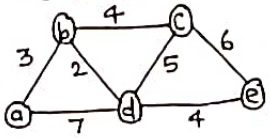


Fig. Q6(a)

b. Construct a Huffman code for the following data :

Character	A	B	C	D	-
Probability	0.4	0.1	0.2	0.15	0.15

Encode the text ABACABAD and decode the text 100010111001010, using the above code. **(04 Marks)**

c. Construct the heap for the list 2, 9, 7, 6, 5, 8 by the bottom-up algorithm. **(04 Marks)**

Module-4

7 a. Define transitive closure. Write Warshall's algorithm to compute transitive closure. Find its efficiency. **(08 Marks)**

b. Apply Floyd's algorithm to find all pair shortest path for the graph of Fig. Q7(b). **(08 Marks)**

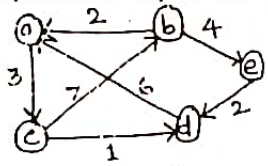
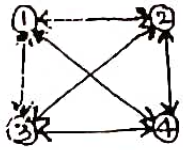


Fig. Q7(b)

OR

8 a. For the given cost matrix, obtain optimal cost tour using dynamic programming. **(08 Marks)**



$$\begin{bmatrix} 0 & 10 & 15 & 20 \\ 5 & 0 & 9 & 10 \\ 6 & 13 & 0 & 12 \\ 8 & 8 & 9 & 0 \end{bmatrix}$$

Fig. Q8(a)

b. Write a pseudocode to find an optimal binary search tree by dynamic programming. **(08 Marks)**

Module-5

9 a. Write the pseudocode for backtracking algorithm. Let w = {3, 5, 6, 7} and m = 15. Find all possible subsets of w that sum to m. Draw the state space tree that is generated. **(09 Marks)**

b. Draw the portion of the state space tree for m – colorings of a graph when n = 4 and m = 3. **(07 Marks)**

OR

10 a. With the help of a state space tree, solve the Travelling Salesman Problem (TSP) of Fig.Q10(a), using branch-and-bound algorithm. **(08 Marks)**

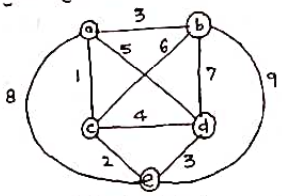


Fig. Q10(a)

b. Explain the classes of NP – Hard and NP – complete. **(08 Marks)**

CBCS Scheme

USN | | | | | | | | | | |

15CS43

Fourth Semester B.E. Degree Examination, June/July 2017
Design and Analysis of Algorithms

Time: 3 hrs. Max. Marks: 80

Note: Answer FIVE full questions, choosing one full question from each module.

Module-1

1 a. Define algorithm. Explain asymptotic notations, Big O, big Omega, big theta notations. **(08 Marks)**

b. Explain general plan of mathematical analysis of nonrecursive algorithms with example. **(08 Marks)**

OR

2 a. Define time and space complexity. Explain important problem types. **(08 Marks)**

b. Illustrate mathematical analysis of recursive algorithm for towers of hanoi. **(08 Marks)**

Module-2

3 a. Explain concept of divide and conquer. Write merge sort algorithm. **(08 Marks)**

b. Write a recursive algorithm for binary search and also bring out its efficiency. **(08 Marks)**

OR

4 a. Illustrate the tracing of quick sort algorithm for the following set of numbers:
25, 10, 72, 18, 40, 11, 64, 58, 32, 9 **(08 Marks)**

b. List out the advantages and disadvantages of divide and conquer method and illustrate the topological sorting for the following graph.

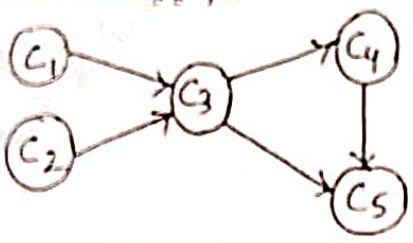


Fig.Q4(b) **(08 Marks)**

Module-3

5 a. Explain Greedy criterion. Write a Prim's algorithm to find minimum cost spanning tree. **(08 Marks)**

b. Sort the given list of numbers using heap sort: 2, 9, 7, 6, 5, 8. **(08 Marks)**

OR

6 a. Write an algorithm to find single source shortest path. **(08 Marks)**

b. Construct a Huffman tree and resulting code word for the following:

Character	A	B	C	D	-
Probability	0.35	0.1	0.2	0.2	0.15

Encode the words DAD and ADD. **(08 Marks)**

HOD
Dept. of Computer Science & Engg
[illegible] Institute of Technology
B.G. Nagar - 571 448.
Nagamangala Tq, Mandya Dist
Karnataka (INDIA)

Module-4

7 a. Explain the concept of dynamic programming, with example. **(08 Marks)**

b. Trace the following graph using Warshall's algorithm.

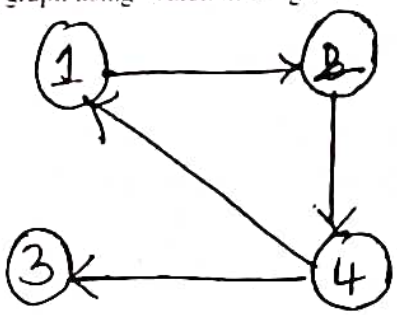


Fig.Q7(b) **(08 Marks)**

OR

8 a. Explain Multistage graphs with example. Write multistage graph algorithm to forward approach. **(08 Marks)**

b. Solve the following instance of Knapsack problem using dynamic programming. Knapsack capacity is 5.

Item	Weight	Value
1	2	$12
2	1	$10
3	3	$20
4	2	$15

(08 Marks)

Module-5

9 a. Explain backtracking concept. Illustrate N queens problem using backtracking to solve 4-Queens problem. **(08 Marks)**

b. Solve subset sum problem for the following example, s = {3, 5, 6, 7} and d = 15. Construct a state space tree. **(08 Marks)**

OR

10 a. Explain the concept of branch and bound and solve assignment problem for the following and obtain optimal solution.

		Job1	Job2	Job3	Job4
Person	a	9	2	7	8
	b	6	4	3	7
	c	5	8	1	8
	d	7	6	9	4

(08 Marks)

b. Explain LC Branch and Bound and FIFO branch and bound. **(08 Marks)**

* * * * *

Module-3

5 a. Explain the concept of greedy technique for Prim's algorithm. Obtain a minimum cost spanning tree for the graph shown in Fig.Q5(a). **(08 Marks)**

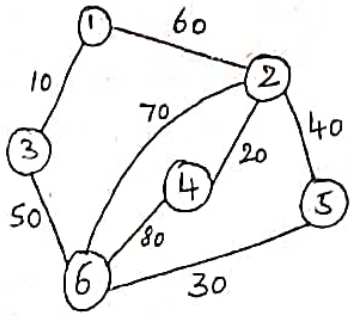


Fig.Q5(a)

b. Solve the below instance of the single source shortest path problem with vertex 6 as the source. With the help of a suitable algorithm. **(08 Marks)**

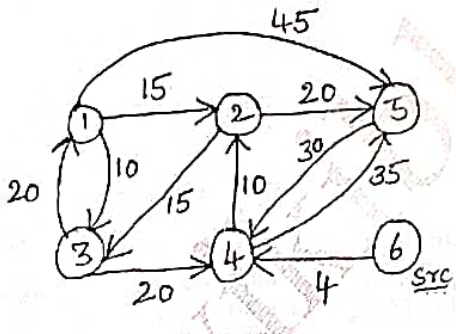


Fig.Q5(b)

OR

6 a. What are Huffman trees? Explain. Construct a Huffman code for the following data :

Character	A	B	C	D	E	–
Probability	0.5	0.35	0.5	0.1	0.4	0.2

Encode DAD_CBE using Huffman encoding. **(08 Marks)**

b. Explain transform and conquer technique. Sort the below list using Heap sort : 3, 2, 4, 1, 6, 5. **(08 Marks)**

Module-4

7 a. Define transitive closure of a graph. Write Warshall's algorithm to compute transitive closure of a directed graph. Apply the same on the graph defined by the following adjacency matrix :

$$R = \begin{bmatrix} 0 & 1 & 0 & 0 \\ 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 1 \\ 0 & 0 & 0 & 0 \end{bmatrix}.$$

(08 Marks)

b. Using Dynamic programming, solve the below instance of knapsack problem. **(08 Marks)**

Item	Weight	Value
1	2	12
2	1	10
3	3	20
4	2	15

Capacity w = 5

HOD
Dept. of Computer Science & Engg
B.G.S. Institute of Technology
Nagamangala Tq, Mandya Dist
Karnataka (INDIA)

OR

8 a. Obtain a optimal binary search tree for the following four–key set. **(08 Marks)**

Key	A	B	C	D
Probability	0.1	0.2	0.4	0.3

b. Solve the following travelling sales person problem represented as a graph shown in Fig.Q8(b), using dynamic programming. **(08 Marks)**

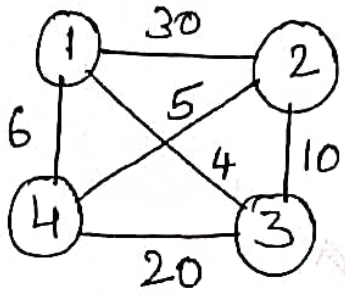


Fig.Q8(b)

Module-5

9 a. What is the central principle of backtracking? Apply backtracking to solve the below instance of sum of subset problem
S = {5, 10, 12, 13, 15, 18} d = 30. **(08 Marks)**

b. Solve the below instance of assignment problem using branch and bound algorithm.

$$C = \begin{array}{c} \begin{matrix} Job_1 & Job_2 & Job_3 & Job_4 \end{matrix} \\ \begin{bmatrix} 9 & 2 & 7 & 8 \\ 6 & 4 & 3 & 7 \\ 5 & 8 & 1 & 8 \\ 7 & 6 & 9 & 4 \end{bmatrix} \end{array} \begin{matrix} \\ \text{Person a} \\ \text{Person b} \\ \text{Person c} \\ \text{Person d} \end{matrix}$$

(08 Marks)

OR

10 a. Draw the state-space tree to generate solutions to 4-Queen's problem. **(04 Marks)**

b. Apply backtracking to the problem of finding a Hamiltonian circuit in the graph shown below: **(04 Marks)**

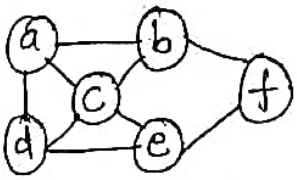


Fig.Q10(a)

c. Define the following :
i) Class P
ii) Class NP
iii) NP complete problem
iv) NP hard problem. **(08 Marks)**

Design And Analysis Of Algorithms

Question Bank

Sub. Name: DAA **Sub. Code: 17CS43** **Section: A & B**

****

(1) Solve the following recurrences. Assume.
T (1) = and T (3) = 1

(i) $T(n) = T(n/2) + T(n/3) + n$

(ii) $T(n) = 3T(n^{1/3}) + \log_3 n$

(2) What is time complexity of counting sort? Sort 1 9 3 3 4 5 6 7 7 8 by counting sort.

(3) Design an algorithm to find the sum of smallest $\log_2 n$ elements in an unsorted array of n distinct element in $o(n)$ time.

(4) Solve the following recurrences :
(i) $T(n) = T(\alpha .n) + T((1-\alpha)n) + n 0 < \alpha < 1$
(ii) $T(n) = T(9n/10) + n$.

(5)What is the running time of heap sort on an array A of length n that is already sorted in increasing order?

(6) Show that for any real constant a and b where b>0, $(n+a)^b = q(n)^b$

(7)Explain how can we modify almost any algorithm to have a good best case running time?

(8) Can the Master method be applied to solve recurrence

$T(n) = 4T(n/2) + n^2 \log n$? why or why not?

(9) How can you adapt 'Quick sort' algorithm to find the m^{th} order statistics in a given list of size n?

10. Write the pseudo code for the pity algorithm.
11. Find the complexity of the following recurrence relation.
12. Solve the following recurrence:
T(1)=1

$T(n)=4T(n/3)+n^2$ for n>=2

$T(n)=O(n^2)$

13. Give an algorithm to count the number of leaf node in a binary tree t. What is its computing time.
14. What do you mean by Asymptotic Notation. Explain.
15. Find the best case and worst case time complexity deletion in a binary tree.
16. Consider the following recurrence
$T(n)=4T(n/2)+n^2$ Find its asymptotic bound using Master Method.

HOD
Dept. of Computer Science & Engg
B.G.S. Institute of Technology.
B.G. Nagar - 571 448
Nagamangala Tq, Mandya Dist
Karnataka (INDIA)

17. Explain selection in expected linear time. You are also require to give the desire algorithm.
18. Show the steps in heap sort to arrange following data in non-decreasing order

1,2,5,6,9,8,7 OR

(A) Find the solution of the following recurrence relation in O-notation

$$T(n)=8T(n/2)+3n^2$$

Where n is an integer power of 2 and greater than 1.

19. Develop and analyze an algorithm to determine whether a given N*N matrix . A has the metric property (that is, for all values of $1<=j,k,<=N, a_{ij} \; a_{ik} + a_{kj}$) or not.
20. Write Master's method for solving recurrence relations of different types.
21. Discuss the basic step steps in complete development of an algorithm.

22. Write divide and conquer approach for binary search and find its average case complexity.
23. Prove that the running time of radix-sort is represent as o(n log n).
24. Explain the concept of partitioning of the set to be sorted using quick-sort algorithm.
25. solve the recurrence relation by iteration:
    $T(n) = T(n-1)+ n^4$

26. We have a set of n jobs to execute, each of which takes unit time. At ay time $T = 1,2....$, we can execute exactly one jobs. Job i earns us a profit g_i ->0 if and only if it is executed no later than time d_i. Develop a greedy algorithm to solve the above problem. Run your algorithm for n=4 and the following values:-

i	1	2	3	4
g_i	50	10	15	30
d_i	2	1	2	7

27. What is "greedy algorithm "? Write its pseudo code prove that fractional Knapsack problem has a greedy-choice property.

28. Explain dynamic programming. Apply it on matrix Chain-multiplication problem.

29. What is the sum of subsets problem? Let w={5,7,10,12,15,18,20} and m=35. find all possible subsets of w that sum to m using recursive black tracking algorithm for it. Draw the portion of the state-space tree that is generated.

30. When and how Dynamic Programming approach is applicable? Discuss matrix chain multiplication with reference to Dynamic Programming Technique and also apply it on the following arrays.

42. Write a short note on dynamic programming.

HOD
Dept. of Computer Science & Engg.
B.G.S. Institute of Technology,
B.G. Nagar - 571 448
Nagamangala Tq, Mandya Dist
Karnataka (INDIA)

43. Discuss the back tracking problem solving approach.

45. What are the different Greedy Criterion? Explain. Consider the five items along with their respective weight and values:

$I=\{I_1,I_2,I_3,I_4,I_5\}$

$W=\{5,10,20,30,40\}$

$V=\{30,20,100,90,160\}$

The knapsack has capacity w=60. Find the solution of the problem using the concept of fractional knapsack.

46. Solve the shortest path problems using Dijkastra's algorithm. Count the number of distance updates.
47. Write an algorithm to find all-pair shortest path. Derive its complexity.
48. We would like to solve, as efficiently as possible, the single source shortest path problems in each of the following graphs. For each graph, state which algorithm would be best to use, and give its running time :
    a. A weighted directed acyclic graph.
    b. A weight directed graph where all edge weights are non-negative; the graph contains a directed cycle.
    c. A weighted directed graph in which some, but not all, of the edges have negative weights, the graph contains a directed cycle.
49. hat are single source shortest paths? Write down Dijekstra's algorithm for it.
50. Explain the Floyd Warshall algorithm with example.

51. Define NP, NP hard and NP complete. Give example of each.

52. Discuss the relationship between the class P.NP, NP-complex and NP-hard problems with suitable example of each class.

53. Give the randomized version of Quick sort. Analysis it for finding the expected running time.

54.

55. Show that Hamiltonian cycle is in NP class of problem.

56. Solve the following recurrences. Assume.
    T (1) = and T (3) = 1

    (i) $T(n) = T(n/2) + T(n/3) + n$

    (ii) $T(n) = 3T(n^{1/3}) + \log_3$

57. What is time complexity of counting sort? Sort 1 9 3 3 4 5 6 7 7 8 by counting sort.

HOD
Dept. of Computer Science & Engg.
B.G.S. Institute of Technology.
B.G. Nagar - 571 448
Nagamangala Tq. Mandya Dist
Karnataka (INDIA)

58. What do you mean by Asymptotic Notation. Explain

59. Explain the concept of partitioning of the set to be sorted using quick-sort algorithm.

60. Solve the following recurrences :
    a. $T(n) = T(\alpha .n) + T((1 - \alpha)n) + n 0 < \alpha < 1$
    b. $T(n) = T(9n/10) + n$.

71. What do you understand by Binomial Heap ? How to merge two binomial heap?

72. . When and how Dynamic Programming approach is applicable? Discuss matrix chain multiplication with reference to Dynamic Programming Technique and also apply it on the following arrays.

30	1	40	10	25

73. Write a short note on dynamic programming.

74. Discuss the back tracking problem solving approach.

75. Explain what do you understand by "assembly line scheduling". Describe a method of solving the problem using Dynamic Programming Technique.

76. What are the different Greedy Criterion? Explain. Consider the five items along with their respective weight and values: $I=\{I_1,I_2,I_3,I_4,I_5\}$
    a. $W=\{5,10,20,30,40\}$
    b. $V=\{30,20,100,90,160\}$
    The knapsack has capacity w=60. Find the solution of the problem using the concept of fractional knapsack.

77. Give a dynamic programming solution for the subset sum problem. Analyze the complexity of the algorithm.
78. Solve the shortest path problems using Dijkotra's algorithm. Count the number of distance updates.
79. What are single source shortest paths? Write down Dijekstra's algorithm for it.

80. Explain the Floyd Warshall algorithm with example.

81. Explain and write the write the Bellman-ford algorithm. You are also required to find the running time of the algorithm.

82. Show how prim's algorithm can be implemented using heap . What would be the time complexity of the algorithm?

83. Show that Hamiltonian cycle is in NP class of problem.

HOD
Dept. of Computer Science & Engg.
B.G.S. Institute of Technology,
B.G. Nagar - 571 448.
Nagamangala Tq, Mandya Dist
Karnataka (INDIA)

84. Give asymptotic upper & lower bound for T(n) in each of the following recurrences for $n \leq 2$.

(i) $T(n) = 16T\left(\left\lfloor \frac{n}{4} \right\rfloor\right) + n^2$

(ii) $T(n) = 7T\left(\left\lfloor \frac{n}{34} \right\rfloor\right) + n^2$

(iii) $T(n) = 2T\left(\left\lfloor \frac{n}{4} \right\rfloor\right) + \sqrt{n}$

(iv) $T(n) = T(n-1) + n$

(v) $T(n) = T(\sqrt{n}) + 1$

85. Argue that the solution of the recurrence T(n) = $T\left(\frac{n}{3}\right) + T\left(\frac{2n}{3}\right) + cn$ is $\Omega(n \log n)$ by using the recursion tree method.

86. Solve the following recurrence using master's method T(n) = $8T\left(\frac{n}{2}\right) + n^3$

87. Solve the recurrence by substitution method T(n) = $T\left(\frac{n}{3}\right) + T\left(\frac{2n}{3}\right) + n$

88. Illustrate the operation of HEAP-SORT on the array A = ⟨16,4,10,14,7,9,3,2,8,1⟩

89. Sort the following array using HEAP-SORT algorithm on the array A = ⟨40,80,35,90,45,50,70⟩.

90. Illustrate the operation of MAX-HEAP-INSERT (A, 11) on the array A = ⟨15,13,9,5,12,8,7,4,0,6,2,1⟩.

91. Give an non-recursive algorithm to find out the largest element in a list of n numbers.

92. What is meant by divide &conquer?

93. Define Dynamic programming.

94. Define all-pair shortest path problem.

95. What is 0/1 Knapsack.

96. What is the procedure to solve traveling Salesman problem.

97. List out the advantages of Dynamic programming.

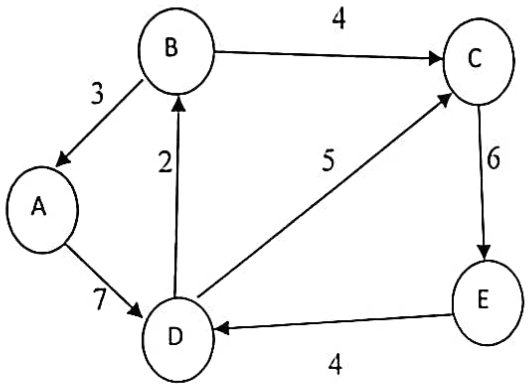
98. Solve the all-pairs shorest path problem for the digraph with the weight matrix given below.

	A	B	C	D
A	0	∞	∞	3
B	2	0	∞	∞
C	∞	7	0	1
D	6	∞	∞	0

Shalini

HOD
Dept. of Computer Science & Engg
B.G.S. Institute of Technology.
B.G. Nagar - 571 448.
Nagamangala Tq, Mandya Dist
Karnataka (INDIA)

106. Solve the following instance of the single source shortest path problem with vertex 'a' as the source.



write the algorithm for the above problem.

99. Explain the 0/1 knapsack with an algorithm.
100. Describe the Traveling salesman problem & discuss how to solve it using Dynamic Programming.

BACKTRACKING

101. Define sum of subsets problem.
102. Define Backtracking.
103. What are the applications of backtracking?
104. Define n-queens problem.
105. Define Hamiltonian Circuit problem in an undirected Graph.

PART-B

106. What is Backtracking? Explain in detail.
107. Explain Subset-sum Problem & Discuss the possible solution strategies using backtracking.
108. Discuss the use of greedy method in solving knapsack problem and subset sum problem.
109. Write short notes on
(a)Graph coloring
(b) (b) 8-Queens problem
110. Apply Backtracking technique to solve the following instance of the subset sum problems. s=(1,3,4,5) & d=11
111. Using Backtracking enumerate how can you solve the following problems
(a)8-queens problem
(b) Hamiltonian circuit problem

HOD
Dept. of Computer Science & Engg.
B.G.S. Institute of Technology,
B.G. Nagar - 571 448.
Nagamangala Tq, Mandya Dist
Karnataka (INDIA)

TRAVERSALS, BRANCH AND BOUND
PART-A (2 MARKS)

112. Define spanning tree? Discuss the design steps in prims algorithm to construct Minimum spanning tree with example.

113. Define spanning tree? Discuss the design steps in kruskal algorithm to construct Minimum spanning tree with example.

114. Give a suitable example and explain the birth first search and depth first search Algorithm.

115. What is branch and bound? Explain detail.

116. Discuss the solution for knapsack problem using branch bound techniques.(

Chalike

HOD
Dept. of Computer Science & Engg.
B.G.S. Institute of Technology,
B.G. Nagar - 571 448.
Nagamangala Tq, Mandya Dist
Karnataka (INDIA)

BGSIT BG Nagara	Doc. Title: Internal Test Question Paper		Doc. No.:06#Form#02b
	Page 1 of 1	Date: 01.04.2018	Rev. No. 00

Internal Test Question Paper Format – CBCS Scheme(VTU)

Name of the Faculty/s:
Swetha K R
Kavyashree N
Date: 10-03-2019 Signature: Swetha KR

Reviewer's Signature: Shashikala

BGS Institute of Technology

Department:Computer Science and Engineering/
Information Science and Engineering

Test: I

USN:

Semester: IV **Section:** A & B

Subject Name & Code: Design and Analysis of Algorithm (17CS43)

Date: 8-03-19 Duration:1 Hr

Time:9:30 to 10:30 Max. Marks: 30

Note: Select one question from each part

Q. No	Questions	Marks	CO	Levels
	Part A			
1	a) Define an algorithm. Discuss the criteria of an algorithm with an example.	7.5	CO1	L1
	b) Define time and space complexity. Explain important problem types that are solved by computer.	7.5	CO1	L1
	OR			
2	a) Explain Asymptotic notations with an examples.	7.5	CO1	L2
	b) Prove that: If $t_1(n) \in O(g_1(n))$ and $t_2(n) \in O(g_2(n))$ then $t_1(n) + t_2(n) \in O(\max\{ g_1(n), g_2(n)$	7.5	CO1	L3
	Part B			
3	a) Explain general plan of mathematical analysis of nonrecursive algorithm with example.	7	CO1	L2
	b) Illustrate the following algorithm Algorithm GUESS(A[][]) for i←0 to n-1 for j←0 to i A[i][j] ←0 a) What does the algorithm compute? b) What is basic operation? c) How many times basic operation is executed? d) What is the efficiency of this algorithm? And Design the algorithm to multiply two matrices & obtain its time complexity.	8	CO1	L2
	OR			
4	a) Illustrate mathematical analysis of recursive algorithm for tower of Hanoi problem.	10	CO1	L2
	b) Design a recursive function to find factorial of a number & obtain its time complexity?	5	CO1	L6

Shashikala HOD
Dept. of Computer Science & Engg.
B.G.S. Institute of Technology,
B.G. Nagar - 571 448.
Nagamangala Tq, Mandya Dist
Karnataka (INDIA)

CBCS Scheme (VTU)

DEPARTMENT: COMPUTER SCIENCE ENGINEERING/INFORMATION SCIENCE ENGINEERING

Scheme & Solution – TEST – 1 Date: 8/3/19

Semester: 4th A Subject Title: DAA Subject Code: 17CS43

Question Number	Solution	Marks Allocated

1) a)	a) It is defined as a Collection of unambiguous instruction occuring in some specific sequence & such an algorithm should produce o/p for given set of i/p in finite amount of time
	Criteria:
	* Input: Each algorithm should have zero or more i/p's
	* Output: It produces correct Results.
	* Definiteness: It should be clear
	* Finiteness:- It must terminate after a finite no of steps.
	* Effectiveness:- It must be a basic State-ment so that it can be executed by a Person.
	Example:- int FPS (int a[], int n)
	{
	int i, pos;
	pos = 0;
	for(i=1; i<n; i++)
	{
	if(a[i]<a[pos]) pos=i;
	}
	return pos;
	}
		01
		04
		2.5
		Shall-ly

b)	b) * Time Complexity of an algorithm is amount of Computer time required by an algorithm to run to Completion	01

Question Number	Solution	Marks Allocated
	* Space Complexity as amount of memory required by an algorithm to run.	01
	Problem types :-	
	* Sorting	
	* Searching	
	* String Processing	
	* Graph problems	5.5
	* Combinatorial problems	
	* Geometric problems.	
	* Numerical Problem.	
2)	a) Asympotic notations	
	* Big-oh [O] :- It is defined as set of functions with a small or same order of growth as g(n) as n goes to infinity.	2.5
	Ex:- $g(n) = n^3$, n & n^2	
	$n \in O(n^3)$	
	$n^2 \in O(n^3)$	
	* Big-Omega (Ω) :- It is defined as a set of functions with a larger or same order of growth as g(n) as n goes to infinity.	2.5
	Ex:- $g(n) = n^3$, n^3, n^4	
	$n^3 \in \Omega(n^3)$	
	$n^4 \in \Omega(n^3)$	
	* Big-Theta (Θ) :- It is defined as a set of function with have same order of growth as g(n) as n goes to infinity.	2.5
	Ex:- $g(n) = n^2$, n^2, n, n^3	
	$n^2 \in \Theta(n^2)$	
	$n \notin \Theta(n^2)$	
	$n^3 \notin \Theta(n^2)$	

Question Number	Solution	Marks Allotted
	b) Show $f_1(n) \in O(g_1(n))$ ... positive constant c_1 & nonnegative integer n_1 $f_1(n) \le c_1 g_1(n)$ for all $n \ge n_1$ Show $f_2(n) \in O(g_2(n))$ $f_2(n) \le c_2 g_2(n)$ for all $n \ge n_2$ $c_3 = \max\{c_1, c_2\}$ $f_1(n) + f_2(n) \le c_3 \max\{g_1(n), g_2(n)\}$ $f_1(n) \in O(g_1(n))$] $f_1(n) + f_2(n)$ $f_2(n) \in O(g_2(n))$] $\in O(\max\{g_1(n), g_2(n)\})$	7.5

3)	a) • Identify the parameters to be considered for analysis
	 • Identify the parameter basic operation
	 • Check whether the no of times the basic operation is executed
	 • Obtain the total no of times basic operation is executed
	 • Simplify using standard formulas & obtain the order of growth.
	 Ex:- Algorithm POS (int a[], int n)
	 { pos=0;
	 for (i=1 to n)
	 {
	 if (a[i] < a[pos]) pos=i;
	 } return pos; }
	 Step1:- parameter is 'n'
	 Step2:- Basic operation is "if (a[i] > a[pos])"
	 Step3:- Total no of times the basic operation executed
	 for i←1 to n-1 do
	 if (a[i] > a[pos]) pos←i
	 $f(n) = \sum_{i=1}^{n-1} 1 = (n-1) - 1 + 1 = n-1$
	 $f(n) = n-1 \approx n$
	 Step4:- The time complexity is
	 $f(n) \in O(n)$
		9.5
		 04
		 Shanth...

	b) i) The algorithm computes "A[i][j]←0" ii) Basic operation is "A[i][j]←0" iii) $\sum_{i=0}^{n-1} \sum_{j=0}^{i} = \sum_{i=0}^{n-1} i-0+1 = n-1+1+1+1$ $= n+1+1 = \frac{n(n-1)}{2}$	03

Question Number	Solution	Marks Allocated
	ii) The time Efficiency is $f(n) \in O(n)$	01
	*) Algorithm to multiply two matrices Algorithm M (a[], b[], c[], n) for i ← 0 to n-1 for j ← 0 to n-1 sum ← 0 for k = 0 to n-1 sum ← sum + a[i][k] * b[k][j] end for c[i][j] ← sum end for end for. Analysis:- Step 1:- The parameter is 'n' Step 2:- The basic operation is sum ← sum + a[i][k] * b[k][j]. Step 3:- no of times the basic operation is executed as $f(n) = \sum_{i=0}^{n-1} \sum_{j=0}^{n-1} \sum_{k=0}^{n-1} 1$ $f(n) \in O(n^3)$	02 02
4)	a) General plan of recursive algorithm * Towers of Hanoi Problem $f(n) = \begin{cases} 1 & \text{if } n=1 \\ f(n-1)+1+f(n-1) & \text{Otherwise} \end{cases}$ Time Efficiency is $f(n) \in O(2^n)$	05 05

	b) Algorithm fact(int n)
	if(n==0) return 1;
	return n * fact(n-1);
	$f(n) = \begin{cases} 0 & \text{if } n=0 \\ 1+f(n-1) & \text{Otherwise} \end{cases}$
	The time Efficiency is $f(n) \in O(n)$
		05

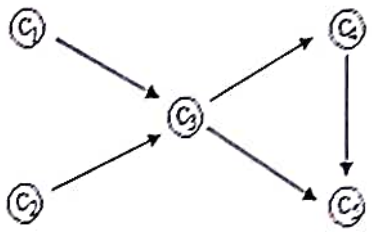
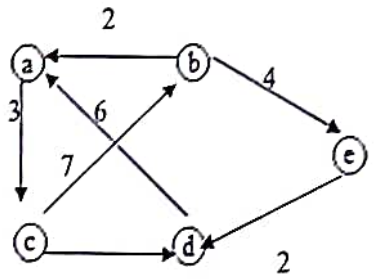
Internal Test Question Paper Format – CBCS Scheme(VTU)

Name of the Faculty/s:
Swetha K R
Date: 15-04-2019
Signature:

Reviewer's Signature:

BGS Institute of Technology
Department: CSE & ISE
Test: II
Semester: IV Section: A & B
USN:
Subject Name & Code: Design and Analysis of Algorithm (17CS43)
Date: 15-04-19 Duration:1 Hr
Time:9:30 to 10:30 Max. Marks: 30

Note: Select one question from each part

Q. No	Questions	Marks	CO	Levels
	Part A			
1	a)Explain Strassen's multiplication and derive its time complexity.	7.5	CO2	L2
	b) List out the advantages and disadvantages of divide and conquer method and illustrate the topological sorting for the graph. 	7.5	CO2	L1
	OR			
2	a) Define transitive closure. Write Warshall's algorithm to compute transitive closure. Find its efficiency.	7.5	CO4	L1
	b) Apply Floyd's algorithm to find all pair shortest path for the graph. 	7.5	CO4	L3
	Part B			
3	a) Solve the following instance of Knapsack problem using dynamic programming. Knapsack capacity is 5. Item Weight Value 1 2 12	7.5	CO4	L5

HOD
Dept. of Computer Science & Engg.
B.G.S. Institute of Technology.
B.G. Nagar - 571 448

	2 1 10 3 3 20 4 2 15			
	a) Write a pseudocode to find an optimal binary search tree by dynamic programming with an example.	7.5	CO4	L6
	OR			
4	a) Sort the following elements using merge sort. 60,50,25,10,35,25,75,30	7.5	CO3	L3
	b) Explain multistage graphs with example. Write multistage graphs algorithm to forward approach.	7.5	CO5	L2

HOD
Dept. of Computer Science & Engg.
B.G.S. Institute of Technology.
B.G. Nagar - 571 448
Nagamangala Tq. Mandya Dist.

CBCS Scheme (VTU)

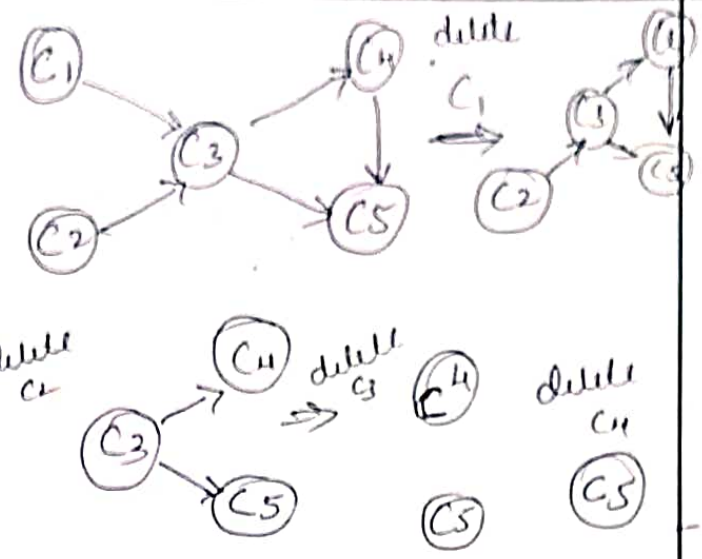
DEPARTMENT: COMPUTER SCIENCE ENGINEERING/INFORMATION SCIENCE ENGINEERING

Scheme & Solution – TEST – II Date:

Semester: IV Subject Title: Design & Analysis of Alg Subject Code: 17CS43

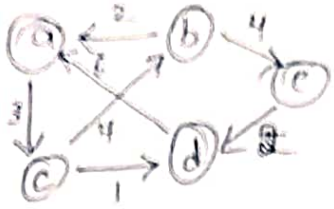
Question Number	Solution	Marks Allocated
1.a)	Strassen's Multiplication	
	$\begin{bmatrix} C_1 & C_2 \\ C_3 & C_4 \end{bmatrix} = \begin{bmatrix} A_1 & A_2 \\ A_3 & A_4 \end{bmatrix} * \begin{bmatrix} B_1 & B_2 \\ B_3 & B_4 \end{bmatrix}$	-1-
	$\begin{bmatrix} m_1+m_4-m_5+m_7 & m_3+m_5 \\ m_2+m_4 & m_1+m_3-m_2+m_6 \end{bmatrix}$	-1-
	where $m_1=(A_1+A_4)*(B_1+B_4)$ $m_2=(A_3+A_4)*B_1$ $m_3=A_1*(B_2-B_4)$ $m_4=A_4*(B_3-B_1)$ $m_5=(A_1+A_2)*B_4$ $m_6=(A_3-A_1)*(B_1+B_2)$ $m_7=(A_2-A_4)*(B_3+B_4)$	-2-
	Example.	-3.5-
b)	Advantages. * Difficult problem is broken down into sub-problems for each sub-prb is solved independently * Divide & Conquer facilitates the discovery of efficiently algorithms * Subproblems can be solved on parallel processors.	
	Disadvantages * Large no of sublists are created is need to be proces	

Shashi
HOD
Dept. of Computer Science & Engg
B.G.S. Institute of Technology,
B.G. Nagar - 571 448.
Nagamangala Tq, Mandya Dist
Karnataka (INDIA)

Question Number	Solution	Marks Allocated
		-6.5-
	delete C5 $C_1 \to C_2 \to C_3 \to C_4 \to C_5$ → Source removal method DFS Method  $C5 \to C_4 \to C_3 \to C_1 \to C_2$ $C_2 \to C_1 \to C_3 \to C_4 \to C_5$	
2. a)	Definition. 0/1 Matrix,	-1-

	Algorithm. Warshall(n, A, P)
	// purpose : Transitive closure
	// Input : Adjacency matrix
	// output : Transitive closure
	for k ← 0 to n-1 do
	for i ← 0 to n-1 do
	for j ← 0 to n-1 do
	if (P[i,j]=0 or (P[i,k]=1 & P[k,j]=1)
	P[i,j]=1.
	end if
	end for end for end for
		-5-

	Efficiency:- $\sum_{k=0}^{n-1}\sum_{i=0}^{n-1}\sum_{j=0}^{n-1} 1 = \sum_{k=0}^{n-1}\sum_{i=0}^{n-1} n = \sum_{k=0}^{n-1} n^2 = n^3$ $= \Theta(n^3)$	-0.5-

Question Number	Solution	Marks Allocated
2b		
	$\begin{bmatrix} 0 & \infty & 3 & \infty & \infty \\ 2 & 0 & \infty & \infty & 4 \\ \infty & 7 & 0 & 1 & \infty \\ 6 & \infty & \infty & 0 & 9 \\ \infty & \infty & \infty & 2 & 0 \end{bmatrix}$	
	$\begin{bmatrix} 0 & \infty & 3 & \infty & \infty \\ 2 & 0 & 5 & \infty & 4 \\ 9 & 7 & 0 & 1 & 11 \\ 6 & \infty & 9 & 0 & \infty \\ \infty & \infty & \infty & 2 & 0 \end{bmatrix} \cong \begin{bmatrix} 0 & \infty & 3 & \infty & \infty \\ 2 & 0 & 5 & \infty & 4 \\ 9 & 7 & 0 & 1 & 11 \\ 6 & \infty & 9 & 0 & \infty \\ \infty & \infty & \infty & 2 & 0 \end{bmatrix}$	-7.5-
	$\begin{bmatrix} 0 & 10 & 3 & 4 & 14 \\ 2 & 0 & 5 & 6 & 4 \\ 7 & 7 & 0 & 1 & 11 \\ 6 & 16 & 9 & 0 & 20 \\ \infty & \infty & \infty & 2 & 0 \end{bmatrix} \cong \begin{bmatrix} 0 & 10 & 3 & 4 & 14 \\ 2 & 0 & 5 & 6 & 4 \\ 7 & 7 & 0 & 1 & 11 \\ 6 & 16 & 9 & 0 & 20 \\ 8 & 18 & 11 & 2 & 0 \end{bmatrix}$	
	$\begin{bmatrix} 0 & 10 & 3 & 16 & 14 \\ 2 & 0 & 5 & 6 & 4 \\ 7 & 7 & 0 & 13 & 11 \\ 6 & 16 & 9 & 0 & 20 \\ 8 & 18 & 11 & 2 & 0 \end{bmatrix}$	
	Part-B	
3. a	0/1 knapsack.	
	$v[i,j] = \begin{cases} 0 & \text{if } i=0 \text{ or } j=0 \\ v[i-1,j] & \text{if } w_i > j \\ \max\{v[i-1,j], v[i-1,j-w_i]+p_i\} & \text{if } w_i \le j \end{cases}$	-1-
	Problem solve	
		-6.5-

	0	1	2	3	4	5
0	0	0	0	0	0	0
1	0	0	12	12	12	12
2	0	10	12	22	22	22
3	0	10	12	22	30	32
4	0	10	15	25	30	37

HOD
Dept. of Computer Science & Eng
B.G.S. Institute of Technolog
B.G. Nagar - 571 448.
Nagamangala Tq, Mandya Di
Karnataka (INDIA)

Question Number	Solution	Marks Allocated

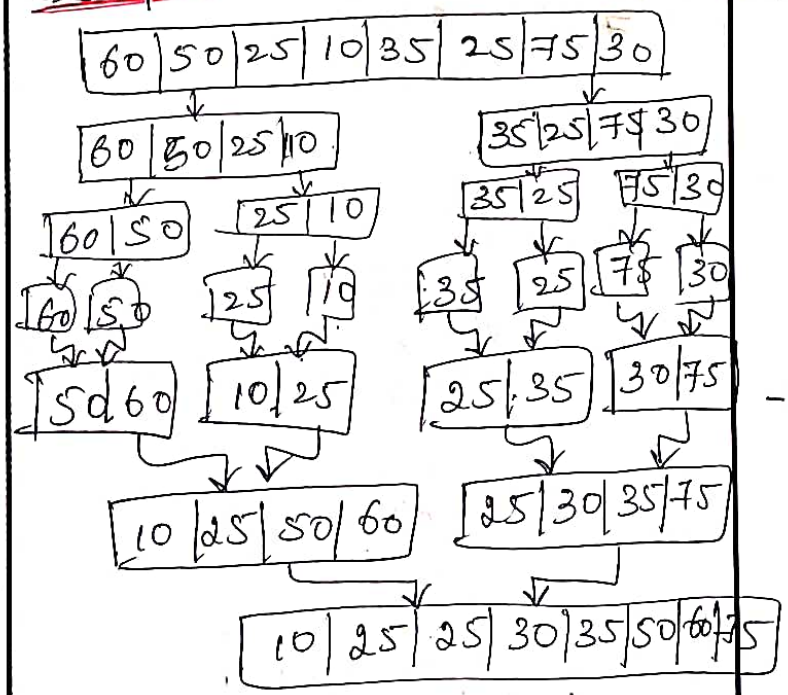
b)

Algorithm.

```
OBST (p[3, int n)
{ for i=1 to n do
    c[i,i-1]=0
    c[i,i]=p[i]
    r[i,i]=i
  end for
  c[n+1,n]=0
for d=1 to n-1 do
  for i=1 to n-d do                    -5-
    j=i+d
    min=∞
    for k=i to j do
  if (c[i,k-1]+c[k+1,j]<min)
  min=k.
  end if
  end for
  r[i,j]=pos. som=0,
for s=i to j do.  som=som+p[s]
 end for.  c[i,j]=min+som
end for. display(c), display(r)
```

example. -2.5-

4. a)



-7.5-

4. ...
b).

Explanation

Algorithm

```
Forward graph (G, n, a, s, d)
// G=(V, E) is the graph
// n represent number of vertices in the
                    graph
// a is the cost adjacency matrix
// s source vertex, d is the destination
                    vertex
c[n]=0;
for j=n-1 down to 1
let r∈V, for each edge <j,r> ∈ E,
                                        -4-
  c[j] = a[j,r] + c[r]
  p[j]=r
end for
j=s
while (j != d)
Print (j, '->')
  j=p[j]
end while
  return.
```


Example.

Shalini

HOD
Dept. of Computer Science & Engg
B.G.S. Institute of Technology
B.G. Nagar - 571 448.
Nagamangala Tq, Mandya Dist
Karnataka (INDIA)

BGSIT BG Nagara	Doc. Title: Internal Test Question Paper		Doc. No.:06#Form#02b
	Page 1 of 1	Date: 01.04.2018	Rev. No. 00

Internal Test Question Paper Format – CBCS Scheme(VTU)

Name of the Faculty/s:
Swetha K R
Date: 17-05-2019
Signature: Swetha KR

Reviewer's Signature: Shashikala

BGS Institute of Technology

Department: CSE & ISE

Test: III

USN:

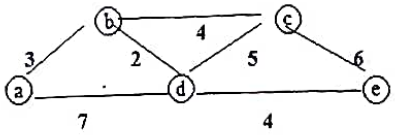
Semester: IV **Section:** A & B

Subject Name & Code: Design and Analysis of Algorithm (17CS43)

Date: 17-05-19 Duration:1 Hr

Time:9:30 to 10:30 Max. Marks: 30

Note: Select one question from each part

Q. No	Questions	Marks	CO	Levels
	Part A			
1	a) Solve the greedy knapsack problem where m=15. n=7. p= (10,5,15,7,6,18,3). W= (2,3,5,7,1,4,1).	7.5	CO3	L2
	b) What is job sequencing with deadlines problem? Let n=5. profits (20,15,10,5,1) and deadlines (2,2,1,3,3) respectively. Find the optimal solution using greedy algorithm	7.5	CO3	L1
	OR			
2	a) Explain Greedy method. Write a Prim's algorithm to find minimum cost spanning tree.	7.5	CO3	L2
	b)Design Dijkstra's algorithm and apply the same to find the single source shortest path for graph taking vertex 'a' as source. 	7.5	CO3	L6
	Part B			
3	a) Let M=30 rupees,n=3 Where denomination d[]={1,15,25}. Find minimum number of coins required to give change for M rupees	7.5	CO3	L5
	b) Construct a Huffman tree and resulting code word for the following: <table><tr><td>Character</td><td>A</td><td>B</td><td>C</td><td>D</td><td>_</td></tr><tr><td>Probability</td><td>0.4</td><td>0.1</td><td>0.2</td><td>0.15</td><td>0.15</td></tr></table> Encodethe text ABACABAD and decode the text 100010111001010, using	7.5	CO3	L3

HOD

Dept. of Computer Science & Engg
B.G.S. Institute of Technology,
B.G. Nagar - 571 448.
Nagamangala Tq, Mandya Dist

	the above code.			
	OR			
4	a) Define minimum cost spanning tree (MST). Mention various applications of minimum spanning trees and obtain the time complexity of prims algorithm.	7.5	CO3	L1
	b)What is backtracking? What are the various problems that can be solved using backtracking method.	7.5	CO5	L1

H O D
Dept. of Computer Science & Engg.
B.G.S. Institute of Technology
B.G. Nagar - 571 448.
Nagamangala Tq, Mandya Dis,
Karnataka (INDIA)

CBCS Scheme (VTU)

DEPARTMENT: COMPUTER SCIENCE & ENGINEERING

Scheme & Solution – TEST – III Date: 16/05/19

Semester: IV Subject Title: Design & Analysis of Alg Subject Code: 17CS43

Question Number	Solution	Marks Allocated

1. a)

$\frac{P1}{W1} = \frac{10}{2} = 5$ $\frac{P2}{W2} = \frac{5}{3} = 1.67$ $\frac{P3}{W3} = \frac{15}{5} = 3$

$\frac{PH}{WH} = \frac{7}{7} = 1$ $\frac{P5}{W5} = \frac{6}{1} = 6$ $\frac{P6}{W6} = \frac{18}{H} = 4.5$

$\frac{P7}{W7} = \frac{3}{1} = 3$

Arranging in decreasing order

$6 > 5 > 4.5 > 3 > 3 > 1.67 > 1$

P: 6 10 18 15 3 5 7

W: 1 2 4 5 1 3 7

Object (i)	Wi	Pi	X=1 or $\frac{W_i}{W_i}$	Profit = Pi*x	W=W-Wi*x
Initial	-	-	-	-	15
1	1	6	1	1*6=6	15-1*1 = 14
2	2	10	1	1*10=10	14-2*1 = 12
3	4	18	1	1*18=18	12-4*1 = 08
4	5	15	1	1*15=15	8-5*1 = 3
5	1	3	1	1*3=3	3-1*1 = 2
6	3	5	2/3=0.67	0.67*5 = 3.35	2-3*0.67
7	7	7	0		

Profits = 6+10+18+15+3+3.35 = 55.35

Fraction = (1, 1, 1, 1, 1, 0.67, 0)

Weights = (1, 2, 4, 5, 1, 3, 7)

7.5

b) Definition of Job sequencing — 1 —

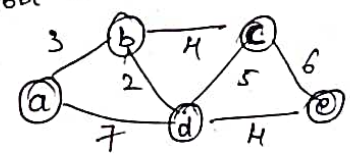
Selected job	Deadline d[i]	Slot J[k] empty or not	Action J[k]=i	Soln
-	-	-	-	J [0] [0]
1	2	empty	Add i to J[2]	J [0] [1]
2	2	Not empty	i	
1	1	empty	Add 2 to J[1]	J [2] [1] [0]

HOD
Dept. of Computer Science &
G.S. Institute of Techn
B.G. Nagar - 571 44
Nagamangala Tq, Mandy
Karnataka (INDIA

Question Number	Solution	Marks Allocated
(c)	3 1 not empty 0 SOD3 can't be performed 4 3 empty Add 4 to J[3] J = {2, 1, 4} 15+20+5 = 40	

2. a)	Greedy method definition
	Prim's algorithm.
	S[source] ← 1
	sum ← 0
	ic ← 0.
	for i ← 1 to n-1 do
	for every v ∈ V-S do
	if (w[u,v] < d[v])
	d[v] ← w[u,v]
	p[v] ← u
	end if, end for, end for
		-2.5-
		-5-

b)	Dijkstra's alg for i ← 0 to n-1 do
	d[i] = cost[source, i]
	p[i] = source
	s[i] = 0
	end for
	s[source] = 1
	for i ← 1 to n-1 do
	if (v = destination) break;
	v ∈ V-S do
	if (d[u] + w[u,v] < d[v])
	d[v] = d[u] + w[u,v]
	p[v] = u end if. end for
	end for.
		-3-

	Problem.  	

Question Number	Solution	Marks Allocated

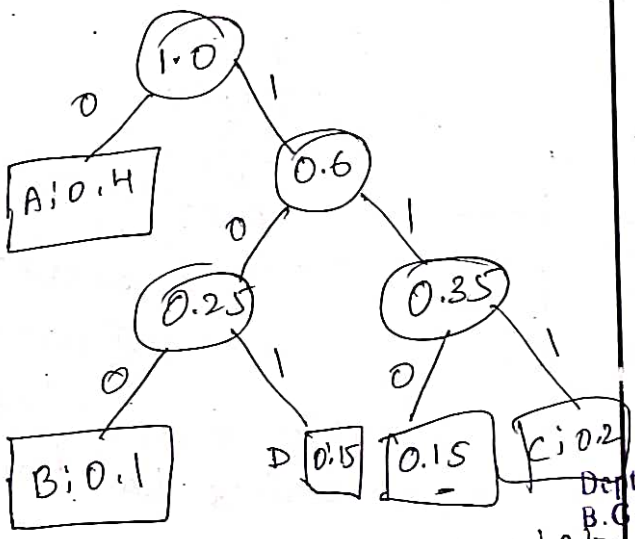
3.a) $M=30 \quad n=3 \quad d=\{25, 15, 1\}$ — 7.5

i	hd=d[i]	hd<m	m=m-hd	X
1	25	yes	30-25=5	25
2	15	no	5	25
3	1	yes	5-1=4	25, 1
	1	yes	4-1=3	25,1,1
	1	yes	3-1=2	25,1,1,1
	1	yes	2-1=1	25,1,1,1,1
	1	yes	1-1=0	25,1,1,1,1)

$X=\{25,1,1,1,1,1\}$

b)

Character	A	B	C	D	-
Probability	0.4	0.1	0.2	0.15	0.15



Encoding:

A	B	A	C	A	B	A	D
0	100	0	111	0	100	0	01

Checked

H O D
Dept. of Computer Science &
B.G.S. Institute of Techn
B.G. Nagar - 571 44
Nagamangala Tq, Mandy
Karnataka (INDIA

Question Number	Solution	Marks Allocated
	String to be decoded / Extract codeword / Equivalent character 1000/0111001010 — 100 — B 01011100101 0 — A 1011100101 0 — 101 — D 11100101 0 — 110 — – 01010 — 0 — A 1010 — 101 — D 0 — 0 — A	
4.a)	MST - Definition Given graph G is a spanning tree cost is minimum.	–1–
	Applications : Helpful in routing Alg. communication N/W.	–2–
	Prim's Algorithm :- $t(n) = \sum_{q=1}^{n-1} \left(\sum_{i=0}^{n-1} 1 + \sum_{v=0}^{n-1} 1 \right)$ $= \sum_{i=1}^{n-1} [(n-1)-0+1) + ((n-1)-0+1)]$ $= \sum_{i=1}^{n-1} 2n$ $= 2n \sum_{i=1}^{n-1} 1$ $= 2n(n-1-1+1)$ $= 2n(n-1)$ $= 2n^2 - 2n \approx n^2$	–H.S–
b)	backtracking :- definition	–2–
	Various problems that can be solved using backtracking metho	–S.S–

|| Jai Sri Gurudev||

B G S INSTITUTE OF TECHNOLOGY

DEPARTMENT OF COMPUTER SCEINCE & ENGINEERING

Academic Year: 2018 – 2019 **For the Period:** 01/02/2019 to 23/05/2019

Assignment I Questions

Faculty Name: Swetha K R
Semester: 4th
Section: 'A&B'
Course Name: Design and analysis of algorithms
Course Code: 17CS43

Sl. No.	Questions	COs
1	Define an algorithm. Discuss the criteria of an algorithm with an example.	1
2	Prove that: If $t_1(n) \in O(g_1(n))$ and $t_2(n) \in O(g_2(n))$ then $t_1(n) + t_2(n) \in O(\max\{ g_1(n), g_2(n)$	1
3	Explain general plan of mathematical analysis of non recursive algorithm with example.	1
4	Illustrate mathematical analysis of recursive algorithm for tower of Hanoi problem.	1
5	Design a recursive function to find factorial of a number & obtain its time complexity?	1

Signature of Course Coordinator

Signature of HoD

H O D
Dept. of Computer Science & Engg.
B.G.S. Institute of Technology,
B.G. Nagar - 571 448
Nagamangala Tq, Mandya Dist
Karnataka (INDIA)

|| Jai Sri Gurudev||

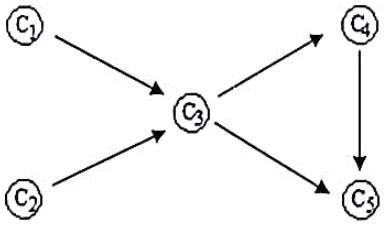
B G S INSTITUTE OF TECHNOLOGY

DEPARTMENT OF COMPUTER SCEINCE & ENGINEERING

Academic Year: 2018 – 2019 **For the Period:** 01/02/2019 to 23/05/2019

Assignment II Questions

Faculty Name: Swetha K R
Semester: 4th
Section: 'A&B'
Course Name: Design and analysis of algorithms
Course Code: 17CS43

Sl. No.	Questions	COs
1	a) Explain Strassen's multiplication and derive its time complexity.	2
2	b) List out the advantages and disadvantages of divide and conquer method and illustrate the topological sorting for the graph. 	2
3	Solve the following instance of Knapsack problem using dynamic programming. Knapsack capacity is 5. Item Weight Value 1 2 12 2 1 10 3 3 20 4 2 15	4
4	a) Write a pseudocode to find an optimal binary search tree by dynamic programming with an example.	4

Signature of Course Coordinator

Signature of HoD

HOD
Dept. of Computer Science & Engg.
B.G.S. Institute of Technology,
B.G. Nagar - 571 448
Nagamangala Tq. Mandya Dist
Karnataka (INDIA)

|| Jai Sri Gurudev||

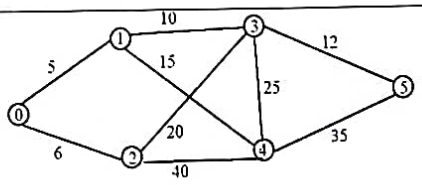
B G S INSTITUTE OF TECHNOLOGY

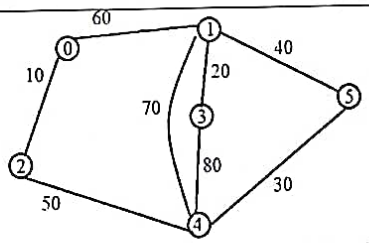
DEPARTMENT OF COMPUTER SCEINCE & ENGINEERING

Academic Year: 2018 – 2019 **For the Period:** 01/02/2019 to 23/05/2019

Assignment III Questions

Faculty Name: Swetha K R
Semester: 4th
Section: 'A&B'
Course Name: Design and analysis of algorithms
Course Code: 17CS43

<table>
<tr><th>Sl. No.</th><th>Questions</th><th>COs</th></tr>
<tr><td>1</td><td> 

Find the minimum spanning tree using Kruskal's algorithms.</td><td>3</td></tr>
<tr><td>2</td><td> 

Find the minimum spanning tree for the following graph by giving the tracing using Prim's algorithm.</td><td>3</td></tr>
<tr><td>3</td><td>Obtain the optimal solution for the job sequencing problem given the following jobs profits and their deadlines
<table>
<tr><td>1o</td><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td></tr>
<tr><td>pi</td><td>20</td><td>15</td><td>30</td><td>40</td><td>25</td></tr>
<tr><td>di</td><td>1</td><td>2</td><td>1</td><td>1</td><td>3</td></tr>
</table></td><td>5</td></tr>
</table>

Signature of Course Coordinator

Signature of HoD

H O D
Dept. of Computer Science & Engg
B.G.S. Institute of Technology.
B.G. Nagar - 571 448
Nagamangala Tq, Mandya Dist
Karnataka (INDIA)

||Jai Sri Gurudev||

BGS INSTITUTE OF TECHNOLOGY

Department of CSE

IV CS "A" EVEN Sem 2019-20

USN	NAME
4BW16CS043	NIHARIKA B R
4BW17CS001	ABHISHEK URS C J
4BW17CS002	AISHWARYA D
4BW17CS003	AISHWARYA G P
4BW17CS004	AISHWARYA K.P
4BW17CS005	AJAY S
4BW17CS006	AKANKASHA K P
4BW17CS008	ANJALI K S
4BW17CS009	ANUPAMA A M
4BW17CS010	ATHFIA FARHEEN N
4BW17CS012	BHAVAN A J
4BW17CS013	BHAVANI N D
4BW17CS014	BHUMIKA M R
4BW17CS015	BINDU H
4BW17CS016	BRUNDA D
4BW17CS017	CHAITHRA R
4BW17CS018	CHAITHRA JAIN H P
4BW17CS020	DEEKSHITHA C
4BW17CS021	DEEPIKA A N
4BW17CS022	DIVYA KHYANI
4BW17CS023	DIVYASHREE K H
4BW17CS024	HARISH GOWDA
4BW17CS025	HARSHITHA Y
4BW17CS026	HEMA D
4BW17CS027	INDU SHREE G J
4BW17CS028	ISHWARAPPA HAVIN
4BW17CS029	JEEVAN R
4BW17CS031	JINASHREE P
30	4BW17CS033	KARTHIK M RAO
---	---	---
31	4BW17CS034	LAKSHMIKANTH GOWDA M
32	4BW17CS035	MAANYA K V
33	4BW17CS036	MANJUSHREE C S
34	4BW17CS037	MANOJ S B
35	4BW17CS038	MEGHANA K
36	4BW17CS039	MEGHANA M V
37	4BW17CS040	NAVYASHREE H D
38	4BW17CS041	NIKITH G S
39	4BW17CS042	NOOR AYESHA S
40	4BW17CS043	POOJA D R
41	4BW17CS044	POOJA K S
42	4BW17CS045	POOJASHREE G
43	4BW17CS046	PRIYADARSHINI P
44	4BW17CS048	PRIYANKA V L
45	4BW17CS049	PUNEETH GOWDA A C
46	4BW17CS050	PUNEETH RAJ B S
47	4BW17CS051	RAHUL B
48	4BW17CS052	RAKESH C S
49	4BW17CS053	RAKSHITHA N
50	4BW17CS054	RAMYA K L
51	4BW17CS055	RANJITHA B S
52	4BW17CS056	RITESH KUMAR CHANDA
53	4BW17CS057	ROHIT KUMAR JHA
54	4BW17CS058	SAHANA L M
55	4BW17CS059	SANJANA GOWDA N C
56	4BW17CS060	SANJAY KUMAR C G
57	4BW17CS061	SHANKREPPA HANDARGAL
58	4BW17CS062	SHIFAALI

59	4BW17CS063	SHRUSTI M
60	4BW17CS064	SIDDARTH SINGH
61	4BW17CS065	SINCHANA B R
62	4BW17CS066	SMITHA B U
63	4BW17CS084	NAMRATHA
64	4BW17CS085	NAYANA
65	4BW17CS086	SOWMYA JAKKULA
66	4BW18CS403	DHANANJAYA
67	4BW18CS404	GAGAN B S
68	4BW18CS406	GIRISH REDDY
69	4BW18CS410	VIDYASAGAR

H O D
Dept. of Computer Science & Engg.
B G.S. Institute of Technology,
B.G. Nagar - 571 448.
Nagamangala Tq. Mandya Dist
Karnataka (INDIA)

||Jai Sri Gurudev||

BGS INSTITUTE OF TECHNOLOGY

Department of CSE

IV CS "B" EVEN Sem 2019-20

I. N	USN	NAME
1	4BW17CS067	SMITHA M
2	4BW17CS068	SNEHA N J
3	4BW17CS069	SOWNDARYA L T
4	4BW17CS070	SPOORTHI H
5	4BW17CS071	SPOORTHI R
6	4BW17CS072	SPOORTHI C
7	4BW17CS074	SWATHI D
8	4BW17CS075	TASMIYA
9	4BW17CS076	TEJAS RAHUL R
10	4BW17CS077	THEJAS G C
11	4BW17CS078	VARALAKSHMI C K
12	4BW17CS081	YASHASHWINI H M
13	4BW17CS082	YOGASHREE C R
14	4BW17CS083	YOGESH G L
15	4BW15CS064	RAKSHITHA S R
16	4BW16CS055	RAJU M D
17	4BW16CS074	THEJAS G S
18	4BW18CS400	ANUSHA K J
19	4BW18CS401	BINDHUSHREE A C
20	4BW18CS402	BHAVYA J K
21	4BW18CS405	GAYITHRI K
22	4BW18CS407	GREESHMA M S
23	4BW18CS408	KALAVATHI R
24	4BW18CS409	KEERTHI B L
25	4BW17IS002	ANUSHA K
26	4BW17IS003	BHARATH KUMAR R
27	4BW17IS004	CHANDANA A
28	4BW17IS005	CHANDINI C M
29	4BW17IS006	GOWTHAMI U
30	4BW17IS008	HARSHA T G
31	4BW17IS009	HARSHINI B.A
32	4BW17IS010	HARSHITHA H S
33	4BW17IS011	HEMA N
34	4BW17IS012	HRUTHIK K M
35	4BW17IS013	JITHENDRA V
36	4BW17IS015	KEERTHANA S V
37	4BW17IS016	KRUTHIKA S V
38	4BW17IS017	MEGHANA G R
39	4BW17IS018	MEGHANA M
40	4BW17IS019	MOHAMMED HASHEEN
41	4BW17IS020	NIKITHA J
42	4BW17IS021	NISARGA K S
43	4BW17IS022	NISARGA M
44	4BW17IS023	NISARGA T A
45	4BW17IS024	NITHYASHREE H R
46	4BW17IS025	PRIYANKA M
47	4BW17IS027	RAKESH J
48	4BW17IS028	RESHMA M S
49	4BW17IS029	SAHANA A N
50	4BW17IS030	SAHANA S S
51	4BW17IS031	SHASHANK K R
52	4BW17IS032	SHREYAS GOWDA M C
53	4BW17IS033	SINCHANA K N
54	4BW17IS034	SNEHA N RAJ
55	4BW17IS035	SOUJANYA C K
56	4BW17IS036	SOWMYA N
57	4BW17IS037	SPANDANA H D
58	4BW17IS038	SPOORTHI C
59	4BW17IS039	SPOORTHI M N
60	4BW17IS041	SUHAS S K
61	4BW17IS042	SWATHI S GOWDA
62	4BW17IS043	TEJASHREE V
63	4BW17IS044	TEJASHWINI S
64	4BW17IS045	TULASI K N
65	4BW17IS046	VASANTH KUMAR A N
66	4BW17IS048	YASHWANTH B A
67	4BW17IS049	YASHWANTH N R
68	4BW17IS050	YATHEESH KUMAR B
69	4BW16IS022	MEGHANA B M
70	4BW16IS027	KAVITHA S JAIN
71	4BW16IS041	SACHIN GOWDA H M
72	4BW16IS044	SHREELAKSHMI

HOD
Dept. of Computer Science & Engg.
B.G.S. Institute of Technology,
B.G. Nagar - 571 448.
Nagamangala Tq. Mandya Dist
Karnataka (INDIA)

||Jai Sri Gurudev||

BGS INSTITUTE OF TECHNOLOGY

Department of Computer Science & Engineering

PROCTOR DETAILS

Name and Designation: SWETHA K R Asst Prof.,

Sl. No.	USN	Student Name	Email-Id	Mobile Number	Parent / Guardian Name	Parents Phone Number	Address
1	18ISE016	H G SWATHI P	swathiswathinuggehali200@gmail.com	6361148025	gangadar gowda	6361148025	honnamaranahalli, channarayapatna nuggehalli hassan
2	18ISE017	HEMA G A P	hemagowda0002@gmail.com	9880114495	Anand kumar	9902060829	gungaramele, nonavinakere hobli tipttur taluk tumkur district
3	18ISE018	JEEVITHA M D	jeevithamd2000@gmail.com	9148656732	dasharatha	9538482893	manchenahalli, honnenahalli post bellur hobli nagamangala taluk mandya district
4	18ISE019	KAVYA B	kavyagowda2217@gmail.com	7619625030	Bettaswamy	7349077476	7th b cross ,mudurамma layout, srinivasanagar banglore 91
5	18ISE020	LAKSHMISHREE P	Lakshmishree182@gmail.com	973122126	Anne gowda	9880422355	begamangala AC Halli post , kasaba hobli , nagamangala taluk Mandya
6	18ISE021	LIKHITHA S P	likhitha8452@gmail.com	9480500889	Sri Rama Reddy V	9483000889	doddabommanahally,mylandlahally post , chintamani (t), chikkaballapur
7	18ISE022	LIKHITHASHREE M K P	mklikitha99@gmail.com	9353706662	MC Kumar	9964921949	#02, professor quarters ,bgsit bgnagar, bellur mandya
8	18ISE024	MEGHANA K S P	ksmeghanagowda01@gmail.com	9901457550	Shashidhar TK	9731864442	A. Hosahalli, Yeliur post, Hutridurga hoblli, Kunigal taluk, Tumkur
9	18ISE025	NAYANASHREE M P	nayanathriveniS@gmail.com	9632559451	M Manjesh kumar	9448877631	2nd cross near ayurvedic hospital, hosahalli ,mandya
10	18ISE026	NISCHITHA K B P	nischithakbgowda@gmail.com	8495004024	Basavaraju k C	9740234210	kumnaghatta, gubbi , tumkur
11	18ISE027	NIVEDITHA N P	nivedithannagaraju@gmail.com	9741732107	Nagaraju R	7406249002	Doddabyadarahalli post pandavapura(t),Mandya(d)
12	18ISE028	PAVANGOWDA P R	pavangowdapr2000@gmail.com	7483306799	Rajegowda PT	8762138054	palagrahara post nagamangala (t) Mandya (d)
13	18ISE029	PRAJWAL B S	PrajwalLakshmi1@gmail.com	9008685528	Srinivasa b k	9008266527	vinayaka extinction 2nd cross kr nagar , Mysore.

H.O.D.
Dept. of Computer Science & Engg.
B.G.S. Institute of Technology
B.G. Nagar - 571 448.
Nagamangala Tq. Mandya Dist

14	18ISE030	PRAMUKHA A U	pramukhaau@gmail.com	8762093489	Umamahesh A N	7899579849	Accharadi(v),sakleshpur(t),Hassan(D).
15	18ISE032	PREETHU V S	preethusanthosh2000@gmail.com	6363010861	kamalamma	9901008480	jaldigere yadiur post kunigal , tumkur
16	18ISE033	PRIYANKA U D	priyankaumesh83@gmail.com	7259888462	Umeshappa	8105782138	Shikaripura(T),Shivmogha(d)
17	18ISE034	PUNEETH C A	puneethgowda7401@gmail.com	9108124232	Ananda C P	9482281979	chikkatholur(v) somarpet(t),kodagu
18	18ISE035	RAGHAVENDRA S	raghu9606434801@gmail.com	9606434801	shambhulingaiah	9164528664	sathanur (v), Mandya (t), Mandya (d).
19	18ISE036	RAKSHITHA A R	rakshu3092000@gmail.com	8277668668	Ravikumar	8495928605	D V Iyengar layout,Tumkur Mysore road, Mayasandra turuvekere(t),Tumkur(d).
20	18ISE037	RAMYA M	sowmyaramya13@gmail.com	7795104636	Y D Murali Mohan	9480271908	SCC Saphire, Anantpura post, Yelahanka new town
21	18ISE038	SAHANA K	sahanak711@gmail.com	8431990669	Krishna Murthy K R	8197004868	Karalakatte(v), Halagur(H), Malavalli(T),Mandya (D)
22	18ISE039	SANJANA D R	sanjanasanjana5010@gmail.com	9535614304	H raju	7996661834	doddabyadarahally, pandavapura(t), mandya(d)
23	18ISE044	VANDANA	nanduv975@gmail.com	6360990491	Adinarayan	7483529087	near bypass road gauribidanur (t),chikkaballapur(d)
24	18ISE045	VINITH S	vishwavinith15@gmail.com	9611260561	N suresh	9900608149	ashoknagar 5th cross mandya
25	18ISE046	YASHWANTH H	yashwanthhemanth404@gmail.com	8105889497	Hemanthkummar M	8088017010	1st e cross thunga nagar magadi main road banglore 560091
26	18ISE047	YOGANANDA B V	bvyogunandabvp16@gmail.com	9964058992	vasu bt	9964058992	#131 ward no 1 bidanagere kunigal tumkur district
27	18ISE048	YOUNUS ZAIN	yunuszain83@gmail.com	7259480083	naushad pasha	9380404636	shanti nagar 3rd cross ,bagur road channarayapatna
28	18ISE049	ZEENATH	zeenath2000z@gmail.com	9148692364	Mohammad peer sab	8722438322	c s pura, c s pura post & hobli , gubbi(t) tumkur(d)
29	19ISE402	GIRISH	giriv1003nanu@gmail.com	7899395372	Suresh H T	9353748911	M hosahalli, mudgandur post, dudda hobli mandya
30	19ISE401	KARTHIK	kartikhonwadkar236@gmail.com	8618032424	Chandrashekar	9742472389	gadag
31	18ISE040	SHASHANK GOWDA	shashankgowdagn20040@gmail.com	9008997604	Hema JM	9611864480	makhan ambikanagara channarayapatana
32	18ISE041	SONASHREE	sonukanthraj104@gmail.com	9845929778	kanthraj	9972965770	javaregowda road ,kuvempu nagar ,channarayapatana
33	18ISE033	PRIYANKA UD	priyankaumesh83@gmail.com	7259888462	umeshappa	8105782138	shikaripura (t)shivmogha (d)

H O D
Dept. of Computer Science & Engg.
B.G.S. Institute of Technology,
B.G. Nagar - 571 448.
Nagamangala Tq. Mandya Dist

BGS Institute of Technology
Bengaluru – Hassan National Highway (NH-75), Nagamangala
Taluk, Mandya District, B G Nagar, Karnataka 571448
Tel: 288418 , Email: principalbgsit@rediffmail.com
Fax: 288419 , Web: www.bgsit.ac.in

COURSE_WISE 2018-19

Batch : BE , 2017-2021
Staff Name : Ms Swetha K R
Subject Code : 17CS43
Subject Name : DESIGN AND ANALYSIS OF ALGORITHMS

Department : Computer Science and Engineering
Semester 4 , Sec : A
Date : 16 May 2019

No	Questions	Poor	Average	Good	Very Good	Excellent	%	Average Score (5)
		1	2	3	4	5		
	Time Sense							
1	Teacher conducts the classes regularly	0	2	6	10	33	89	4.5
2	Syllabus of this course is completed in time	0	2	7	12	30	87.5	4.4
3	Assignments, class tests, quizzes and seminars were conducted as per schedule	0	1	8	12	30	87.8	4.4
4	Alternate arrangements were made during his/her absence	0	1	6	13	31	89	4.5
	Class Control/Management							
1	The faculty is effective in controlling and conducting the class	0	0	8	13	30	88.6	4.4
2	The faculty invites student participation.	0	2	7	13	29	87.1	4.4
3	The faculty rightfully addresses inappropriate behaviour of students	0	0	9	14	28	87.5	4.4
4	The faculty has a tendency of inviting opinion and questions on subject matter from students	0	2	6	16	27	86.7	4.3
5	The faculty enhances learning by judicious reinforcement mechanism	1	1	6	13	30	87.5	4.4
	Subject Command							
1	The faculty focused on the defined syllabus	0	1	6	14	30	88.6	4.4
2	The faculty conducted and involved students in classroom discussions	0	1	7	17	26	86.7	4.3
3	The faculty had good communication skills	0	1	9	12	29	87.1	4.4
4	The lectures were well structured	0	2	7	15	27	86.3	4.3
5	The faculty related the subject to real life applications of concepts	1	2	5	13	30	87.1	4.4
6	The faculty referred to latest developments in the fields	0	1	7	11	32	89	4.5
	Use of Teaching Aid							
1	The faculty used different teaching aids like PPT's, Blackboard, Overhead Projectors etc	0	3	9	10	29	85.5	4.3

H.O.D
Dept. of Computer Science & Engg
B.G.S. Institute of Technology
B.G. Nagar - 571 448.
Nagamangala Tq, Mandya Dist
Karnataka (INDIA)

BGS Institute of Technology
Bengaluru – Hassan National Highway (NH-75), Nagamangala
Taluk, Mandya District, B G Nagar, Karnataka 571448
Tel: 288418 , Email: principalbgsit@rediffmail.com
Fax: 288419 , Web: www.bgsit.ac.in

COURSE_WISE 2018-19

Batch : BE , 2017-2021
Staff Name : Ms Swetha K R
Subject Code : 17CS43
Subject Name : DESIGN AND ANALYSIS OF ALGORITHMS

Department : Computer Science and Engineering
Semester 4 , Sec : A
Date : 16 May 2019

2	The blackboard/whiteboard work was clear in terms of legibility, visibility and structure	0	1	12	10	28	85.5	4.3
3	The faculty used different teaching methods in conducting the class. (Example group discussion, seminars, student presentations, etc.)	0	2	11	6	32	86.7	4.3
4	The faculty shared and discussed the answers to class tests or sessional tests	1	0	10	10	30	86.7	4.3
5	The faculty allowed the review of answer scripts of class tests	1	0	11	9	30	86.3	4.3
6	The faculty made sure all students are able to understand him/her.	0	1	9	10	31	87.8	4.4
	Helping Attitude							
1	The faculty has a helping attitude towards varied academic interests of students.	0	1	5	15	30	89	4.5
2	The faculty helps students gain access to material not readily available in text books, through e-resources, e-journals, reference books etc	0	1	6	17	27	87.5	4.4
3	The faculty has helps students facing physical, emotional and learning challenges.	0	1	7	15	28	87.5	4.4
4	The faculty's approach is towards development of professional skills among students	0	1	7	14	29	87.8	4.4
5	The faculty helps students in realizing career goals	0	1	7	12	31	88.6	4.4
6	The faculty helps students in realizing their strengths and development needs	0	1	8	14	28	87.1	4.4
	Total Count	**4**	**32**	**206**	**340**	**795**	**87.5**	**4.39**

HOD
Dept. of Computer Science & Engg.
B.G.S. Institute of Technology
B.G. Nagar - 571 448
Nagamangala Tq, Mandya Dist
Karnataka (INDIA)

BGS Institute of Technology
Bengaluru – Hassan National Highway (NH-75), Nagamangala
Taluk, Mandya District, B G Nagar, Karnataka 571448
Tel: 288418 , Email: principalbgsit@rediffmail.com
Fax: 288419 , Web: www.bgsit.ac.in

COURSE_WISE 2018-19

Batch : BE , 2017-2021
Staff Name : Ms Swetha K R
Subject Code : 17CS43
Subject Name : DESIGN AND ANALYSIS OF ALGORITHMS

Department : Computer Science and Engineering
Semester 4 , Sec : A
Date : 16 May 2019

nice lecturer
teaching is good
good
nice teaching
good
very good
completed all the modules with in time
teaching was good
teaching is good
good
teaching is good
exelent teaching
His teaching is very good so i can understand properly
good teaching
good
fantastic
good teaching
less use of kannada required
very good teaching
good
the teaching was very effective
very good
good
helps to understand the subject better
good
good teaching
Excellent
Learned something
Good teaching
Good

Suggest to do content beyond the syllabus.

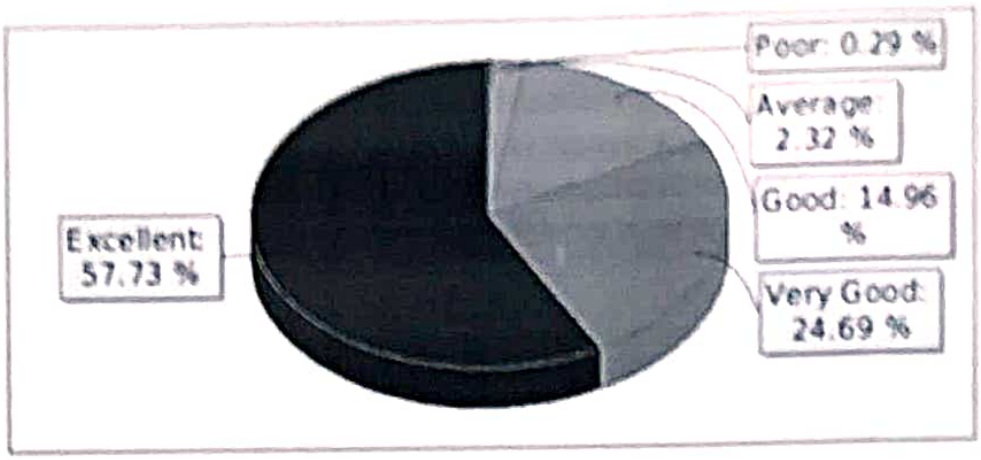
H O D
Dept. of Computer Science & Engg
B.G.S. Institute of Technology
B.G. Nagar - 571 448.
Nagamangala Tq. Mandya Dist
Karnataka (INDIA)

BGS Institute of Technology
Bengaluru - Hassan National Highway (NH 75), Nagamangala
Taluk, Mandya District, B.G.Nagar, Karnataka 571448
Tel: 288418, Email: principalbgsit@rediffmail.com
Fax: 288419, Web: www.bgsit.ac.in

COURSE_WISE 2018-19

Batch : BE , 2017-2021
Staff Name : Ms Swetha K R
Subject Code : 17CS43
Subject Name : DESIGN AND ANALYSIS OF ALGORITHMS

Department : Computer Science and Engineering
Semester 4 , Sec : A
Date : 16 May 2019



Comments
very good
teaching was very good
very good
best teaching
good
good
good teaching
Good teaching
teaching was good ,easily understandable
excellent teaching
we leart many things about this subject
gud teaching
teaching is good
Will always make the class interactive and interesting
good
very effective teaching
good teaching
good teaching
good
Good
Good teaching

HOD
Dept. of Computer Science & Engg.
B.G.S. Institute of Technology,
B.G. Nagar - 571 448.
Nagamangala Tq, Mandya Dist
Karnataka (INDIA)

||Jai Sri Gurudev||

BGS Institute of Technology

BG Nagara-571448, Mandya

Result Analysis

Course Coordin Swetha K R
Course Name & Design and Analysis of Algorithms-17CS43
Semester & Sec 4th-A & B
Academic Year 2018-2019

Sl. No.	USN	NAME	IA	SEE	Total	Result
1	4BW16CS043	NITHARIKA B R	24	21	45	Pass
2	4BW17CS001	ABHISHEKURS C J	36	32	68	Pass
3	4BW17CS002	AISHWARYA D	24	29	53	Pass
4	4BW17CS003	AISHWARYA G P	25	30	55	Pass
5	4BW17CS004	AISHWARYA .K.P	26	27	53	Pass
6	4BW17CS005	AJAY.S	32	32	64	Pass
7	4BW17CS006	AKANKSHA.K.P	36	33	69	Pass
8	4BW17CS008	ANJALI K.S	20	18	38	Fail
9	4BW17CS009	ANUPAMA.A.M	36	40	76	Pass
10	4BW17CS010	ATHFIA FARHEEN N	31	36	67	Pass
11	4BW17CS012	BHAVAN A.J	37	32	69	Pass
12	4BW17CS013	BHAVANI N D	26	14	40	Fail
13	4BW17CS014	BHUMIKA.M.R	38	29	67	Pass
14	4BW17CS015	BINDU	36	37	73	Pass
15	4BW17CS016	BRUNDA.D	24	23	47	Pass
16	4BW17CS017	CHAITHRA R	27	30	57	Pass
17	4BW17CS018	CHAITRA JAIN H P	31	29	60	Pass
18	4BW17CS020	DEEKSHITHA.C	35	28	63	Pass
19	4BW17CS021	DEEPIKA.A.N	35	38	73	Pass
20	4BW17CS022	DIVYA KHYANI	36	27	63	Pass
21	4BW17CS023	DIVYASHREE K H	28	23	51	Pass
22	4BW17CS024	HARISH GOWDA	25	29	54	Pass
23	4BW17CS025	HARSHITHA.Y	40	33	73	Pass
24	4BW17CS026	HEMA.D	28	29	57	Pass
25	4BW17CS027	INDU SHREE G.J	39	24	63	Pass
26	4BW17CS028	ISHWARAPPA HAVIN	34	26	60	Pass
27	4BW17CS029	JEEVAN.R	36	40	76	Pass
28	4BW17CS031	JINASHREE.P	35	29	64	Pass
29	4BW17CS032	K.P KARTHIK	29	32	61	Pass
30	4BW17CS033	KARTHIK M RAO	24	27	51	Pass
31	4BW17CS034	LAKSHMIKANTH GO	27	27	54	Pass
32	4BW17CS035	MAANYA K.V	32	33	65	Pass
33	4BW17CS036	MANJUSHREE C.S	36	24	60	Pass
34	4BW17CS037	MANOJ S B	21	16	37	Fail
35	4BW17CS038	MEGHANA .K	36	32	68	Pass
36	4BW17CS039	MEGHANA. M V	26	30	56	Pass

H O D
Dept. of Computer Science &
B.G.S. Institute of Technology.
B.G. Nagar - 571 448.
Nagamangala Tq, Mandya Dist
Karnataka (INDIA)

37	4BW17CS040	NAVYASHREE H.D	32	35	67	Pass
38	4BW17CS041	NIKITH G S	26	33	59	Pass
39	4BW17CS042	NOOR AYESHA	32	25	57	Pass
40	4BW17CS043	POOJA D.R	38	33	71	Pass
41	4BW17CS044	POOJA K. S	39	37	76	Pass
42	4BW17CS045	POOJASHREE G	36	43	79	Pass
43	4BW17CS046	PRIYADARSHINI P	23	21	44	Pass
44	4BW17CS048	PRIYANAKA.V.L	37	39	76	Pass
45	4BW17CS049	PUNEETHGOWDA C	20	24	44	Pass
46	4BW17CS050	PUNEETH RAJ B.S	22	21	43	Pass
47	4BW17CS051	RAHUL.B	20	21	41	Pass
48	4BW17CS052	RAKESH C.S	24	17	41	Fail
49	4BW17CS053	RAKSHITHA .N	27	32	59	Pass
50	4BW17CS054	RAMYA K.L	36	38	74	Pass
51	4BW17CS055	RANJITHA B S	20	14	34	Fail
52	4BW17CS056	RITESH KUMAR CHA	24	32	56	Pass
53	4BW17CS057	RONIT KUMAR JNA	20	21	41	Pass
54	4BW17CS058	SAHANA L M	34	43	77	Pass
55	4BW17CS059	SANJANA GOWDA N	39	49	88	Pass
56	4BW17CS060	SANJAY KUMAR C.G	28	28	56	Pass
57	4BW17CS061	SHANKREPPA HAND	24	25	49	Pass
58	4BW17CS062	SHIFAALI	27	36	63	Pass
59	4BW17CS063	SHRUSTI M	30	32	62	Pass
60	4BW17CS064	SIDDHARTH SINGH	31	27	58	Pass
61	4BW17CS065	SINCHANA B R	33	50	83	Pass
62	4BW17CS066	SMITHA B U	32	27	59	Pass
63	4BW17cs084	NAMRATHA H R	31	23	54	Pass
64	4BW17cs085	NAYANA M	24	25	49	Pass
65	4BW17cs086	SOUMYA JAKKULA	32	26	58	Pass
66	4BW18CS403	DHANANJAYA H M	22	12	34	Fail
67	4BW18CS404	GAGAN	25	31	56	Pass
68	4BW18CS406	GIRISH REDDY	19	16	35	Fail
69	4BW18CS410	VIDYASAGAR	20	12	32	Fail
70	4BW15CS064	RAJU M D	25	26	51	Pass
71	4BW16CS074	THEJAS G S	25	15	40	Fail
72	4BW17CS067	SMITHA M	30	29	59	Pass
73	4BW17CS068	SNEHA N J	35	32	67	Pass
74	4BW17CS069	SOWNDARYA L T	32	31	63	Pass
75	4BW17CS070	SPOORTHI H	31	32	63	Pass
76	4BW17CS071	SPOORTHI R	38	28	66	Pass
77	4BW17CS072	SPOORTHI C	21	21	42	Pass
78	4BW17CS074	SWATHI D	29	35	64	Pass
79	4BW17CS075	TASMIYA	28	24	52	Pass
80	4BW17CS076	TEJAS RAHUL R	19	22	41	Pass
81	4BW17CS077	THEJAS G C	22	8	30	Fail
82	4BW17CS078	VARALAKSHMI C K	37	38	75	Pass
83	4BW17CS081	YASHASHWINI H M	19	32	51	Pass
84	4BW17CS082	YOGASHREE C R	26	15	41	Fail

Dept. of Computer Science & Engg
B.G.S. Institute of Technology
B.G. Nagar - 571 448.
Nagamangala Tq, Mandya Dis.
Karnataka (INDIA)

[Jai Sri Gurudev]

BGS Institute of Technology

BG Nagara-571448, Mandya

Result Analysis

Course Coordin Swetha K R
Course Name & Design and Analysis of Algorithms-17CS43
Semester & Sec 4th-A & B
Academic Year 2018-2019

Sl. No.	USN	NAME	IA	SEE	Total	Result
1	4BW16CS043		24	21	45	Pass
2	4BW17CS001		36	32	68	Pass
3	4BW17CS002		24	29	53	Pass
4	4BW17CS003		25	30	55	Pass
5	4BW17CS004		26	27	53	Pass
6	4BW17CS005		32	32	64	Pass
7	4BW17CS006		36	33	69	Pass
8	4BW17CS008		20	18	38	Fail
9	4BW17CS009		36	40	76	Pass
10	4BW17CS010		31	36	67	Pass
11	4BW17CS012		37	32	69	Pass
12	4BW17CS013		26	14	40	Fail
13	4BW17CS014		38	29	67	Pass
14	4BW17CS015		36	37	73	Pass
15	4BW17CS016		24	23	47	Pass
16	4BW17CS017		27	30	57	Pass
17	4BW17CS018		31	29	60	Pass
18	4BW17CS020		35	28	63	Pass
19	4BW17CS021		35	38	73	Pass
20	4BW17CS022		36	27	63	Pass
21	4BW17CS023		28	23	51	Pass
22	4BW17CS024		25	29	54	Pass
23	4BW17CS025		40	33	73	Pass
24	4BW17CS026		28	29	57	Pass
25	4BW17CS027		39	24	63	Pass
26	4BW17CS028		34	26	60	Pass
27	4BW17CS029		36	40	76	Pass
28	4BW17CS031		35	29	64	Pass
29	4BW17CS032		29	32	61	Pass
30	4BW17CS033		24	27	51	Pass
31	4BW17CS034		27	27	54	Pass
32	4BW17CS035		32	33	65	Pass
33	4BW17CS036		36	24	60	Pass
34	4BW17CS037		21	16	37	Fail
35	4BW17CS038		36	32	68	Pass
36	4BW17CS039		26	30	56	Pass
37	4BW17CS040		32	35	67	Pass

HOD
Dept. of Computer Science & Engg
B.G.S. Institute of Technology
B.G. Nagar - 571 448.
Nagamangala Tq, Mandya Dist
Karnataka (INDIA)

85	4BW17CS083	YOGESH G L	19	9	28	Fail
86	4BW18CS400	ANUSHA K J	23	21	44	Pass
87	4BW18CS401	BINDHUSHREE A C	32	35	67	Pass
88	4BW18CS402	BHAVYA J K	27	22	49	Pass
89	4BW18CS405	GAYTHRI K	32	40	72	Pass
90	4BW18CS407	GREESHMA M S	22	12	34	Fail
91	4BW18CS408	KALAVATHI R	29	32	61	Pass
92	4BW18CS409	KEERTHI B L	23	15	38	Fail

No. of Students Attended	92
No. of Students Absent	0
No. of Students Passed	78
No. of Students Failed	14
Pass Percentage	84.7

Signature of Course Coordinator

Signature of HoD

H O D
Dept. of Computer Science & Engg.
B.G.S. Institute of Technology
B.G. Nagar - 571 448.
Nagamangala Tq. Mandya Dist.
Karnataka (INDIA)

BGS INSTITUTE OF TECHNOLOGY
DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING
CO PO Attainment

Course Coordinator: Swetha K R
Subject Name: Design and Analysis of Algorithm
Sub code: 17CS43

												IA	ASST	CIE=0.9*IA+0.1*ASST		
CO1	115	132	92	93	75	35	126	65				733	366	2.003	3	2.10
	65	59	41	37	37	29	62	36				366				
CO2	49	89										138	81	1.704	3	1.83
	32	49										81				
CO3	31	103	98	15	17	107	121	6				498	373	1.335	3	1.50
	33	77	74	16	16	69	85	3				373				
CO4	141	78	48	34	41							342	247	1.385	3	1.55
	62	65	50	33	37							247				
CO5	5											5	2	2.5	3	2.55
	2											2				

	0.6	0.3	0.1	
	CIE	SEE	CES	TOTAL
CO1	2.10	0.63	3	1.75
CO2	1.83	0.63	3	1.59
CO3	1.50	0.63	3	1.39
CO4	1.55	0.63	3	1.42
CO5	2.55	0.63	3	2.02

CO-PO/PSO Mapping Table

PO/PSO		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	1.75	3	2	1										3	
CO2	1.59	2	3	1		2								3	
CO3	1.39	2	3	1		2								3	
CO4	1.42	2	3	1		2								3	
CO5	2.02	2	3	1		2								3	
Sum		11	14	5		8								15	
Weighted Sum		18.10	22.8	8.17		12.84								24.52	
Target		2.20	2.80	1.00		2.00								3.00	
PO Attainment		1.21	1.52	0.54		1.07								1.63	

Chalike
H O D
Dept. of Computer Science & Engg.
B.G.S. Institute of Tech...
...Nagar - 571 ...

[Jai Sri Gurudev]

BGS INSTITUTE OF TECHNOLOGY

Department of CSE

PERIOD	From:01/02/2019	To:23/05/2019
SEM	IV	
SUBJECT NAME	Design And Analysis of Algorithms	
STAFF NAME	Swetha K R	
NO. OF STUDENTS IDENTIFIED	06	

Signature of Course Coordinator

Signature of HoD

H O D
Dept. of Computer Science & Engg.
B.G.S. Institute of Technology,
B.G. Nagar - 571 448
Nagamangala Tq, Mandya Dist
Karnataka (INDIA)

||Jai Sri Gurudev||

BGS INSTITUTE OF TECHNOLOGY

Department of CSE

ATTENDANCE Sem: IV

Year: 2019

Sl. No.	USN	Name	12	13	15	21	27	29	9	11	12
			03	03	03	03	03	03	04	04	04
1	4BW16CS043	NIHARIKA B R	P	P	P	P	P	P	P	P	P
2	4BW17CS005	ANJALI K S	P	P	P	P	P	P	P	P	P
3	4BW17CS037	MANOJ S B	P	P	P	P	P	P	P	P	P
4	4BW17CS056	RITHESH KUMAR CHANDA	P	P	P	P	P	P	P	P	P
5	4BW17CS056	ROHITH KUMAR JHA	P	P	P	P	P	P	P	P	P
6	4BW17CS084	NAMRATHA H R	P	P	P	P	P	P	P	P	P

H O D
Dept. of Computer Science & Engg.
B.G.S. Institute of Technology,
B.G. Nagar - 571 448
Nagamangala Tq. Mandya Dist
Karnataka (INDIA)

Topic Covered

Sl. No.	Topic Identified	Scheduled Date	Delivered Date
1.	Asymptotic notations	12/03/2019	12/03/2019
2.	Problems on Asymptotic notation	13/03/2019	13/03/2019
3.	Divide And Conquer concepts	15/03/2019	15/03/2019
4.	Merge sort , Quick sort	21/03/2019	21/03/2019
5.	Dynamic Programming concepts	27/03/2019	27/03/2019
6.	Floyds, warshalls, knapsack problems	29/03/2019	29/03/2019
7.	Greedy method concepts	9/4/2019	9/4/2019
8.	Prims ,kruskals algorithm problems	11/4/2019	11/4/2019
9.	Backtracking concepts, sum of subset problems, nqueens problems	12/4/2019	12/4/2019

Shashi

H O D
Dept. of Computer Science & Engg
B.G.S. Institute of Technology
B.G. Nagar - 571 448
Nagamangala Tq, Mandya Dist
Karnataka (INDIA)

Analysis Report

Sl. No.	USN	Name	First Internal Marks	Final Marks
1	4BW16CS043	NIHARIKA B R	10	24
2	4BW17CS005	ANJALI K S	07	20
3	4BW17CS037	MANOJ S B	11	21
4	4BW17CS056	RITHESH KUMAR CHANDA	11	24
5	4BW17CS056	ROHITH KUMAR JHA	01	20
6	4BW17CS084	NAMRATHA H R	11	31

Remark:

Dept. of Computer Science & Engg.
B.G.S. Institute of Technology
B.G. Nagar - 571 448
Nagamangala Tq. Mandya Dist.
Karnataka (INDIA)

Period From 8/2/19 to 28/6/19 Semester Odd / Even ✓

Name of the Teacher: Swetha K.R

Designation: Assistant Professor

Department: Computer Science & Engg

Sl. No	Sem. / Sec. / Branch	Subject	Code
1	IV / A / CSE	Design and Analysis of Algorithms	17CS43
2			
3			
4			

	REVIEWS at the End of the				End of Semester
	1st Month	2nd Month	3rd Month	4th Month	
Staff	Completed as per plan.	Completed as per plan	Completed as per plan	Completed as per plan	Swetha
HOD / Reviewer			B.K.Raj	B.K.Raj	B.K.Raj

LESSON PLANNING

Class : IV "A"

Subject with Code : Design and Analysis of Algorithms [17CS43]

Period : From 01/02/19 To 23/05/19

1st Month : From 01/02/19 To 28/02/19	No. of Hours Planned :	10	Actual No. of Hours Taken :	13

Chapter / Experiment / Module No. : 1 :- Introduction:

Module No: 2:- Divide and Conquer

HOD's Review and Sign. :

2nd Month : From 01/03/19 To 31/03/19	No. of Hours Planned :		Actual No. of Hours Taken :	

Chapter / Experiment / Module No. : 2 :- Divide and Conquer

Module:3 :- Greedy method

HOD's Review and Sign. :

3rd Month : From 01/04/19 To 30/04/19	No. of Hours Planned :		Actual No. of Hours Taken :	

Chapter / Experiment / Module No. : 3:- Greedy method.

Module 4 :- Dynamic Programming

HOD's Review and Sign. :

4th Month : From 01/05/17 To 22/05/17	No. of Hours Planned :		Actual No. of Hours Taken :	

Chapter / Experiment / Module No. : 5 Backtracking.

HOD's Review and Sign. :

5th Month : From ..... To	No. of Hours Planned :		Actual No. of Hours Taken :	

Chapter / Experiment / Module No. :

HOD's Review and Sign. :

Tutorials & Tests Conducted on

Tutorial - 1 : d d m m y y y y

Tutorial - 2 : d d m m y y y y

Tutorial - 3 : d d m m y y y y

Test - 1 : 03/03/2017

Test - 2 : 16/04/2017

Test - 3 : 10/05/2017

Staff Sign

B. K. Raj

HOD's Sign

LESSON PLANNING

Class : | | | Subject with Code :

Period : From ..... To .....

1st Month : From ..... To	No. of Hours Planned :		Actual No. of Hours Taken :	

Chapter / Experiment / Module No. :

HOD's Review and Sign. :

2nd Month : From ..... To	No. of Hours Planned :		Actual No. of Hours Taken :	

Chapter / Experiment / Module No. :

HOD's Review and Sign. :

3rd Month : From ..... To	No. of Hours Planned :		Actual No. of Hours Taken :	

Chapter / Experiment / Module No. :

HOD's Review and Sign. :

4th Month : From ..... To	No. of Hours Planned :		Actual No. of Hours Taken :	

Chapter / Experiment / Module No. :

HOD's Review and Sign. :

5th Month : From ..... To	No. of Hours Planned :		Actual No. of Hours Taken :	

Chapter / Experiment / Module No. :

HOD's Review and Sign. :

Tutorials & Tests Conducted on

Tutorial - 1 : d d m m y y y y

Tutorial - 2 : d d m m y y y y

Tutorial - 3 : d d m m y y y y

Test - 1 : d d m m y y y y

Test - 2 : d d m m y y y y

Test - 3 : d d m m y y y y

Staff Sign

HOD's Sign

ATTENDANCE

Class : IV "A" Subject : Design and Analysis of Algo

	Sl. No.	Reg. No.	Name	12/2	13/2	13/2	14/2	14/2	15/2	15/2
37				1	2	3	4	5	6	7
30	1.	16CS043	Niharika B.R	A	1	2	3	4	5	6
28	2.	17CS001	Abhishek URS C.J	1	2	3	A	A	4	A
30	3.	17CS002	Aishwarya.D	A	1	2	3	4	5	6
30	4.	17CS003	Aishwarya G.P	1	2	3	4	5	6	7
33	5.	17CS004	Aishwarya K.P	A	1	2	3	4	5	6
30	6.	17CS005	Ajay S	1	2	3	4	A	5	A
33	7.	17CS006	Akankasha K.P	1	2	3	4	5	6	7
28	8.	17CS008	Anjali K.S	A	1	2	3	4	5	6
34	9.	17CS009	Anupama A.M	A	1	2	3	4	5	6
30	10.	17CS010	Athgia Parheen N	1	A	A	2	3	4	A
29	11.	17CS012	Bhavan A.J	1	2	A	3	4	5	A
30	12.	17CS013	Bhavani N.D	A	A	A	A	A	A	1
31	13.	17CS014	Bhumika M.R	A	A	A	1	2	3	4
30	14.	17CS015	Bindu H	1	2	3	4	5	6	7
33	15.	17CS016	Brunda D	A	1	2	3	4	5	A
30	16.	17CS017	Chaithra R	1	2	3	4	5	6	A
30	17.	17CS018	Chaithra Jain H.R	A	1	2	A	A	3	4
33	18.	17CS020	Deekshitha C	A	1	2	3	4	5	A
33	19.	17CS021	Deepika A.N	1	2	3	4	5	6	7
33	20.	17CS022	Divya Khyani	1	2	3	4	5	6	A
28	21.	17CS023	Divyashree K.H	A	A	1	2	3	4	5
31	22.	17CS024	Harish Gowda	1	2	3	4	5	A	A
35	23.	17CS025	Harshitha Y	A	1	2	3	4	5	A
34	24.	17CS026	Hema D	1	2	3	4	5	6	7
34	25.	17CS027	Indushree G.J	1	2	3	4	5	6	7
		No. of Abs.								
		Initials								

gorithms [17CS43]

ASSESSMENT

2/2	2/2	2/2	26/2	27/2	29/2	1/3
8	9	10	11	12	13	14
7	8	9	10	11	12	13
5	6	7	8	9	10	11
7	8	9	10	11	12	13
8	9	10	11	12	13	14
7	8	9	10	11	12	13
6	7	8	9	10	11	12
8	9	10	11	12	13	14
A	A	A	7	8	9	10
7	8	9	10	11	12	13
5	6	7	8	9	A	10
6	7	8	9	10	11	A
2	3	11	5	6	7	8
5	6	7	8	9	10	11
8	9	10	11	12	13	14
6	7	8	9	10	11	12
7	8	9	10	11	12	13
5	6	7	8	9	10	11
6	7	8	9	10	A	A
8	9	10	A	11	12	13
7	8	9	10	11	12	13
6	7	8	9	10	11	12
6	7	8	9	10	11	12
6	7	8	9	10	11	12
8	9	10	11	12	13	14
8	9	10	11	12	13	14

Attendance			Test Marks			Sessional Marks	University Marks
A2	A3	A	T1	T2	T3		
89	92	92	10	12	20	24	
78	92	92	30	23	25	36	
89	96	96	17	15	10	24	
93	94	94	13	15	15	25	
95	96	96	16	15	16	26	
88	96	94	30	18	19	32	
94	96	96	30	20	29	36	
75	88	88	7	8	16	20	
88	94	94	27	21	29	36	
78	90	90	16	19	27	31	
88	90	90	30	26	26	37	
88	92	92	21	18	10	26	
94	94	94	28	28	29	36	
88	90	90	30	17	20	36	
92	92	92	22	03	17	24	
88	90	90	AB	25	26	27	
79	96	96	18	25	21	31	
88	94	94	27	24	23	35	
88	94	94	18	28	30	35	
88	90	90	29	24	25	36	
88	94	94	20	12	22	28	
88	94	94	24	17	05	25	
95	98	98	29	30	30	40	
95	98	98	24	23	06	28	
95	98	98	28	28	30	39	

10/5	11/5	13/5	13/5	14/5	14/5	15/5	15/5
45	46	47	48	49	50	51	52
H1	H2	H3	H4	H5	H6	H7	H8
H1	H2	H3	H4	H5	H6	H7	H8
H3	H3	H5	H6	H7	H8	H9	H0
H4	H5	H6	H7	H8	A	A	H9
H3	H4	H5	H6	H7	H8	H9	H0
H2	H3	H4	H5	H6	H7	H8	H9
H3	H4	H5	H6	H7	H8	H9	H0
39	H0	H1	H2	H3	H4	H5	H6
H2	H3	H4	H5	H6	H7	H8	H9
H0	H1	H2	H3	H4	H5	H6	H7
H0	H1	H2	H3	H4	H5	H6	H7
H1	H2	H3	H4	H5	H6	H7	H8
H2	H3	H4	H5	H6	H7	H8	H9
H0	H1	H2	H3	H4	H5	H6	H7
H1	H2	H3	H4	H5	H6	H7	H8
H0	H1	H2	H3	H4	H5	H6	H7
H0	H1	H2	H3	H4	H5	H6	H7
H3	H4	H5	H6	H7	H8	H9	H0
H2	H3	H4	H5	H6	H7	H8	H9
H2	H3	H4	H5	H6	H7	H8	H9
H0	H1	H2	H3	H4	H5	H6	H7
H2	H3	H4	H5	H6	H7	H8	H9
H4	H5	H6	H7	H8	H9	H0	H9
H4	H5	H6	H7	H8	H9	H0	H1
H4	H5	H6	H7	H8	H9	H0	H1
H9	H4	H4	H4	H4	H4	H4	H4

ASSESSMENT

53	54	55	56	57	58	59	60	Attendance				Test Marks			Sessional Marks	University Marks
								A1	A2	A3	A	T1	T2	T3		
								~~87~~	89	92	92	10	12	20	24	
								68	78	92	92	30	~~23~~	25	36	
								~~87~~	89	96	96	17	15	10	24	
								93	93	94	94	13	15	15	25	
								~~87~~	95	96	96	16	15	16	~~26~~	
								81	88	96	94	30	18	19	32	
								93	94	96	96	30	20	29	36	
								68	75	~~88~~	~~88~~	~~7~~	8	16	20	
								~~87~~	88	94	94	~~27~~	21	29	36	
								68	78	90	90	16	19	~~27~~	31	
								~~75~~	88	90	90	30	~~26~~	26	37	
								~~75~~	88	92	92	21	18	10	26	
								93	94	94	94	~~28~~	~~28~~	29	~~36~~	
								68	88	90	90	30	17	30	26	
								93	92	92	92	22	03	17	24	
								~~78~~	88	90	90	AB	25	26	27	
								68	74	96	96	18	25	31	31	
								~~87~~	88	94	94	27	24	23	35	
								81	88	94	94	18	28	30	35	
								81	88	90	90	29	24	25	36	
								81	88	94	94	20	12	22	28	
								81	82	94	94	24	17	05	25	
								93	95	98	98	29	30	30	40	
								93	95	98	98	24	23	06	28	
								93	96	98	98	28	28	30	39	

ATTENDANCE

Class : IV | 'A'

Subject : Design and Analysis of Algorithms [17CS43]

Sl. No.	Reg. No.	Name	12/2	13/2	13/2	14/2	14/2	19/2	19/2	21/2	24/2	25/2	27/2	28/2	1/3
			1	2	3	4	5	6	7	8	9	10	11	12	13	14
26	17CS028	Ishwarappa Havin	1	2	A	3	4	5	6	7	8	9	10	11	12	13
27	17CS029	Jeevan R	1	2	3	4	5	6	A	7	8	9	10	11	12	13
28	17CS031	Jinashree P	1	2	3	4	5	6	7	8	9	10	11	12	13	14
29	17CS032	Karthik K.P	1	2	A	3	4	5	6	7	8	9	10	11	12	13
30	17CS033	Karthik M Rao	1	2	A	A	A	3	A	4	5	6	7	8	A	A
31	17CS034	Lakshmikanth Gowda M	1	2	3	4	5	6	A	7	8	9	10	11	12	A
32	17CS035	Maanya K.V	1	2	3	4	5	6	7	8	9	10	11	12	13	14
33	17CS036	Manjushree C.S	1	2	3	4	5	6	7	8	9	10	11	12	13	14
34	17CS037	Manoj S.B	1	A	A	2	3	4	5	6	7	8	9	10	11	A
35	17CS038	Meghana K	1	2	3	4	5	6	7	8	9	10	11	12	13	14
36	17CS039	Meghana M.V	1	2	A	3	4	5	A	6	7	8	9	10	11	12
37	17CS040	Navyashree H.D	1	2	3	4	5	6	7	8	9	10	11	12	13	14
38	17CS041	Nikith G.S	A	1	A	2	3	4	A	5	6	7	8	9	10	11
39	17CS042	Noor Ayesha S	1	2	3	4	5	6	A	7	8	9	10	11	A	A
40	17CS043	Pooja D.R	1	2	3	4	5	6	7	8	9	10	11	12	13	A
41	17CS044	Pooja K.S	1	2	3	4	5	6	7	8	9	10	11	12	13	14
42	17CS045	Poojashree.G	1	2	3	4	5	6	7	8	9	10	11	12	13	14
43	17CS046	Priyadarshini P	A	A	A	1	2	3	4	5	6	7	8	9	10	11
44	17CS048	Priyanka V.L	1	2	3	4	5	6	A	7	8	9	10	11	12	13
45	17CS049	Puneeth Gowda A.C	1	2	A	A	A	3	4	5	6	7	A	8	9	10
46	17CS050	Puneeth Raj B.S	1	2	A	3	4	5	A	6	7	8	A	9	10	A
47	17CS051	Rahul B	1	2	A	3	4	5	A	6	7	8	A	9	A	A
48	17CS052	Rakesh C.S	1	2	A	3	4	5	6	7	8	9	10	11	12	13
49	17CS053	Rakshitha N	A	1	2	3	4	5	A	6	7	8	A	9	10	11
50	17CS054	Ramya K.L	1	2	3	4	5	6	7	8	9	10	11	12	13	14
	No. of Abs.															
	Initials															

ATTENDANCE

Class: IV | A

Subject: Design and Analysis of Algorithms (17CS43)

ASSESSMENT

	Sl. No.	Reg. No.	Name	11/2 (1)	12/2 (2)	13/2 (3)	14/2 (4)	14/2 (5)	15/2 (6)	17/2 (7)	18/2 (8)	19/2 (9)	20/2 (10)	21/2 (11)	22/2 (12)	25/2 (13)	1/3 (14)	Attendance A1	Attendance A2	Attendance A	Test Marks T1	Test Marks T2	Test Marks T3	Sessional Marks	Attendance Marks
36	51	17CS0[illegible]	Ranjitha B.S	1	2	3	4	5	6	7	8	9	10	A	11	12	13	95	98	98	18	25	07	20	
18	52	17CS0[illegible]	Ritesh Kumar Chanda	A	A	A	A	1	2	A	3	4	5	6	7	A	8	95	86	86	11	[illegible]	21	[illegible]	
24	53	17CS0[illegible]	Rohit Kumar JHA	A	1	2	A	3	4	A	5	6	7	8	9	10	11	80	[illegible]	[illegible]	1	4	20	[illegible]	
34	54	17CS0[illegible]	Sahana L.M	1	2	A	3	4	5	6	7	8	9	10	11	12	13	88	76	76	29	20	23	24	
34	55	17CS0[illegible]	Sanjana Gowda N.C	1	2	3	4	5	6	A	7	8	9	10	11	12	13	88	71	71	[illegible]	30	26	37	
35	56	17CS060	Sanjay Kumar C.G	1	2	3	4	5	6	A	7	8	9	10	11	12	13	95	93	92	21	[illegible]	22	28	
32	57	17CS061	Shankreppa Handargal	1	2	3	4	5	6	A	7	8	9	10	11	12	13	70	76	[illegible]	[illegible]	17	7	[illegible]	
35	58	17CS062	Shivalli	1	2	A	3	4	5	6	7	8	9	10	11	12	13	95	95	93	27	01	12	[illegible]	
34	59	17CS063	Shrusti H	1	2	3	4	5	6	A	7	8	9	10	11	12	13	94	96	94	22	15	22	30	
23	60	17CS064	Siddarth Singh	A	A	A	A	1	2	A	3	4	5	6	7	8	9	75	88	88	21	20	18	31	
35	61	17CS065	Sinchana B.R	1	2	3	4	5	6	A	7	8	9	10	11	12	13	95	95	93	24	24	20	33	
33	62	17CS066	Smitha B.U	1	2	3	A	A	A	A	4	5	6	7	8	9	10	88	92	92	26	12	25	32	
28	63	17CS084	Namratha H.R	A	1	2	3	4	5	6	A	A	7	8	9	10	11	88	94	94	11	29	24	31	
22	64	17CS055	Nayana	A	1	2	A	A	3	4	5	6	7	8	9	A	10	88	90	90	24	08	11	24	
28	65	17CS036	Sowmya Jakkur	1	2	A	3	A	4	A	5	6	A	A	7	8	9	75	88	88	22	30	23	32	
35	66	18CS405	Dhananjaya	1	2	3	4	5	6	7	8	9	10	11	12	13	14	100	100	100	[illegible]	[illegible]	30	35	
30	67	18CS404	Gagan B.S	A	A	A	1	2	3	4	5	6	7	8	9	10	A	78	90	90	18	18	10	25	
26	68	18CS406	Girish Reddy	A	A	1	2	3	4	5	6	7	8	9	10	11	12	85	92	92	04	03	20	17	
10	69	18CS410	Vidyasagar	A	A	A	A	A	A	A	A	1	A	2	3	A	4	80	86	86	05	13	12	20	
	70																								
	71																								
	72																								
	73																								
	74																								
	75																								
	No. of Abs.																								
	Initials			KY	KY	KY	KY	KY	KY	KY	KY	KY	KY	KY	KY	KY	KY	KY	KY	KY	KY	KY	KY	KY	

ATTE

Class: IV A

	Sl. No.	Reg. No.	Name
36	51	17CS055	Ranjitha B.S
19	52	17CS056	Ritesh kumar ch
24	53	17CS051	Rohit kumar JH
34	54	17CS05A	Sahana L.M
34	55	17CS057	Sanjana Gowda
35	56	17CS060	Sanjay kumar
32	57	17CS061	Shankreppa Har
35	58	17CS062	Shifalli
34	59	17CS063	Shrusti H
23	60	17CS064	Siddarth Sing
35	61	17CS065	Sinchana B.R
33	62	17CS066	Smitha B.U
29	63	17CS054	Namratha H.R
22	64	17CS055	Nayana
28	65	17CS036	Sowmya Jakku
35	66	18CS403	Dhananjaya
30	67	18CS404	Gagan B.S
26	68	18CS406	Girish Reddy
10	69	18CS410	Vidyasagar
	70		
	71		
	72		
	73		
	74		
	75		
		No. of Abs.	
		Initials	

Sl. No.	5/3	6/3	12/3	13/3	14/3	14/3	15/3	19/3
	15	16	17	18	19	20	21	22
51	14	15	16	17	18	19	20	21
52	A	A	9	A	10	11	12	13
53	12	A	A	A	13	14	15	16
54	A	14	15	16	17	18	19	20
55	A	14	15	16	17	18	19	20
56	14	15	16	17	18	19	20	21
57	A	14	15	16	17	18	19	20
58	14	15	16	17	18	19	20	21
59	14	15	16	17	18	19	20	21
60	10	11	A	12	13	14	15	16
61	14	15	16	17	18	19	20	21
62	11	12	13	14	15	16	17	18
63	12	13	14	15	16	17	18	19
64	11	12	A	13	14	15	16	17
65	A	10	11	12	13	14	15	16
66	15	16	17	18	19	20	21	22
67	A	11	12	13	14	15	16	17
68	A	A	13	14	15	16	17	18
69	5	6	7	8	9	10	11	12
Initials	14	14	14	14	14	14	14	14

Sl. No.	[illegible]	20/3	21/3	26/3	27/3	28/3	29/3
	23	24	25	26	27	28	29
51	22	23	24	25	26	27	28
52	14	13	16	17	18	19	20
53	17	18	19	20	21	22	23
54	21	22	23	24	25	26	27
55	21	22	23	23	25	26	27
56	22	23	24	25	26	27	28
57	21	22	23	24	25	26	27
58	22	23	24	25	26	27	28
59	22	23	24	25	26	27	28
60	17	18	19	20	21	22	23
61	22	23	24	25	26	27	28
62	29	20	21	22	23	24	25
63	20	21	22	23	24	25	26
64	18	19	20	21	22	23	24
65	17	18	19	20	21	22	23
66	23	24	25	26	27	28	29
67	18	19	20	21	22	23	24
68	19	20	21	22	23	24	25
69	13	14	15	16	17	18	19
Initials	14	14	14	14	14	14	14

ASSESSMENT

Sl. No.	Attendance			Test Marks			Sessional Marks	University Marks
	A2	A3	A	T1	T2	T3		
51	95	98	98	18	05	07	20	
52	75	86	86	11	12	27	24	
53	80	85	85	1	4	28	[illegible]	
54	88	96	96	29	20	23	24	
55	88	96	96	20	30	26	37	
56	75	98	98	24	[illegible]	22	28	
57	70	76	[illegible]	[illegible]	17	2	A+1	
58	95	98	98	27	01	12	A-1	
59	94	94	94	[illegible]	15	23	30	
60	75	88	88	01	22	16	31	
61	95	95	95	14	24	20	33	
62	88	92	92	26	12	25	32	
63	88	94	94	11	29	24	31	
64	88	90	90	24	08	11	24	
65	75	88	88	[illegible]	30	[illegible]	32	
66	100	100	100	[illegible]	06	30	[illegible]	
67	78	90	90	18	18	10	25	
68	85	92	92	04	02	22	[illegible]	
69	82	86	86	05	13	12	20	
Initials	14	14	14	14	14	14	14	

ATT[illegible]

Class: [illegible]

	Sl. No.	Reg. No.	Name
36	51	[illegible]	Ranjitha B.S
19	52	[illegible]	Ritesh kumar Cl[illegible]
24	53	[illegible]	Rohit kumar JH[illegible]
39	54	[illegible]	Sahana L.M
34	55	[illegible]	Sanjana Gowd[illegible]
35	56	17CS060	Sanjay kumar
32	57	17CS061	Shankreppa Ha[illegible]
35	58	17CS062	Shigalli
34	59	17CS063	Shruthi H
23	60	17CS064	Siddarth Sin[illegible]
35	61	17CS065	Sinchana B.R
33	62	17CS066	Smitha B.U
29	63	17CS084	Namratha H.R
22	64	17CS085	Nayana
28	65	17CS086	Sowmya Jakku[illegible]
35	66	18CS405	Dhananjaya
30	67	18CS404	Gagan B.S
26	68	18CS406	Girish Reddy
10	69	18CS410	Vidyasagar
	70		
	71		
	72		
	73		
	74		
	75		
		No. of Abs.	
		Initials	

[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
30	31	32	33	34	35	36	37
29	30	31	32	33	34	35	36
21	22	23	24	25	26	27	28
24	25	26	27	28	29	30	31
28	29	30	31	32	33	34	35
28	29	30	31	32	33	34	35
29	30	31	32	33	34	35	36
28	29	30	31	32	33	34	35
29	30	31	32	33	34	35	36
29	30	31	32	33	34	35	36
24	25	26	27	28	29	30	31
29	30	31	32	33	34	35	36
26	27	28	29	30	31	32	33
27	28	29	30	31	32	33	34
25	26	27	28	29	30	31	32
24	25	26	27	28	29	30	31
30	31	32	33	34	35	36	37
25	26	27	28	29	30	31	32
26	27	28	29	30	31	32	33
20	21	22	23	24	25	26	27

[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
38	39	40	41	42	43	44
37	38	39	40	41	42	43
29	30	31	32	33	34	35
32	33	34	35	36	37	38
36	37	38	39	40	41	42
36	37	38	39	40	41	42
37	38	39	40	41	42	43
36	37	38	39	40	41	42
37	38	39	40	41	42	43
37	38	39	40	41	42	43
32	35	34	35	36	37	38
37	38	39	40	41	42	43
34	35	36	37	38	39	40
35	36	37	38	39	40	41
33	34	35	36	37	38	39
32	33	34	35	36	37	38
33	39	40	41	42	43	44
33	34	35	36	37	38	39
34	35	36	37	38	39	40
28	29	30	31	32	33	35

ASSESSMENT

Attendance			Test Marks			Sessional Marks	Marks (University)
[illegible]	[illegible]	[illegible]	T1	T2	T3		
95	98	98	18	05	07	[illegible]	
75	86	86	11	4	21	[illegible]	
80	85	85	1	[illegible]	28	[illegible]	
88	96	96	29	20	23	[illegible]	
88	96	96	30	30	26	[illegible]	
95	93	92	24	21	23	33	
90	96	[illegible]	[illegible]	17	2	[illegible]	
95	95	94	27	11	12	[illegible]	
94	96	96	[illegible]	[illegible]	23	30	
75	82	83	01	22	18	31	
95	93	93	26	24	23	33	
82	92	92	26	12	25	32	
89	94	94	11	29	24	31	
88	90	90	26	08	11	24	
75	85	85	[illegible]	29	23	32	
100	100	100	[illegible]	[illegible]	20	[illegible]	
73	90	90	18	18	10	25	
85	92	92	04	02	22	[illegible]	
50	86	86	05	13	18	10	

ATTE

Class: 4 | B

Sl. Num	Reg. Num	Name	45	46	47	48	49	50	51	52
31	1HK22CS[illegible]	Ranjitha B.S	114	115	116	117	118	119	50	51
32	1HK22CS[illegible]	Rikah kumari ch	38	39	40	41	42	43	44	45
33	1HK22CS[illegible]	Rohit kumar JH	39	40	41	42	43	44	45	46
34	1HK22CS[illegible]	Sahana L.M	113	114	115	116	117	118	119	50
35	1HK22CS[illegible]	Sanjana Gowda	113	114	115	116	117	118	119	50
36	1HK22CS[illegible]	Sanjay kumar	114	115	116	117	118	119	120	51
37	1HK22CS[illegible]	Shankreppa Har	113	114	115	116	117	118	119	50
38	1HK22CS[illegible]	Shigalli	114	115	116	117	118	119	50	51
39	1HK22CS[illegible]	Shruthi M	114	115	116	117	118	119	50	51
40	1HK22CS[illegible]	Siddarth Singh	39	40	41	42	43	44	45	46
41	1HK22CS[illegible]	Sinchana B.R	114	115	116	117	118	119	50	51
42	1HK22CS[illegible]	Smitha B.U	41	42	43	44	45	46	47	48
43	1HK22CS[illegible]	Namratha H.R	118	119	46	45	46	47	48	49
44	1HK22CS[illegible]	Nayana	40	41	42	43	44	45	46	47
45	1HK22CS[illegible]	Soumya JALLU	39	40	41	42	43	44	45	46
46	1RC23CI[illegible]	Dhananjaya	45	46	47	48	49	50	51	52
47	1RC23CI[illegible]	Eshan B.S	40	41	42	43	44	45	46	47
48	1RC23CI[illegible]	Girish Reddy	41	42	43	44	45	46	47	48
49	1RC23ME[illegible]	Vidyasagar	38	39	40	41	42	43	44	45
70										
71										
72										
73										
74										
75										
	No. of Abs.									
	Initials									

ASSESSMENT

53	54	55	56	57	58	59	60	Attendance A1	A2	A3	A	Test Marks T1	T2	T3	Assignment Marks	University Marks
								73	75	78	78	18	05	07	30	
								50	45	80	85	14	40	24	44	
								75	80	85	85	1	14	28	37	
								87	88	90	90	39	40	23	34	
								81	88	75	70	50	50	26	37	
								73	75	75	78	21	22	22	28	
								22	20	20	20	13	13	2	14	
								93	95	95	98	29	31	19	37	
								93	94	90	94	23	15	23	30	
								50	75	88	85	01	22	18	31	
								93	95	95	93	24	20	20	33	
								75	88	92	93	26	13	25	32	
								81	88	90	94	11	29	24	31	
								75	88	90	90	26	08	11	29	
								62	75	85	88	23	39	23	32	
								100	100	100	100	28	26	20	35	
								68	78	80	90	18	18	10	25	
								75	85	92	92	21	02	20	14	
								25	50	86	86	05	13	12	30	

ATTENDANCE

Class: IV | B Subject: Design and Analysis of Algorithms [15CS43]

ASSESSMENT

Sl. No.	Reg. No.	Name	9/3	10/3	11/3	15/3	18/3	20/3	22/3	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	Attendance			Test Marks			Sessional Marks	Remarks
			1	2	3	4	5	6	7	8	9	10	11	12	13	14			%	T1	T2	T3		
1.	4BW17CS067	SMITHA M	1	2	3	4	5	6	7	8	9	10	11	12	13	14	[illegible]	93	93	22	20	18	30	
2.	4BW17CS068	SNEHA N J	1	2	3	4	5	6	7	8	9	10	11	12	13	14	10	98	98	25	22	27	35	
3.	4BW17CS069	SOWNDARYA L T	1	2	3	4	5	6	7	8	9	10	11	12	13	14	10	95	95	26	10	30	34	
4.	4BW17CS070	SPOORTHI H	1	2	3	4	5	6	7	8	9	10	11	12	13	14	10	93	93	15	7	30	31	
5.	4BW17CS071	SPOORTHI R	1	2	3	4	5	6	A	7	8	9	10	11	12	13	12	93	93	26	32	30	38	
6.	4BW17CS072	SPOORTHI C	1	2	3	4	5	6	7	8	9	10	11	12	13	14	10	95	95	13	1	30	31	
7.	4BW17CS074	SWATHI D	1	2	3	4	5	6	7	8	9	10	11	12	13	14	13	98	98	18	18	33	41	
8.	4BW17CS075	TASMIYA	1	2	3	4	5	6	7	8	9	10	11	12	13	14	10	93	93	14	10	29	28	
9.	4BW17CS076	TEJAS RAHUL R	1	2	3	4	A	5	6	7	8	9	10	11	12	13	28	91	91	00	06	22	19	
10.	4BW17CS077	THEJAS G C	1	2	3	4	5	6	7	8	9	10	11	12	13	14	10	95	95	06	00	30	20	
11.	4BW17CS078	VARALAKSHMI C K	1	2	3	4	5	6	7	8	A	9	10	11	12	13	13	98	95	25	25	29	34	
12.	4BW17CS081	YASHASHWINI H M	1	2	3	4	5	6	7	8	9	10	11	12	13	14	12	98	95	14	9	13	19	
13.	4BW17CS082	YOGASHREE C R	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	98	98	25	10	14	26	
14.	4BW17CS083	YOGESH G L	1	2	3	4	5	6	7	8	9	10	11	12	13	14	13	95	95	02	05	21	17	
15.	4BW15CS064	RAKSHITHA S R	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	98	93	17	11	16	25	
16.	4BW16CS055	RAJU M D	1	2	3	4	A	5	6	7	8	9	10	11	12	13	13	95	95	14	20	24	30	
17.	4BW16CS074	THEJAS G S	1	2	3	4	5	6	7	8	9	10	11	12	A	13	8	95	95	12	10	29	25	
18.	4BW18CS400	ANUSHA K J	1	2	3	4	5	6	7	8	9	10	11	12	13	14	12	98	98	11	4	33	23	
19.	4BW18CS401	BINDHUSHREE A C	1	2	3	4	5	6	7	8	9	10	11	12	13	14	18	98	98	16	21	29	32	
20.	4BW18CS402	BHAVYA J K	1	2	3	4	5	6	7	8	9	10	11	12	13	14	8	98	98	10	14	25	27	
21.	4BW18CS405	GAYITHRI K	1	2	3	4	5	6	7	8	9	A	10	11	12	13	15	95	95	23	19	25	32	
22.	4BW18CS407	GREESHMA M S	1	2	3	4	5	6	7	8	9	10	11	12	13	14	6	98	98	16	7	14	20	
23.	4BW18CS408	KALAVATHI R	1	2	3	4	5	6	7	8	9	10	11	12	13	14	10	95	95	16	10	30	29	
24.	4BW18CS409	KEERTHI B L	1	2	3	4	A	5	6	7	8	9	10	11	12	13	13	95	95	14	01	23	23	
25.	4BW17IS002	ANUSHA K	1	A	2	3	4	5	6	7	8	9	10	11	12	13	3	98	98	25	05	15	25	
	No. of Abs.																							
	Initials		[signature]	[signature]	[signature]	[signature]	[signature]	[signature]	[signature]	[signature]	[signature]	[signature]	[signature]	[signature]	[signature]	[signature]	[signature]	[signature]	[signature]	[signature]	[signature]	[signature]	[signature]	

ATTE

ASSESSME

Class: 3A B

Sl. No.	Usn	Name
1	4BW17CS067	SMITHA M
2	4BW17CS068	SNEHA N J
3	4BW17CS069	SOWNDARYA L T
4	4BW17CS070	SPOORTHI H
5	4BW17CS071	SPOORTHI R
6	4BW17CS072	SPOORTHI C
7	4BW17CS074	SWATHI D
8	4BW17CS075	TASMIYA
9	4BW17CS076	TEJAS RAHUL R
10	4BW17CS077	THEJAS G C
11	4BW17CS078	VARALAKSHMI C K
12	4BW17CS081	YASHASHWINI H M
13	4BW17CS082	YOGASHREE C R
14	4BW17CS083	YOGESH G L
15	4BW15CS064	RAKSHITHA S R
16	4BW16CS055	RAJU M D
17	4BW16CS074	THEJAS G S
18	4BW18CS400	ANUSHA K J
19	4BW18CS401	BINDHUSHREE A C
20	4BW18CS402	BHAVYA J K
21	4BW18CS405	GAYITHRI K
22	4BW18CS407	GREESHMA M S
23	4BW18CS408	KALAVATHI R
24	4BW18CS409	KEERTHI B L
25	4BW17IS002	ANUSHA K
		No. of Abs.
		Initials

15/3	16/3	17/3	18/3	19/3	20/3	21/3	22/3
15	16	17	18	19	20	21	22
15	16	17	18	19	20	21	22
15	16	17	18	19	20	21	22
15	16	17	18	19	20	21	22
14	15	16	17	18	A	19	20
15	16	17	18	19	20	21	22
15	16	17	18	19	20	21	22
15	16	17	18	A	19	20	21
14	15	16	17	18	19	20	21
15	16	17	18	19	20	21	A
14	15	16	17	18	19	20	21
15	16	17	18	19	20	21	22
15	16	17	18	A	19	20	21
15	16	17	18	19	20	21	22
15	16	17	18	19	20	21	22
14	15	16	17	18	19	20	21
14	15	16	A	17	18	19	20
15	16	17	18	19	20	21	22
15	16	17	18	19	20	A	21
15	16	17	18	19	20	21	22
14	15	16	17	18	19	20	21
15	16	17	18	19	20	21	22
15	16	17	A	18	19	20	21
14	15	16	17	A	18	19	20
14	15	16	17	18	19	20	21
14	14	15	14	14	14	14	14

32

23/3	24/3	25/3	26/3	27/3	28/3	29/3
23	24	25	26	27	28	29
A	23	24	25	26	27	28
23	24	25	26	27	A	28
23	24	25	26	27	28	A
23	24	25	26	27	28	29
A	23	24	25	26	27	28
22	23	24	25	26	27	28
23	24	25	26	A	27	28
22	23	24	25	26	27	28
23	24	25	26	27	A	28
23	24	25	26	A	27	28
A	23	24	25	26	27	28
21	22	23	24	25	26	27
23	24	25	26	27	A	28
22	23	24	25	26	27	28
A	23	24	25	26	27	28
22	23	A	24	25	26	27
23	24	A	25	26	27	28
22	23	24	25	26	27	28
21	22	23	24	25	26	27
22	23	24	25	26	27	28
14	14	14	14	14	14	14

33

Randomno			Test Marks			Assignment Marks	Seminar Marks
1	2	3	T1	T2	T3		
23	25	23	22	20	16	10	
20	18	18	15	16	20	15	
10	15	13	20	15	20	20	
19	23	21	5	7	20	21	
13	23	23	26	22	20	18	
10	16	15	13	1	20	21	
13	18	23	18	12	23	11	
10	12	23	17	10	21	16	
18	21	21	20	16	22	19	
10	25	25	20	20	20	20	
13	23	25	25	23	23	18	
23	25	25	14	9	13	17	
25	25	23	25	10	14	16	
23	25	25	02	05	21	17	
15	23	23	17	11	16	25	
13	25	25	14	20	24	20	
8	25	25	12	10	29	25	
10	23	25	11	4	33	23	
25	25	25	16	21	29	22	
25	25	25	12	14	25	24	
15	25	21	23	19	25	22	
6	23	23	06	7	14	28	
20	25	21	16	10	20	20	
13	25	19	14	01	23	23	
13	23	23	25	05	15	25	
14	14	14	14	14	14	14	

ATTEN

Class : IV B

Sl. No.	Reg. No.	Name
1.	4BW17CS067	SMITHA M
2.	4BW17CS068	SNEHA N J
3.	4BW17CS069	SOWNDARYA L T
4.	4BW17CS070	SPOORTHI H
5.	4BW17CS071	SPOORTHI R
6.	4BW17CS072	SPOORTHI C
7.	4BW17CS074	SWATHI D
8.	4BW17CS075	TASMIYA
9.	4BW17CS076	TEJAS RAHUL R
10.	4BW17CS077	THEJAS G C
11.	4BW17CS078	VARALAKSHMI C K
12.	4BW17CS081	YASHASHWINI H M
13.	4BW17CS082	YOGASHREE C R
14.	4BW17CS083	YOGESH G L
15.	4BW15CS064	RAKSHITHA S R
16.	4BW16CS055	RAJU M D
17.	4BW16CS074	THEJAS G S
18.	4BW18CS400	ANUSHA K J
19.	4BW18CS401	BINDHUSHREE A C
20.	4BW18CS402	BHAVYA J K
21.	4BW18CS405	GAYITHRI K
22.	4BW18CS407	GREESHMA M S
23.	4BW18CS408	KALAVATHI R
24.	4BW18CS409	KEERTHI B L
25.	4BW17IS002	ANUSHA K
	No. of Abs.	
	Initials	

2/11	19/11	23/11	24/11	25/11	29/11	3/12	6/12
30	31	32	33	34	35	36	37
29	30	31	32	33	A	34	35
30	31	32	33	34	35	36	37
29	30	31	32	33	34	35	36
29	30	31	32	33	34	A	35
28	29	30	31	32	33	34	35
29	30	31	32	33	34	35	36
30	31	32	33	34	35	36	A
28	29	30	31	32	33	34	35
27	28	29	30	31	32	33	A
29	30	31	32	33	34	35	36
29	30	31	32	33	34	35	36
29	30	31	32	33	34	35	36
29	30	31	32	33	34	35	36
29	30	31	32	33	34	35	36
29	30	31	32	33	34	35	36
28	29	30	31	32	33	34	35
28	29	30	31	32	33	34	35
29	30	31	32	33	34	35	36
29	30	31	32	33	34	35	36
29	30	31	32	33	34	35	36
28	29	30	31	32	33	34	35
29	30	31	32	33	34	35	36
29	30	31	32	33	34	35	36
28	29	30	31	32	33	34	35
29	30	31	32	33	34	35	36

34

6/5	7/5	7/5	8/5	9/5	13/5	13/5
38	39	40	41	42	43	44
36	37	38	39	A	40	41
38	39	40	A	41	42	43
37	38	39	40	41	A	42
36	37	38	39	40	A	41
36	37	38	39	40	41	A
37	38	39	40	41	A	42
37	38	39	40	41	42	43
36	A	37	38	39	40	41
34	35	36	37	38	39	40
A	37	38	39	40	41	42
37	38	39	40	41	42	43
37	38	39	40	41	42	43
37	38	39	40	41	42	43
37	38	39	40	A	41	42
37	38	39	40	41	42	43
36	37	38	39	40	41	42
36	37	38	39	40	41	42
37	38	39	40	41	42	43
37	38	39	40	41	42	43
37	38	39	40	41	42	43
36	37	38	39	40	41	42
37	38	39	40	41	42	43
37	38	39	40	41	42	43
36	37	38	39	40	41	42
37	38	39	40	41	42	43

35

ASSESSME

Attendance			Test Marks			Sessional Marks	University Marks
A2	A3	A	T1	T2	T3		
28	93	93	22	20	16	30	
10	98	98	27	20	25	35	
10	95	95	26	10	30	30	
10	93	93	17	17	30	31	
12	93	93	26	08	30	38	
10	95	95	13	1	20	21	
13	98	98	18	18	21	29	
10	93	93	14	10	29	28	
38	91	91	00	06	22	19	
10	95	95	06	00	30	22	
13	98	98	28	25	29	37	
13	98	98	14	2	18	19	
15	98	98	25	10	14	26	
13	95	95	02	05	21	19	
15	98	98	17	11	16	25	
13	95	95	14	20	07	30	
13	95	95	12	10	28	25	
12	98	98	11	4	23	23	
38	98	98	16	21	29	32	
18	98	98	10	14	25	27	
15	95	95	23	19	25	32	
16	98	98	16	7	14	22	
10	95	95	16	10	30	29	
13	95	95	14	01	23	23	
13	98	98	25	05	15	25	

ATTEN

Class : IV B

Sl. No.	Reg. No.	Name
1.	4BW17CS067	SMITHA M
2.	4BW17CS068	SNEHA N J
3.	4BW17CS069	SOWNDARYA L T
4.	4BW17CS070	SPOORTHI H
5.	4BW17CS071	SPOORTHI R
6.	4BW17CS072	SPOORTHI C
7.	4BW17CS074	SWATHI D
8.	4BW17CS075	TASMIYA
9.	4BW17CS076	TEJAS RAHUL R
10.	4BW17CS077	THEJAS G C
11.	4BW17CS078	VARALAKSHMI C K
12.	4BW17CS081	YASHASHWINI H M
13.	4BW17CS082	YOGASHREE C R
14.	4BW17CS083	YOGESH G L
15.	4BW15CS064	RAKSHITHA S R
16.	4BW16CS055	RAJU M D
17.	4BW16CS074	THEJAS G S
18.	4BW18CS400	ANUSHA K J
19.	4BW18CS401	BINDHUSHREE A C
20.	4BW18CS402	BHAVYA J K
21.	4BW18CS405	GAYITHRI K
22.	4BW18CS407	GREESHMA M S
23.	4BW18CS408	KALAVATHI R
24.	4BW18CS409	KEERTHI B L
25.	4BW17IS002	ANUSHA K
	No. of Abs.	
	Initials	

45	46	47	48	49	50	51	52
14/5	14/5						
H2	H3						
H4	H5						
H3	H4						
H2	H3						
H2	H3						
H3	H4						
H4	H5						
H2	H3						
H1	H2						
H3	H4						
H4	H5						
H4	H5						
H4	H5						
H3	H4						
H4	H5						
H3	H4						
H3	H4						
H4	H5						
H4	H5						
H4	H5						
H3	H4						
H4	H5						
H4	H5						
H3	H4						
H4	H5						
H4	H4						

ASSESSMEN

53	54	55	56	57	58	59	60	Attendance A1	A2	A3	A	Test Marks T1	T2	T3	Sessional Marks	University Marks
								85	88	93	93	22	20	16	30	
								85	90	98	98	27	23	25	35	
								88	90	95	95	26	10	30	38	
								88	90	93	93	17	17	30	31	
								85	92	93	93	26	08	30	38	
								82	90	95	95	13	1	20	21	
								88	93	98	98	18	18	21	29	
								85	90	93	93	14	10	89	28	
								80	88	91	91	00	06	22	19	
								85	90	95	95	06	00	30	22	
								88	93	98	98	28	25	29	37	
								88	93	98	98	14	2	13	19	
								80	95	98	98	25	10	14	26	
								88	93	95	95	02	05	21	19	
								88	95	98	98	17	11	16	25	
								80	93	95	95	14	20	07	30	
								88	93	95	95	12	10	28	25	
								88	92	98	98	11	4	23	23	
								85	88	98	98	16	21	29	32	
								85	88	98	98	12	14	25	27	
								83	95	95	95	23	19	25	32	
								88	96	98	98	16	7	14	22	
								88	90	95	95	16	10	30	29	
								85	93	95	95	14	01	23	23	
								85	93	98	98	25	05	15	25	
								H	H	H	H	H	H	H	H	

WORK DIARY

Monday	Tuesday	Wednesday
Date :	Date :	Date :
Date : 04/2/19	Date : 5/2/19 IV 'A', DAA 5th hour	Date : 6/2/19 IV 'A', DAA 2nd hour
Date : 11/2/19	Date : 12/2/19 IV 'A', DAA 5th hour Module 1: Introduction :- Algorithm	Date : 13/2/19 IV 'A', DAA 2nd hour Algorithm Specification

WORK DIARY

Thursday	Friday	Saturday Date : 02/02/19
Date :	Date : 01/02/19 IV 'A', DAA 2nd hour	Sunday Date : 03/02/19
Date : 7/2/19 IV 'A' DAA 1st hour & 2nd hour	Date : 8/2/19 IV 'A' DAA 2nd hour	Saturday Date : 9/2/19 Sunday Date : 10/2/19
Date : 14/2/19 IV 'A' DAA 1st & 2nd hour Analysis framework. Space Efficiency Time Efficiency	Date : 15/2/19 IV 'A' DAA 2nd hour Performance Analysis Space Complexity	Saturday Date : 16/2/19 Sunday Date : 17/2/19

WORK DIARY

Monday	Tuesday	Wednesday
Date : 18/2/19	Date : 19/2/19 IV A DAA 5th hour " JUTN Project "	Date : 20/2/19 IV A DAA 2nd hour Time Complexity -Asymptotic Notations → Big-oh notation
Date : 25/2/19	Date : 26/2/19 IV A DAA. 5th hour → Mathematical Analysis of Non Recursive Algorithms. General steps. Example problems	Date : 27/2/19 IV A DAA 2nd hour → Elements of analysis Problem → Excessise problems
Date : 04/03/19	Date : 05/03/19 IV A DAA 5th hour Module 2:- Divide and Conquer Introduction Analysis of D&C	Date : 06/03/19 IV A DAA 2nd hour Module 1. Question Paper Questions Revision

WORK DIARY

Thursday	Friday	Saturday
Date : 21/2/19 IV A DAA 1st & 4th hr → Big-omega notation → Theta notation → Little-oh notation Problems on Asymptotic notation	Date : 22/2/19 IV DAA. 2nd hour Important Problem types • Linear data structures • Non linear data structures Fundamental data structures.	Saturday Date : 23/2/19 Sunday Date : 24/2/19
Date : 28/2/19 IV A DAA 1st & 4th hr Mathematical Analysis of Recursive Algorithms General steps. Example problems forward Substitution Backward Substitution	Date : 01/3/19 IV A DAA. 2nd hour Mathematical Analysis of Recursive Algorithms example Problems	Saturday Date : 02/03/19 Sunday Date : 03/03/19
Date : 07/03/19 IV A DAA 1st & 4th hr ← 1st	Date : 08/03/19 IV A DAA 2nd hr Internals →	Saturday Date : 09/03/19 Sunday Date : 10/03/19

WORK DIARY

Monday	Tuesday	Wednesday
Date : 11/03/19	Date : 12/03/19 IV 'A' DAA, 5th hour General Method of Divide & Conquer.	Date : 13/03/19 IV 'A' DAA, 2nd hour Binary search • Iterative Method • Recursive Method
Date : 18/03/19	Date : 19/03/19 IV 'A' DAA, 5th hour Strassen's Matrix multiplication	Date : 20/03/19 IV 'A' DAA, 2nd hour Decrease and Conquer Topological Sequence
Date : 25/03/19 V 'B' DAA, 1st & 5th hour Strassen's Matrix Multiplication	Date : 26/03/19 IV 'A' DAA, 5th hr Problems on topological Sort using Source Removal Method	Date : 27/03/19 IV 'A' DAA, 2nd hr Revision on Module 3. IV 'B' DAA, 3rd hour → Analysis of Strassen's Matrix Mul

WORK DIARY

Thursday	Friday	Saturday
Date : 14/03/19 IV 'A' DAA, 1st hr & 4th hr • merge sort Algorithm • Analysis • Problem	Date : 15/03/19 IV 'A' DAA, 2nd hour • Quick Sort Algorithm • Problem	Saturday Date : 16/03/19 Sunday Date : 17/03/19
Date : 21/03/19 IV 'A' DAA, 1st & 4th hr → using DFS Method Algorithm. Problem.	Date : 22/03/19 IV 'A' DAA, 2nd hr Topological sort using Source Removal Method	Saturday Date : 23/03/19 Sunday Date : 24/03/19
Date : 28/03/19 IV 'A' DAA, 1st & 4th hr Module - 4 Dynamic Programming → Introduction → Multistage Graph IV 'B' DAA 3rd hour. → Problems	Date : 29/03/19 IV 'A' DAA, 2nd hr → Multistage Graph Problems → Warshall's Algorithm IV 'B' DAA 4th hour Module-4 → Introduction	Saturday Date : 30/03/19 IV ~~A~~ DAA 4th hour ← Technical Fault → Sunday Date : 31/8/19

WORK DIARY

Monday	Tuesday	Wednesday
Date : 1/4/19 IV 'B' DAA 1st & 5th hour → Multistage graph → Problems on forward approach → Problems on Backward approach.	Date : 2/4/19 IV 'A' DAA. 5th hr → Warshall's Algorithm → Analysis	Date : 3/4/19 IV 'A' DAA, 2nd hr 0/1 knapsack Algorithm IV 'B' DAA 3rd hour Multistage graph. forward approach. Backward approach
Date : 8/4/19 IV 'B' DAA 1st & 5th hour 0/1 knapsack Problem.	Date : 9/4/19 IV 'A' DAA, 5th hr Bellman ford Algorithm IV	Date : 10/4/19 IV 'A' DAA, 2nd hr Bellman ford Multistage graph forward Approach IV 'B' DAA 3rd hour Bellman ford Algorithm forward Approach.
Date : 15/4/19 IV 'B' DAA 1st & 5th hour ← IInd internals	Date : 16/4/19 IV 'A' DAA, 5th hr →	Date : 17/4/19 IV 'A' DAA, 2nd hr IV 'B' DAA 3rd hour

WORK DIARY

Thursday	Friday	Saturday Date : 6/4/19
Date : 4/4/19 IV 'A' DAA 3rd & 4th hr 0/1 knapsack problem IV 'B' DAA 3rd hour warshall's Algorithm	Date : 5/4/19 IV 'A' DAA, 2nd hr Memory function IV 'B' DAA 4th hours floyd's Algorithm	IV 'A' DAA 4th hour ← UGADI FESTIVAL → Sunday Date : 7/4/19
Date : 11/4/19 IV 'A' DAA, 1st & 4th hr Backward approach after optimal binary search Problem IV 'B' DAA 3rd hours Backward approach optimal binary search problem	Date : 12/4/19 IV 'A' DAA, 2nd hr optimal binary search problem IV 'B' DAA 4th hours optimal binary Search problem	Saturday Date : 13/4/19 IV 'A' DAA 4th hour IInd Internals Sunday Date : 14/4/19
Date : 18/4/19 IV 'A' DAA, 1st & 4th hr Voting day IV 'B' DAA 3rd hour	Date : 19/4/19 IV A DAA, 2nd hr IV 'B' DAA 4th hour	Saturday Date : 20/4/19 IV 'A' DAA 4th hour Sunday Date : 21/4/19

WORK DIARY

Monday	Tuesday	Wednesday
Date : 22/4/19 IV 'B' DAA 1st & 5th hour Travelling Sales Person problem	Date : 23/4/19 IV 'A' DAA, 5th hr Travelling Salesperson Problem Bruteforce Method	Date : 24/4/19 IV 'A' DAA, 2nd hr Dynamic Programming Meltod. IV 'B' DAA 3rd hour Dynamic programming Method.
Date : 29/4/19 IV 'B' DAA 1st & 5th hour Module 5: Greedy Technique General Method	Date : 30/4/19 IV 'A' DAA, 5th hr Module 5: Greedy Technique General Method	Date : 1/5/19 IV 'A' DAA, 2nd hr Knapsack Problem IV 'B' DAA 3rd hour Knapsack problem
Date : 6/5/19 IV 'B' DAA 1st & 5th hour Knapsack problem Prim's Algorithm	Date : 7/5/19 IV 'A' DAA, 5th hr Prim's Algorithm	Date : 8/5/19 IV 'A' DAA, 2nd hr Job sequencing with dead lines IV 'B' DAA 3rd hour Job sequencing with dead lines

WORK DIARY

Thursday	Friday	Saturday
Date : 25/4/19 IV 'A' DAA, 1st & 4th hr Module 4 Revision IV 'B' DAA, 3rd hour Module 4 Revision	Date : 26/4/19 IV 'A' DAA, 2nd hr IV 'B' DAA 4th hour Prajwalana.	Saturday Date : 27/4/19 IV 'A' DAA 4th hour NPTEL Exam Sunday Date : 28/4/19
Date : 2/5/19 IV 'A' DAA, 1st & 4th hr Dijkstra's Alg IV 'B' DAA 3rd hour Dijkstra's Alg	Date : 3/5/19 IV 'A' DAA, 2nd hr Dijkstra's Algorithm IV 'B' DAA 4th hour Farewell party Sri	Saturday Date : 4/5/19 IV 'A' DAA 4th hour Dijkstra's Algorithm Sunday Date : 5/5/19
Date : 9/5/19 IV 'A' DAA, 1st & 4th hr Huffman trees and Coding IV 'B' DAA 3rd hour Huffman trees & Coding	Date : 10/5/19 IV 'A' DAA 2nd hr Heapsort. Module-5 started IV 'B' DAA 4th hour Heap sort. Module-5	Saturday Date : 11/5/19 IV 'A' DAA 4th hour Backtracking. nqueens. Sunday Date : 12/5/19

WORK DIARY

Monday	Tuesday	Wednesday
Date : 13/5/19	Date : 14/5/19	Date : 15/5/19
IV 'B' DAA 1st & 5th hour N-queens problem	IV 'A' DAA, 5th hr Sum of Subset problems.	IV 'A' DAA, 2nd hr ← III rd
IV 'A' DAA 3rd hour N-queens problem Sum of subset problem	IV 'B'	IV 'B' DAA 3rd hr
Date : 20/5/19	Date : 21/5/19	Date : 22/5/19
IV 'B' DAA 1st & 5th hr	IV 'A' DAA, 5th hr	IV 'A' DAA, 2nd hr
← Lab internals →		IV 'B' DAA 3rd hr
Date :	Date :	Date :

WORK DIARY

Thursday	Friday	Saturday Date : 18/5/19
Date : 16/5/19	Date : 17/5/19	IV 'A' DAA 1st hr
IV 'A' DAA, 1st & 4th hr internals →	IV 'A' DAA, 2nd hr	Sunday Date : 19/5/19
IV 'B' DAA 3rd hr	IV 'B' DAA 4th hr	
Date : 23/5/19.	Date :	Saturday Date :
IV 'A' DAA, 1st & 4th hr IV 'B' DAA 3rd hr B. K Rag 12.6.19		Sunday Date :
Date :	Date :	Saturday Date :
		Sunday Date :

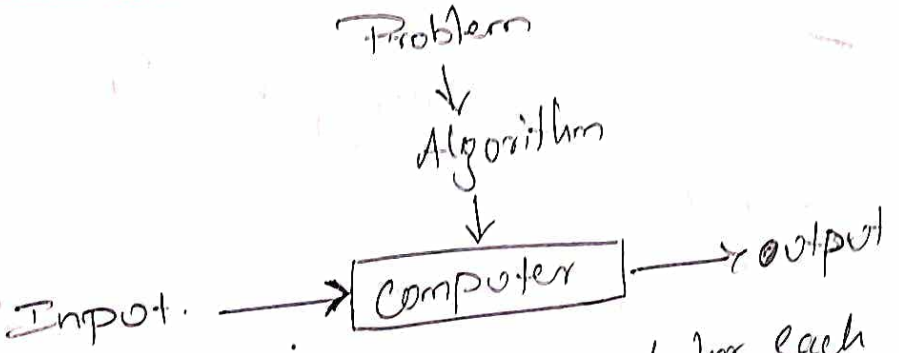
Unit - 1 INTRODUCTION

Algorithm:

It is a sequence of unambiguous instruction for solving a problem i.e; for obtaining a required output for any legitimate input in a finite amount of time.

Instructions → some one should be there in order to understand it i.e, computer.

Notion of Algorithm:



- The nonambiguity requirement for each step of an algorithm cannot be compromised
- The range of inputs for which an algorithm works has to be specified carefully.
- The same algorithm can be represented in several different ways.
- Several algorithms for solving the same problem may exist
- Algorithms for the same problem can be based on very different ideas and can solve the problem with dramatically different speeds.

nonambiguity — any character can be recognised uniquely without reference the preceding character.

Euclid's Algorithm for computing gcd(m,n)

Step1:- if n=0. return the value of 'm' as the g and stop; Otherwise proceed to step 2.

Step2:- Divide 'm' by 'n' and assign the value remainder to 'r'.

Step3:- Assign the value of n to m and the of 'r' to 'n'. Go to step 1.

Algorithm: Euclid(m,n)

// computes gcd(m,n) by Euclid's algorithm
// Input: Two nonnegative, not-both-zero integers m and n
// output: Greatest Common divisor of m and n

```
while n ≠ 0 do
    r ← m mod n
    m ← n
    n ← r
return m
```

Eg:- m = 66, n = 34

```
while(n!=0)
{
  r=m%n;
  m=n;
  n=r;
}
gcd=m;
```

```
{
r = 66 % 34 = 32
m = 34
n = 32
}
gcd = 34;
```

```
{
r = 34 % 32 = 2
m = 32
n = 2
}
gcd = 32
```

```
{
r = 32 % 2 = 0
m = 2
n = 0
}
gcd = 2
```

nentals of Algorithmic Problem Solving

We can consider algorithms to be procedural solutions
problems.
These solutions are not answers but specific instructions
for getting answers.

We have a sequence of steps in order to go
through in designing and analyzing an algorithm

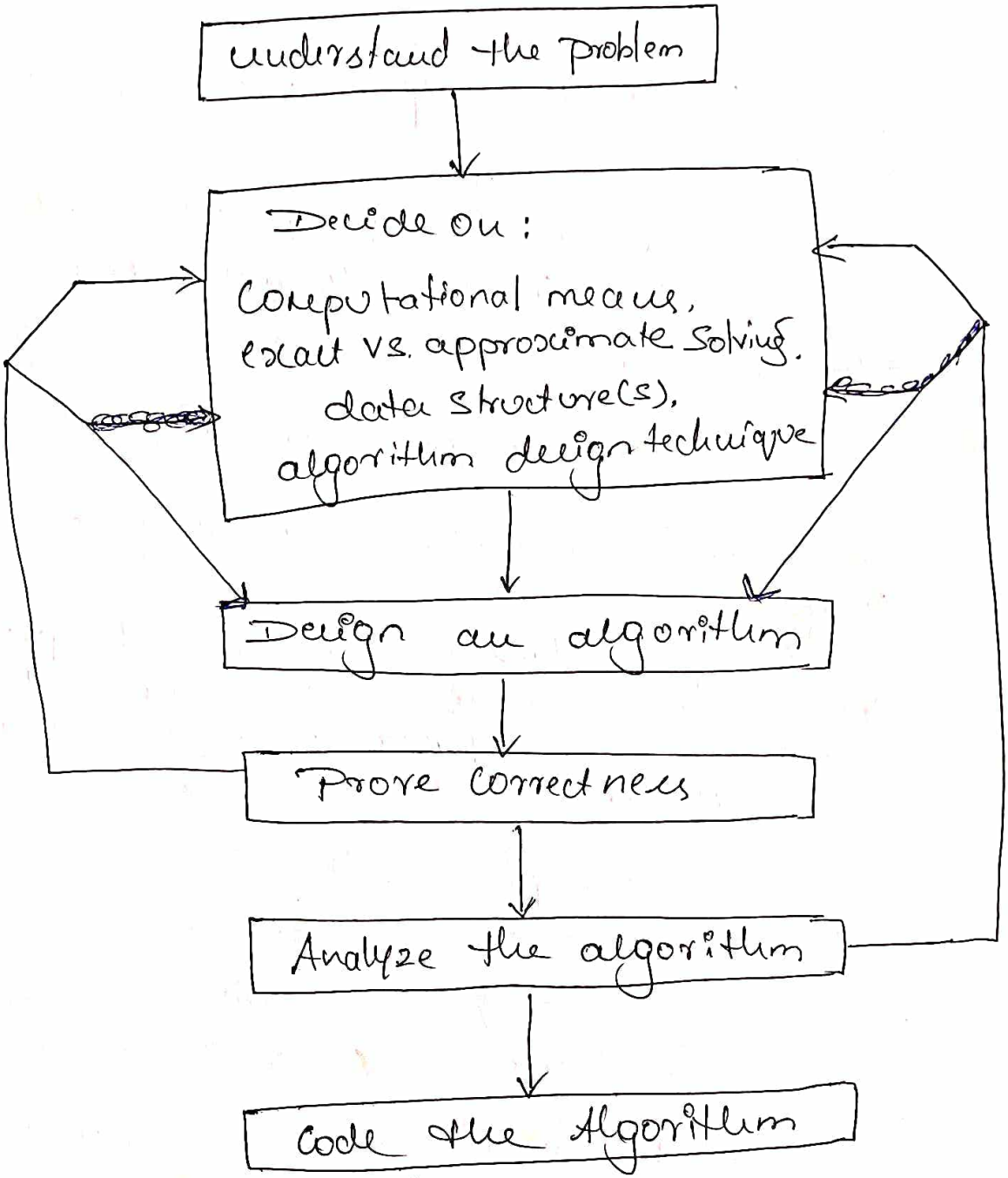


fig: Algorithm design and analysis proce

Understanding the problem:

- Read the problem's description carefully and ask questions if you have any doubt about the problem.
- Do few examples and think about special cases.
- For few problems, there are many algorithms already available, but for the given problem we need to design/develop. ~~But for these~~ an algorithm of our own,
- An input to the algorithm specifies instance of the problem the algorithm solves.
- It is very imp. to specify exact range of instances to algorithm. Correct algorithm is not the one that works most of the time.

Deciding on: (i) Computational means:-

- Once problem is understood, we think of the means for computation.
- Majority of algorithms are destined to be programmed for computer resembling Von-neumann machine. This architecture is usually captured by so-called Random-Access Machine (RAM)
- Its central assumption is that inst are executed one after the other, only one operation at a time.
- Accordingly, the algorithms designed to be executed on such machines are called Sequential Algorithms.
- The central assumptions of the RAM model does not hold for some newer computers that can execute the operations in parallel.
- Algorithms that take advantage of this capability are called Parallel Algorithms.

Choosing b/w Exact and Approximate Problem Solving.

- In the initial case, an algorithm is called an Exact Algorithm.
- But in the latter case, an algorithm is called an Approximate Algorithm.

This is Because - ⓐ There are important problems that simply cannot be solved exactly for most of their instances. Ex:- finding the square root.

ⓑ Available algorithms may be slow because of some intrinsic Complexity.

(iii) Appropriate Data Structure:-

- Some of the algorithm design techniques depend on structuring or restructuring data.
- Some years ago an importance of algorithms and data structures with title
  :- Algorithms + Data structures = programs.
- Data structures remain crucially important for both design and analysis of algorithms.

(iv) Algorithm Design Techniques:-

- It is a general approach to solve problems algorithmically that is applicable to a variety of problems from different areas of computing.
- Reasons to learn the design techniques:-
  ⓐ They provide guidance for designing algorithms for new problems for which there is no known satisfactory algorithm.

(6) They can serve as a natural way to categorize and study algorithms

Methods of specifying Algorithms :-

Basically there are 2 options for specifying Algorithms.

(i) Pseudocode which is a mixture of a Natural l and programming language-like constructs.

— A Pseudocode is more precise than a natural language.

— They make use of if, for and while to show their scope.

(ii) Flow-chart is a method of expressing an algorithm by a collection of connected geometric shapes containing descriptions of the algorithm's steps.

Proving Algorithm's Correctness :-

— Once an algorithm is specified, we have to prove its Correctness i.e; for every legitimate i/p, we have to prove that the algorithm yields a required result in a finite amount of time.

— For some algorithms, a proof of correctness is quite easy for others it may be complex.

— A common technique for proving correctness is to use mathematical induction because an algorithm's iterations provide a natural sequence of steps needed for such proofs.

...lyzing an Algorithms

After Correctness, the important factor is efficiency.
There are two kinds of algorithm efficiency
- Time efficiency :- indicates how fast the algorithm runs.
- Space efficiency :- indicates how much extra memory the algorithm needs.

- Another characteristics of an algorithm is Simplicity
  Ex:- Euclid's algorithm is simpler than the usual Method.
- Another characteristics of an algorithm is Generality

Coding an Algorithm :-

- Most algorithms are destined to be ultimately implemented as computer programs.
- Computer scientists believe that unless the correctness of a computer program is proven with full mathematical rigor, that program cannot be considered correct.
- The validity of programs is still established by testing
- Implementing an algorithm correctly is necessary but not sufficient. The algorithm's power may be not so effective because of insufficient implementation [placing of the int / loops].
- As the rule says, "A good Algorithm is a result of repeated effort and rework".

3073151

Important Problem Types :-

The most important problem types that we up are :-

① **Sorting :-**

It are we to arrange the items given list in ascending order.

- In practical examples, we need to sort the of numbers, using characters. Also the record schools, colleges etc—

Sorting techniques :-

- Bubble sort
- Insertion sort
- Selection sort.
- Quick sort
- Merge sort
- Topological sort.

② **Searching :-**

It deals with finding a given value called a search key in a given set.

- For searching, there is no single algorithm that fits all situations best.
- Some algorithms work faster than others but require more memory.
- Some work very fast but are applicable for sorted arrays.

Searching techniques :-

- Linear search
- Binary search
- Depth First search
- Breadth First search

4. String Processing :-

- String is a sequence of characters from an alphabet.
- Problem may be that of searching for a given word in a text.

String processing problems are :-

- string concatenation - Reduce the space b/w the strings.
- string matching

(4) Combinatorial Problems :-

In General, combinatorial problems are the most difficult problems in computing from both theoretical and practical perspective.

Combinatorial problems are :-

- Subset problem — combination
- Permutation — Graph colouring.

(5) Geometric problems :-

Deals with geometric objects such as points, lines, polygons, etc.

Geometric problems are :-

- closest pair problem — Convex Hull problem

(6) Numerical Problems :-

- Majority of the numerical problems can be solved approximately, but not exactly.

Numerical problems are :-

- Solving equations — Evaluating functions.
- Computing integrals

Asymptotic Notations :-

Asymptotic Notations actually applies to ... Notation :: Asymptotic
Let $t(n)$ will be an algorithm's running time usually indicated by its basic operation count, and $g(n)$ will be some simple function.

Informal Introduction to Asymptotic Notations:

$O(g(n))$ is the set of all functions with a smaller or same order of growth as $g(n)$.

$n \in O(n^2)$ $100n+5 \in O(n^2)$ $\frac{1}{2}n(n-1) \in O(n^2)$

- The first two functions are linear and hence have a smaller order of growth than $g(n) = n^2$
- The last is quadratic and has same order of growth as n^2.

The second notation $\Omega(g(n))$ stands for the set of all functions with a large or same order of growth as $g(n)$.

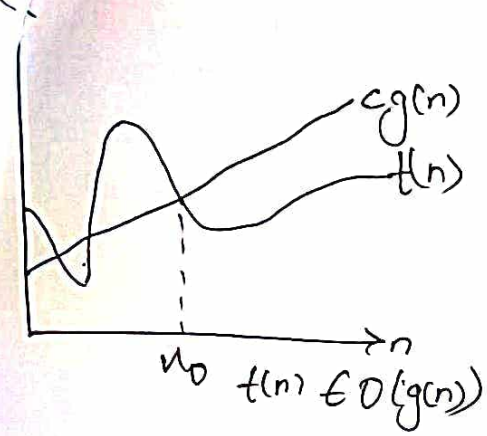
$n^3 \in \Omega(n^2)$ $\frac{1}{2}n(n-1) \in \Omega(n^2)$ $100n+5 \notin \Omega(n^2)$

Finally $\Theta(g(n))$ is the set of all functions that have the same order of growth as $g(n)$.

Thus every quadratic function an^2+bn+c with $a>0$ is in $\Theta(n^2)$

Notation :-

A function $t(n)$ is said to be in $O(g(n))$ denoted as :-



$t(n) \in O(g(n))$ if $t(n)$ is bounded above by some constant multiple of $g(n)$ for all large 'n', ie. there exist some positive constant 'c' and some non-negative integer 'n_0' such that

$$t(n) \leq cg(n) \quad \text{for all } n \geq n_0$$

eg:- $100n+5 \in O(n^2)$

$100n+5 \leq 100n+n$ (for all $n \geq 5$) $= 101n$

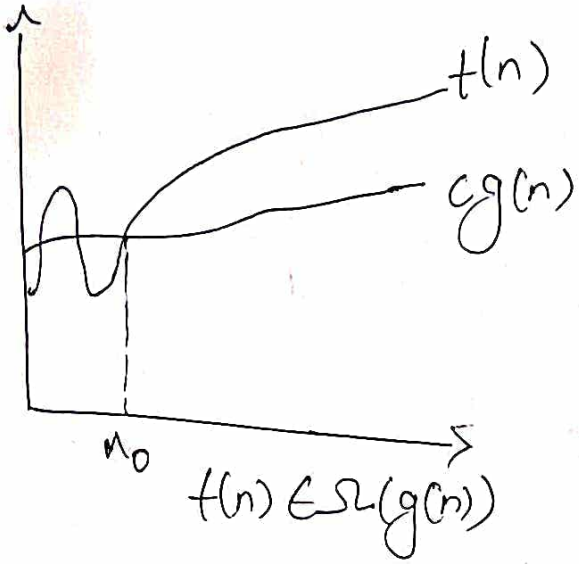
$101n \leq 101n^2$

Here $c = 101$, $n_0 = 5$.

This is basically used in finding out the worst-case-time complexities.

Ω - notation :-

A function $t(n)$ is said to be in $\Omega(g(n))$. denoted as $t(n) \in \Omega(g(n))$ if $t(n)$ is bounded below by some positive constant multiple of $g(n)$ for all large 'n' i.e. if there exist some positive constant 'c' and some non-negative integer 'n_0' such that.



$t(n) \geq c.g(n)$ for all

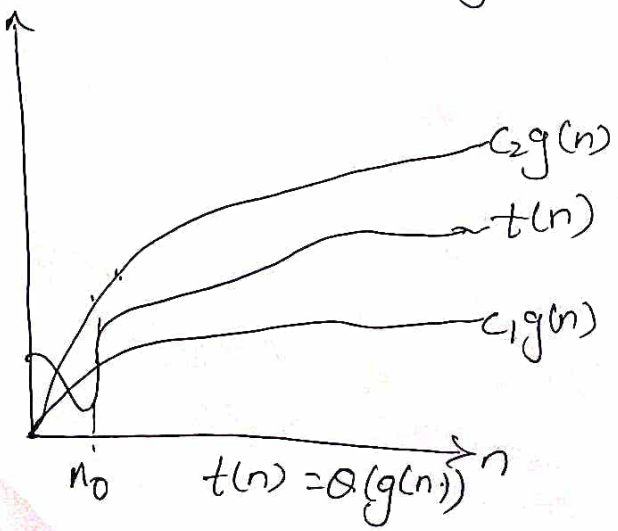
eg:- $n^3 \in \Omega(n^2)$

$n^3 \geq n^2$ for all $n \geq 0$

i.e we select $c=1, n_0=0$

This is basically used in finding out the Best case - time complexity.

Θ - Notation :- A function $t(n)$ is said to be in $\Theta(g(n))$, denoted $t(n) \in \Theta(g(n))$, if $t(n)$ is bounded both above and below by some Positive constant multiples of $g(n)$ for all large 'n', i.e; if there exist some positive constant c_1 and c_2 and some non-negative integer 'n_0' such that:-



$c_1g(n) \leq t(n) \leq c_2g(n)$ for all $n \geq n_0$

. . is basically used to find out the Average-Case i.e Complexity

Usually the Best Case running time of algorithm is represented by Ω

The Average Case running time of the algorithm is represented by Θ

The Worst Case running time of the algorithm is represented by O

There will be an upper boundry and a lower boundry for any algorithm.

We use 'O' to give the upper bound.
We use 'Ω' to give the lower bound.
We use 'Θ' to give both the upper and lower bound

Ex:- Linear search.

10 15 20 30 35 40 50 60 70 75

Here $n=10$ $n_0=1$

Lower bound $\Rightarrow 1$
Upper bound $\Rightarrow 10$

Best Case [Ω] :- $t(n) \geq cg(n)$

$t(n)=1$ $c=1, n_0=1$

Average case [Θ] :- $c_2 g(n) \leq t(n) \leq c_1 g(n)$

$1 \leq t(n) \leq 10$

$c_1 = 10$

$c_2 = 1$

$n_0 = 1$

Worst case [O] :- $t(n) \leq cg(n)$

$t(n) = 10$

$c = 10$

$n_0 = 1$

Mathematical Analysis of Non-Recursive Algorithm :

The general plan for analysing the time efficiency of Non-Recursive Algorithm

(i) Decide on a parameter indicating input size.

(ii) Identify the algorithm's basic operation.

(iii) Check whether no of times the basic operation is executed depends only on the size of an i/p or on some additional property.

(iv) Set up a sum expressing the no of times the algorithm's basic operation is executed

(v) Using standard formulae and rules of sum manipulation, either find a closed-form formula for the count and establish its order of growth.

Elements Uniqueness Problem:-

Algorithm :- Unique Elements [A[0.... n-1]]

// Purpose :- Determines whether all the elements in the given array are distinct.

// Input :- Array A[0....n-1]

// Output :- True if all elements are distinct
False otherwise.

```
for i ← 0 to n-2 do        -> outer loop
    for j ← i+1 to n-1 do  -> inner loop
        if A[i] = A[j]
            return false.
return true.
```

Analysis:-

$$C(n) = \text{Outerloop} \times \text{innerloop}.$$

$$= \sum_{i=0}^{n-2} \sum_{j=i+1}^{n-1} 1$$

$$= \sum_{i=0}^{n-2} (n-1) - (i+1) + 1$$

$$= \sum_{i=0}^{n-2} (n-1-i-1+1)$$

$$= \sum_{i=0}^{n-2} (n-1-i)$$

$$= \sum_{i=0}^{n-2} (n-1) - \sum_{i=0}^{n-2} (i)$$

$$= (n-1)\sum_{i=0}^{n-2} 1 - \sum_{i=0}^{n-2} i$$

We have a standard formula.

$$\sum_{i=0}^{n} i = \frac{n(n+1)}{2}$$

∴ Above equation becomes

$$= (n-1)\sum_{i=0}^{n-2} 1 - \frac{(n-2)(n-2+1)}{2}$$

$$= (n-1)\sum_{i=0}^{n-2} 1 - \frac{(n-2)(n-1)}{2}$$

$$= (n-1)(n-20+1) - \frac{(n-2)(n-1)}{2}$$

$$= (n-1)(n-1) - \frac{(n-2)(n-1)}{2}$$

$$= (n-1)\left[(n-1) - \frac{(n-2)}{2}\right]$$

$$= (n-1)\left[\frac{2n-2-n+2}{2}\right]$$

$$= \frac{(n-1)n}{2} = \frac{n^2-n}{2}$$

$$= \Theta(n^2)$$

Algorithm MatrixMultiplication(A[0..n-1, 0..n-1], B[0..n-1, 0..n-1])

multiplies two n-by-n matrices by the definition based algorithm

input: Two n-by-n matrices A and B

output: Matrix C = AB

```
for i ← 0 to n-1 do          → outer loop
    for j ← 0 to n-1 do      → Inner most loop
        c[i,j] ← 0.0
    for k ← 0 to n-1 do      → Inner most loop.
        c[i,j] ← c[i,j] + A[i,k] * B[k,j]
                          two arithmetic operations
                                add & multiple.
return c.
```

Analysis:-

$$M(n) = \sum_{i=0}^{n-1} \sum_{j=0}^{n-1} \sum_{k=0}^{n-1} 1$$

$$= \sum_{i=0}^{n-1} \sum_{j=0}^{n-1} (n-1-0+1)$$

$$= \sum_{i=0}^{n-1} \sum_{j=0}^{n-1} 1 \cdot n$$

$$= \sum_{i=0}^{n-1} (n-1-0+1)\, n$$

$$= \sum_{i=0}^{n-1} 1 \cdot n^2$$

$$= (n-1-0+1)\, n^2$$

$$= n^3 \in \Theta(n^4)$$

Finding the element with Maximum value in given array.

Algorithm:- MaxElement (A[0....n-1])

//Purpose :- Determine the value of the largest el... in given array

//Input :- An array A[0....n-1]

//Output :- Returns the value of largest element in A.

```
maxVal ← A[0]
for i ← 1 to n-1 do
    if A[i] > maxval
        maxval ← A[i]
return maxval
```

Analysis :-

Step1 :- i/p size is 'n'.

Step 2 :- Basic operation is comparision in loop

Step 3 :- Comparision is executed on each repetition of loop

Step 4 :- Let C(n) be the no of times comparison is made. Each time the loop is executed, comparison is made i.e ; for each new value of 'i', the comparison is made,

∴ For i=1 to n-1, the comparison is made.

$\therefore C(n)$ = One comparison made for each value of i.

let us simplify.

$$C(n) = \sum_{i=1}^{n-1} 1$$

$$C(n) = n - 1 + 1$$

$$C(n) = n - 1 \in \Theta(n)$$

Mathematical Analysis of Recursive Algorithms:-

General plan for Analysing the time efficiency of Recursive Algorithms.

(i) Decide on parameter indicating the input size.

(ii) Identify algorithms basic operation.

(iii) check whether the no of times the basic operation is executed can vary on different i/p of same size

(iv) Set up a recurrence relation with an appropriate initial condition for the no of times the basic operation is executed.

(v) Solve the recurrence relation to find the order of growth.

① Computing factorial of some number

Algorithm :- factorial (n)

// Purpose :- To compute n! using recursive

// Input :- A non-negative integer 'n'

// Output :- Returns the factorial value.

```
if (n=0)
    return 1
else
    return factorial (n-1)*n
```

Analysis :-

Step 1 :- Factorial algorithm works for i/p size 'n'

Step 2 :- Basic operation in computing factorial is multiplication.

Step 3 :- Recursive fn call can be formulated as

$$F(n) = F(n-1) * n \text{ for } n > 0$$

The basic operation is multiplication.

$$\therefore F(n) = F(n-1) + 1$$

$F(n-1)$ → These multiplications are required to compute fact $(n-1)$

$+1$ → To multiply factorial by $(n-1)$ by 'n'.

Step 4 :- From step 3, we have obtained the recurrence relation. $F(n) = F(n-1) + 1$

Now, we solve this.

Backward substitution.

$$F(n) = F(n-1) + 1 \qquad n = (n-1)+1$$
$$= [F(n-2)+1] + 1$$
$$= F(n-2) + 2$$
$$= [F(n-3)+1] + 2$$
$$= F(n-3) + 3$$

From the substitution method, we establish a general formula as :-

$$\boxed{F(n) = F(n-i) + i}$$

Now, we prove correctness using mathematical induction

Prove $M(n) = n$ by mathematical induction.

Basis :- let $n=0$ then

$$M(n) = 0$$
$$M(0) = 0$$

Induction :- Assume $M(n-1) = n-1$ then

$$M(n) = M(n-1) + 1$$
$$= n-1+1$$
$$= n$$

$\therefore M(n) = n$

$\therefore$ The time complexity of factorial function is $\Theta(n)$.

(2) Tower of Hanoi Problem.

Design a recursive algorithm for computing 2^n for a non-negative integer n, based on the formula

$2^n = 2^{n-1} + 2^{n-1}$. Set up a recurrence relation and solve it.

Algorithm :- pow(n)

// purpose :- To compute nth power of 2.

// input :- The integer n.

// output :- Returns 2^n value.

```
if (n=1)
    return 2
return (pow(n-1) + pow(n-1))
```

Step 1 :- I/p size is "n",

Step 2 :- Basic operation is multiplication by 2 for n times. i.e, 2 recursive calls of (n-1).

Step 3 :- T(n) is the computation for recursive calls.

$$T(n) = T(n-1) + T(n-1) + 1$$

$$T(n) = 2T(n-1) + 1 \quad \text{for } n > 1,$$

$$T(1) = 1,$$

We will solve this recurrence relation

$$T(n) = 2T(n-1) + 1 \quad \text{for } n>1,\ T(1) = 1,$$

$$= 2[2T(n-2)+1] + 1$$

$$= 4T(n-2) + 3$$

$$= 4[2T(n-3)+1] + 3$$

$$= 8T(n-3) + 7$$

$$= 2^3 T(n-3) + 2^2 + 2^1 + 1$$

$$= 2^4 T(n-4) + 2^3 + 2^2 + 2^1 + 1.$$

$$\vdots$$

This can be written in general as.

$$T(n) = 2^i T(n-i) + 2^i - 1$$

∴ from all these computations, we conclude that the time complexity of this algorithm is

$$O(2^n)$$

Since the initial condition is specified for $n=1$, which is achieved for $i=n-1$, we get the following formula for the solution to recurrence.

$$T(n) = 2^{n-1} T(n-(n-1)) + 2^{n-1} - 1$$

$$= 2^{n-1} T(1) + 2^{n-1} - 1$$

$$= 2^{n-1} + 2^{n-1} - 1$$

$$= 2^n - 1$$

$$2^{n-1} T(n-n+1) = 2^{n-1} T(1)$$

$$2^n \left(\frac{1}{2} + \frac{1}{2}\right) - 1 \Rightarrow 2^n(1) - 1$$

$$\Rightarrow 2^n - 1$$

$$2^n - 1$$

3)

$$T(n) = \begin{cases} 1 & \text{if } n = 1 \\ 4T(n/3) + n^2 & \text{for } n \geq 2. \end{cases}$$

$$T(n) = 4T(n/3) + n^2$$

$$= 4\left[4 \cdot T\left(\frac{n}{3^2}\right) + \frac{n^2}{3^2}\right] + n^2$$

$$= 4^2 T\left(\frac{n}{3^2}\right) + 4 \cdot \frac{n^2}{3^2} + n^2$$

$$= 4^2 T\left(\frac{n}{3^2}\right) + \frac{13n^2}{3^2}$$

$$= 16T\left(\frac{n}{9}\right) + \frac{13n^2}{9}$$

$$= 16\left[4 \cdot T\left(\frac{n}{27}\right) + \frac{n^2}{9^2}\right] + \frac{13n^2}{9}$$

$$\because T\left(\frac{n}{9}\right) = 4T\left(\frac{n}{27}\right) + \left(\frac{n}{9}\right)^2$$

$$= 64T\left(\frac{n}{27}\right) + 16 \cdot \frac{n^2}{9^2} + \frac{13n^2}{9}$$

$$= 64T\left(\frac{n}{27}\right) + 16 \cdot \frac{n^2}{81} + \frac{13n^2}{9}$$

$$= 64T\left(\frac{n}{27}\right) + \frac{133n^2}{81}$$

$$= 4^3 T\left(\frac{n}{3^3}\right) + 133\left(\frac{n}{3^2}\right)^2$$

$$= 4^k T\left(\frac{n}{3^k}\right) + c\left(\frac{n}{3^{k-1}}\right)^2$$

Assume $\frac{n}{3^k} = 1$ then $n = 3^k$. and $k = \log_3 n$

$$= 4^k T(1) + c\left(\frac{n}{3^{k-1}}\right)^2 \quad \because \frac{n}{3^k} = 1$$

$$= 4^k \cdot 1 + \frac{c}{(3^{k-1})^2} \cdot n^2$$

$$4^k + c_1 \cdot n^2$$

$$= 4^{\log_3^n} + c_1 \cdot n^2$$

$$= n^{\log_3^4} + c_1 \cdot n^2$$

$$= n^{1.26} + c_1 \cdot n^2$$

$$T(n) = O(n^2)$$

$\because c_1 = \frac{c}{(3^{k-1})^2}$

$\because a^{\log_b^n} = n \cdot \log_b^a$

$4^{\log_3^n} = n \cdot \log_3^4$

(4) $T(n) = 2T\left(\frac{n}{2}\right) + c \qquad T(1) = 1$

let $T(n) = 2T\left(\frac{n}{2}\right) + c$

$$= 2\left[2T\left(\frac{n}{4}\right) + c\right] + c$$

$$= 4T\left(\frac{n}{4}\right) + 3c$$

$$= 4\left[2T\left(\frac{n}{8}\right) + c\right] + 3c$$

$$= 8T\left(\frac{n}{8}\right) + 7c$$

$$= 2^3 T\left(\frac{n}{2^3}\right) + 7c$$

$$= 2^3 T\left(\frac{n}{2^3}\right) + (2^3 - 1)c$$

$$\vdots$$

$$T(n) = 2^k T\left(\frac{n}{2^k}\right) + (2^k - 1)c$$

$\therefore$ we put $2^k = n$. then

$$T(n) = nT\left(\frac{n}{n}\right) + (n-1)c$$

$$= n \cdot T(1) + (n-1)c$$

W.K.T $T(1) = 1$ $\therefore T(n) = n + (n-1)c$

⑤ $T(n) = T\left(\frac{n}{3}\right) + c \qquad T(1) = 1$

$= \left[T\left(\frac{n}{9}\right) + c\right] + c$

$= T\left(\frac{n}{9}\right) + 2c.$ ⟹ using backward substitution

$= \left[T\left(\frac{n}{27}\right) + c\right] + 2c$ → $T\left(\frac{n}{9}\right) = T\left(\frac{n}{27}\right)$

$= T\left(\frac{n}{27}\right) + 3c$

$= T\left(\frac{n}{3^3}\right) + 3c \qquad \because 3^3 = 27$

$\vdots$

$T(n) = T\left(\frac{n}{3^k}\right) + kc.$

If we put $3^k = n$ then $k = \log_3 n$

$T(n) = T\left(\frac{n}{n}\right) + \log_3 n \, c$

$= T(1) + \log_3 n \cdot c$

W.K.T $T(1) = 1$

$\therefore \boxed{T(n) = c \cdot \log_3 n + 1}$

BRUTE - FORCE APPROACH

Brute force is a straight forward approach of ving the problem. It is directly based on the roblem statement and definitions of concepts that are directly involved in the problem.

Selection Sort :-

Selection sort by scanning the entire given list to find its smallest element and exchange it with the first element, putting the smallest element in its final position

Algorithm :- SelectionSort (A[0....n-1])

// Purpose :- Sort the elements using selection sort

// Input :- An array A[0...n-1] of orderable elements (or)
An array of elements A[0...n-1] to be sorted.

// Output :- Sorted array A[0...n-1] (or)
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
    temp ← A[i]
    A[i] ← A[min]          } (or) { swap A[i] and
    A[min] ← temp                 A[min]
```

Solve these elements using selection sort

89	45	68	90	29	34	17
A[0]	A[1]	A[2]	A[3]	A[4]	A[5]	A[6]

i, min j, min j j j, min

i=0, j=1

If A[j] < A[min]

if (45 < 89) — T, min ← j, j++.
min ← 45

if (68 < 45) — F j++

if (90 < 45) — F j++

if (29 < 45) — True. min ← j
min ← 29, j++

if (34 < 29) — F j++

if (17 < 29) — True. min ← j
min ← 17, j++ → F

then. swap. A[i] and A[min]

89	45	68	90	29	34	17

i min

17	45	68	90	29	34	89

i, min j j, min j

i will be incremented.

i=1
j=2

if (68 < 45) — F j++.
if (90 < 45) — F j++
if (29 < 45) — T min ← j, min ← 29, j++.
if (34 < 29) — F j++
if (89 < 29) — F j++, j will be fail

then swap A[i] and A[min].

17	29	68	90	45	34	89

min i j min min j j

i will be incremented.

i=2
j=3 if (90 < 68) — F j++.

if (45 < 68) — T min ← j, j++.

if (34 < 45) — T min ← 45, min ← j, min ← 34, j++

for loop.

if (89 < 34) — F j++, j will be fail

then swap A[i] and A[min]

~~17 29 34 68 90 45~~

17	29	34	90	45	68	89

min i min j j j

i will be incremented

i=3
j=4 if (45 < 90) True. min ← j, min ← 45
j++

if (68 < 45) fail j++ for loop.

if (89 < 45) fail j++, j will be fail

then swap A[i] and A[min].

17	29	34	45	90	68	89

i will be incremented

17	29	3H	H5	90	68	89

min i min j j

i=4
j=5

if (68 < 90) — T. min ← j, min ← 68. j++;

if (89 < 68) — F j++, for loop F will be 3

then Swap A[i] and A[min].

17	29	3H	H5	68	90	89

min i min j

i will be incremented.

i=5
j=6.

if (89 < 90) — T min ← j, min ← 90. j++, for loop (F will be fail)

then swap A[i] and A[min]

17	29	3H	H5	68	89	90

Analysis

This algorithm can be analysed mathematically we apply general plan for non-recursive mathematical analysis..

Step 1:- i/p size is 'n' i.e, total no of elements in the list.

Step 2:- The basic operation is key comparison.
if $A[j] < A[min]$

Step 3:- Basic operation depends on array size 'n'.
∴ we find sum as.

$C(n)$ = outerloop × Innerloop × Basic operation.

$$C(n) = \sum_{i=0}^{n-2} \sum_{j=i+1}^{n-1} 1$$

$$= \sum_{i=0}^{n-2} (n-1-i+1+1)$$

$$= \sum_{i=0}^{n-2} (n-i+1)$$

$$= \sum_{i=0}^{n-2} (n-1) - \sum_{i=0}^{n-2} i$$

based on this form $\sum_{i=1}^{n-1} i = 1+2+3+\cdots+(n+1) = \frac{n(n+1)}{2}$

$$= (n-1) \sum_{i=0}^{n-2} 1 - \frac{(n-2)(n-2+1)}{2}$$

$$= (n-1)(n-2-0+1) - \frac{(n-2)(n-1)}{2}$$

$$= (n-1)(n-1) - \frac{(n-2)(n-1)}{2}$$

$$= (n-1)\left[(n-1) - \frac{(n-2)}{2}\right]$$

$$= (n-1)\left[\frac{2n-2-n+2}{2}\right]$$

$$= \frac{n(n-1)}{2}$$

$$= \frac{n^2-n}{2}$$

$$C(n) = \Theta(n^2)$$

Bubble sort :-

In bubble sort, the largest element is moved at the highest index in the array.

Algorithm :- Bubble sort ($A[0 \ldots n-1]$)

// purpose :- Sort a given array by bubble sort

// Input :- An array of elements $A(0 \ldots n-1]$ to be sort

// Output :- Sorted array $A[0 \ldots n-1]$

```
for i ← 0 to n-2 do
    for j ← 0 to n-2-i do
        if (A[j] > A[j+1]) then
            temp ← A[j]
            A[j] ← A[j+1]
            A[j+1] ← temp
```

(Or) { Swap A[j] & A[j+1]

Now we will explain by solving i.e; sorting the given array elements.

$$= \frac{n(n-1)}{2}$$

$$= \frac{n^2 - n}{2}$$

$$C(n) = \Theta(n^2)$$

Bubble sort :-

In bubble sort, the largest element is moved at the highest index in the array.

Algorithm :- Bubble sort ($A[0 \ldots n-1]$)

// Purpose :- Sort a given array by bubble sort

// Input :- An array of elements $A(0 \ldots n-1]$ to be sorted

// Output :- Sorted array $A[0 \ldots n-1]$

```
for i ← 0 to n-2 do
    for j ← 0 to n-2-i do
        if (A[j] > A[j+1]) then
            temp ← A[j]
            A[j] ← A[j+1]
            A[j+1] ← temp
```

Or — Swap A[j] & A[j+1]

Now we will explain by solving i.e; sorting the given array elements.

89	45	68	90	29	34	17

pass.

if (A[j] > A[j+1])

=1 if (89 > 45) - T
then swap.
then j++.

45	89	68	90	29	34	17

=0.
j=1
j+1=2

if (89 > 68) - T
then swap
then j++.

45	68	89	90	29	34	17

i=0
j=2
j+1=3

if (89 > 90) - F
then j++.

45	68	89	90	29	34	17

i=0
j=3
j+1=4

if (90 > 29) - T
then swap
then j++

45	68	89	29	90	34	17

i=0
j=4
j+1=5

if (90 > 34) - T
then swap
then j++

45	68	89	29	34	90	17

i=0
j=5
j+1=6

if (90 > 17) - T
then swap
then j++

45	68	89	29	34	17	90

i=0
j=6. → fail, It will complete pass 1. i will be Complete

---

i=1. Second pass.

45 68 89 29 34 17 90

j=0
j+1=1

if (45 > 68) - F
then j++

45	68	89	29	34	17	90

j=1
j+1=2

if (68 > 89) - F
then j++

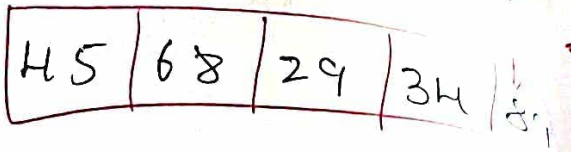
45	68	89	29	34	17	90

j=2
j+1=3

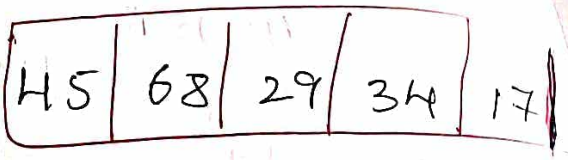
if (89 > 29) - T
then swap
then j++.

45	68	29	89	34	17	90

j=3
j+1=4
if (89 > 34) – T.
then swap
then j++



j=4
j+1=5
if (89 > 17) – T
then swap
then j++

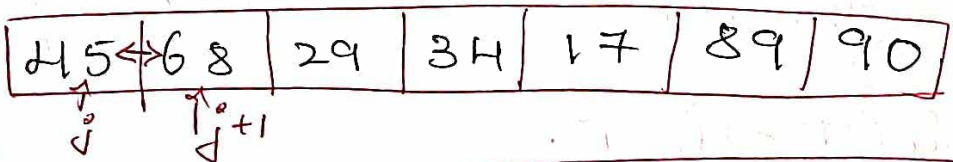


j=5
j will be fail.
i will be incremented.

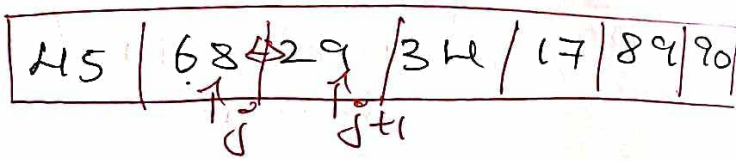
Second pass will be completed.

---

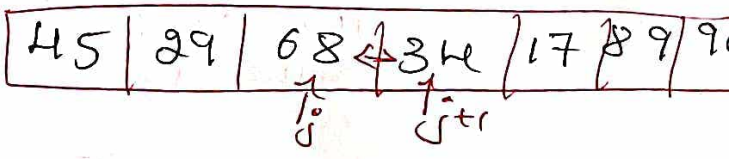
i = 2.
j=0
j+1=1



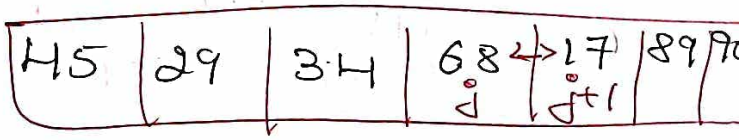
if (45 > 68) – F
then j++.



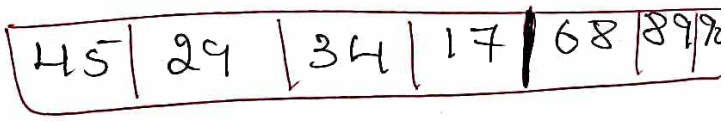
j=1
j+1=2
if (68 > 29) – T
then swap
then j++.



j=2
j+1=3
if (68 > 34) – T
then swap
then j++.

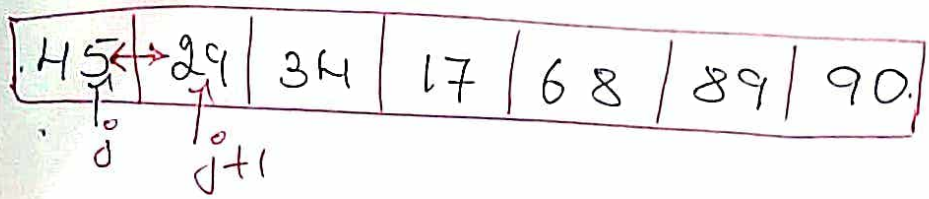


j=3
j+1=4
if (68 > 17) – T
then swap
then j++.

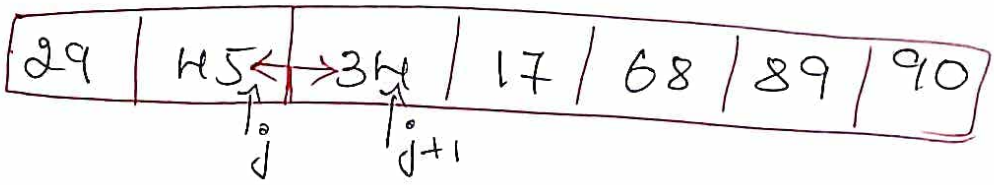


j=4
j will be fail.
i will be incremented.

third pass will be completed.



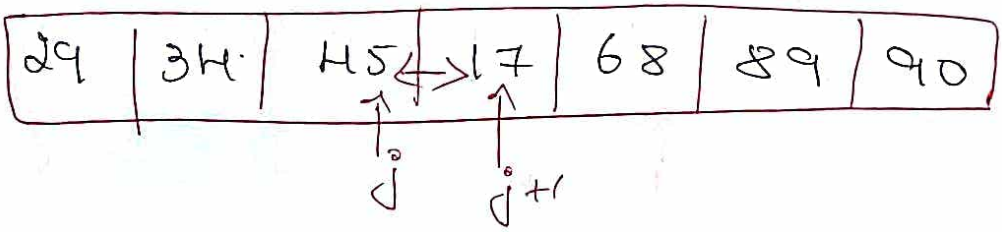
if (45 > 29) — T
then swap.
then j++.



j = 1
j+1 = 2

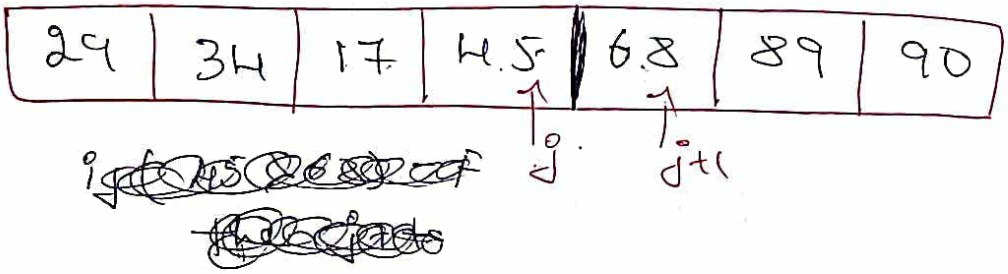
if (45 > 34) — T
then swap
then j++.

j = 2
j+1 = 3



if (45 > 17) — T
then swap
then j++

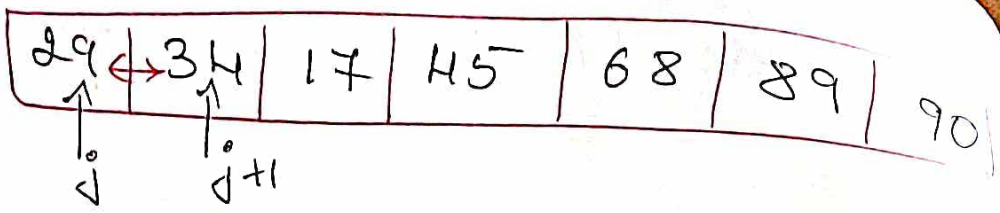
j = 3
j+1 = 4.



j will be fail.
i will be incremented.

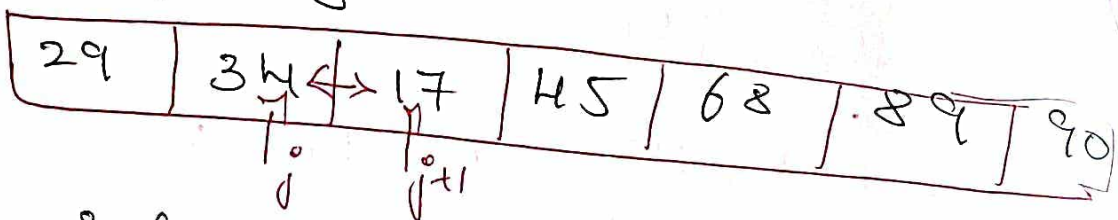
fourth pass is completed.

i=4.
j=0
j+1=1



if(29 > 34) — F
then j++.

j=1
j+1=2.



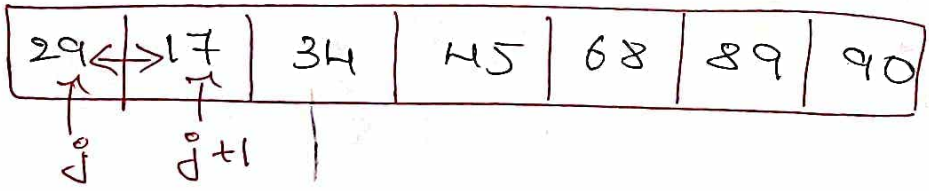
if(34 > 17) — T
then swap
then j++

j=2.
(j=0; j<n-2-i)
j will be fail.
i will be incremented.

FIFTH pass is completed.

---

i=5
j=0
j+1=1.



if(29 > 17) — T
then swap
then j++.

j=1 | 17 | 29 | 34 | 45 | 68 | 89 | 90

j will be fail
i will be incremented.

i will be fail.
then all the elements will be sorted.

Outer loop → i, Inner loop → j

Basis:-

$$C(n) = \sum_{i=0}^{n-2} \sum_{j=0}^{n-2-i} 1 \quad \rightarrow \text{Basic operation [comparision.}$$

$$= \sum_{i=0}^{n-2} n-2-i+1$$

$$= \sum_{i=0}^{n-2} n-i-1$$

$$= \sum_{i=0}^{n-2} (n-1) - \sum_{i=0}^{n-2} i$$

$$= \sum_{i=0}^{n-2} (n-1) - \frac{(n-2)(n-1)}{2}$$

$$= (n-1) \sum_{i=0}^{n-2} 1 - \frac{(n-2)(n-1)}{2}$$

$$= (n-1)(n-2-0+1) - \frac{(n-2)(n-1)}{2}$$

$$= (n-1)(n-1) - \frac{(n-2)(n-1)}{2}$$

$$= (n-1)\left[(n-1) - \frac{(n-2)}{2}\right]$$

$$= (n-1)\left[\frac{2n-2-n+2}{2}\right)$$

$$= \frac{(n-1)n}{2}$$

$$= \frac{n^2-n}{2}$$

$$C(n) = \Theta(n^2)$$

Sequential Search / Linear Search.

In this method, the element to be searched is considered as key element.

Each successive element is compared with the key element.

If a match is found then it is called successful search. otherwise it is an unsuccessful search.

Algorithm :- Seq_Search(A[0...n-1], key)

// Purpose :- To search key element from array A[0...n-1]

// Input :- An array A[0...n-1] and key

// Output :- Returns the index of 'i' where key value is present else -1 is returned.

```
for i ← 0 to n-1 do
    if (A[i] = key) then
        return i
return -1
```

```
A[n] ← K
i ← 0
while (A[i] ≠ K) do
    i ← i+1
if i < n
    return i
return -1
```

In this algorithm, we either get the desired element present in the list or the list is exhausted.

Order. 70 30 20 50 60 10 40.
↑0 ↑1 ↑2 ↑3 ↑4 ↑5 ↑6.

Key = 40.

i=0. if(A[i] = key)

if(70 = 40) F return -1 then i++
if(30 = 40) F return -1 then i++
if(20 = 40) F return -1 then i++
if(50 = 40) F return -1 then i++
if(60 = 40) F return -1 then i++
if(10 = 40) F return -1 then i++
if(40 = 40) T return 6.

i.e. at location '6' the key will be search.

Analysis:-

- The input size is 'n'
- Basic operation is comparing 'A[i]' with 'key'.
- The algorithm not only depends on i/p size but is dependant on best case, average case and worst case.
- If the 'key' element is present at n^{th} location then algorithm will run for longest time and we get worst time complexity.

$$\sum_{i=0}^{n-1} 1 = n-1-0+1$$

$$= n.$$

$$C_{worst} = O(n)$$

- If the 'key' element is present at 1st ... the algorithm runs for a very short ... we get besttime complexity.

$$C_{Best} = (1)$$

- If the 'key' element is present b/w the 1st location ... last location, then it is average time complexity.

$$C_{Avg} = \left(\frac{n+1}{2}\right)$$

Brute-Force string matching:-

It is a technique of matching some pattern from a given text.

Given strings of 'n' characters is called Text.
Strings of 'm' characters is called pattern.
Always $m \leq n$

Algorithm :- Brute-force-pattern (T[0---n-1], P[0---m-1])
// purpose :- string matching.
// Input :- The array text T and pattern P
// output :- position of matched pattern in text is returned on successful search and -1 if search is unsuccessful.

```
for i <- 0 to n-m do
    j <- 0
    while j<m and P[j]=T[i+j] do     — while ll b fair man only i will be incremented
        j <- j+1
    if (j=m)
        return i
return -1
```

Here checking is performed at all positions in the text b/w 0 and n-m, whether an occurrence of the pattern starts there or not.

If match is found, it is continued by shifting one character to the right.

If no match is found, then we have to do 'm' comparisons.

We will explain by taking the ex:-

PAVAN LIKES BOOKS — Text

BOOKS — Pattern

We will start finding match for pattern from 0th location in Text. If match is not found the shift to the right by 1 position.

0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
P	A	V	A	N		L	I	K	E	S			B	O	O	K	S

B	O	O	K	S
0	1	2	3	4

Important Problems

Consider a function $f(n) = 2n+2$ and $g(n) = n^2$. Then we have to find some constant c, so that $f(n) \leq c.g(n)$.

Ex: $f(n) = 2n+2$ and $g(n) = n^2$ then we find c for $n=1$

$f(n) = 2n+2$ & $g(n) = n^2$ $\Leftrightarrow$ i.e $f(n) > g(n)$

If $n=1$ $\quad = 2(1)+2$ $\quad g(n) = 1$

$f(n) = 4$

If $n=2$ $\quad f(n) = 2n+2$ & $g(n) = n^2$

$= 2(2)+2$ $\quad g(n) = 2^2$ $\Leftrightarrow$ i.e $f(n) > g(n)$

$= 6$ $\quad = 4$

If $n=3$ $\quad f(n) = 2(3)+2$ & $g(n) = 3^2$ $\Leftrightarrow$ i.e $f(n) < g(n)$

$= 8$ $\quad = 9$

$\therefore f(n) < g(n)$ is true, Hence we can conclude that for $n \geq 2$, we obtain $f(n) < g(n)$

Thus always upper bound of existing time is obtained by bigoh notation.

⇒ P.T : $f(n) = a_m n^m + \dots + a_1 n + a_0$. then $f(n) = O(n^m)$ (6M)

Soln: Let

$$f(n) = a_m n^m + a_{m-1} n^{m-1} + a_{m-2} n^{m-2} + \dots + a_0 \quad \text{---(1)}$$

If we treat a_m^i as a constant then the equation (1) becomes

$$f(n) = A \sum_{i=0}^{m} a^n \quad \text{---(2)}$$ where A is $a_0^0 + a_1^1 + a_2^2 + \dots$

If equation (2) is $\Rightarrow$ $f(n) = A \sum_{i=0}^{n} 1$

$= A[1+1+1+1+\dots+1]$

$\leq A(n^2)$

$= A(n^1)$

$= A \cdot O(n^1)$

If equation (2) is

$$f(n) = A \sum_{i=0}^{n} n = A[1+2+3+\cdots+n]$$

$= A(n^2)$

$= A \cdot O(n^2)$

If equation (2) is

$$f(n) = A \sum_{i=0}^{n} n^2 = A \cdot O(n^3)$$

Thus

$$f(n) = A \sum_{i=0}^{m} n = A \cdot O(n^m)$$

Thus neglecting the constant term we will have

$$f(n) = O(n^m)$$

---

3) Prove: $3n^3 + 2n^2 = O(n^3)$; $3^n \neq O(2^n)$ → (6M.)

Solution :- The big-oh notation denotes the upper bound of algorithm's running time. using big oh notation we can give longest amount of time taken by the algorithm to complete.

Hence we can write

$$F(n) \leq c * g(n)$$

Then $F(n) \in O(g(n))$

In short we will find the values of n, c. such that

$$f(n) \leq c * g(n)$$

remains true.

Assume $f(n) = 3n^3 + 2n^2$

$$g(n) = n^3$$

Then for $n >= 2$ and $c = 4$ $(f(n) \in O(g(n)))$ is true. i.e when $n = 2$ & $c = 4$

$$f(n) = 3(2)^3 + 2(2)^2$$
$$= 3(8) + 2(4)$$
$$= 32 \longrightarrow LHS$$

$$g(n) = n^3$$
$$= 2^3$$
$$= 8$$
$$c * g(n) = 4(8)$$
$$= 32 \longrightarrow RHS$$

LHS = RHS is proved.

But when

$$f(n) = 3^n$$
$$g(n) = 2^n \text{ let us find}$$

$$3^n \leq c * 2^n$$

i.e $\left(\frac{3^n}{2^n}\right) \leq c = \left(\frac{3}{2}\right)^n \leq c$

But there is no such value of c which $\geq \left(\frac{3}{2}\right)^n$. Hence $3^n \neq O(2^n)$. In other words:

$3^n < c*(2^n)$ will never be true. (However 3^n also

---

4) If $T_1(n) = O(f(n))$ and $T_2(n) = O(g(n))$ then show that $T_1(n) + T_2(n) = O(\max(f(n), g(n))$

Properties of order of growth.

If $f_1(n)$ is order of $g_1(n)$ and $f_2(n)$ is order of $g_2(n)$, then $f_1(n) + f_2(n) \in O(\max(g_1(n), g_2(n))$.

Proof:- The four arbitrary real no's a_1, b_1, a_2 & b_2: if $a_1 \leq b_1$ and $a_2 \leq b_2$, then $a_1 + a_2 \leq 2\max\{b_1, b_2\}$.

Solution: Let there be some Constant c_1 such that

$$T_1(n) \leq c_1 g_1(n) \text{ for } n \geq n_1 \quad \text{—— (1)}$$

Similarly there will be some constant c_2

such that

$$T_2(n) \leq c_2 g_2(n) \text{ for } n \geq n_2 \quad \text{—— (2)}$$

Let $c_3 = \max\{c_1, c_2\}$ such that $n \geq \max\{n_1, n_2\}$

Then we can write using equation (1) & (2) as:

$$T_1(n) + T_2(n) \leq c_1 g_1(n) + c_2 g_2(n)$$

$$\leq (c_1 + c_2)(g_1(n) + g_2(n))$$

$$\leq c_3 (g_1(n) + g_2(n))$$

$$\leq c_3 \, 2\max(g_1(n) + g_2(n))$$

$T_1(n) + T_2(n) \in O(\max(g_1(n) + g_2(n))$ is true.

with the constants c and n_0 required by the O definition being $2c_3 = 2\max\{c_1, c_2\}$ and $\max\{n_1, n_2\}$, respectively.

---

5) Prove that : $n! \in \Omega(2^n)$

Proof:- $n! \in \Omega(2^n)$: The function $f(n)$ is said to be in $\Omega(g(n))$ if $f(n)$ is bounded below some positive constant.

So Consider $f(n) = n!$ and $g(n) = 2^n$.

Then $n = 0$

$f(n) = n! = 0$

$g(n) = (n) = 0$

so $f(n) = g(n)$

But if $n = 1$

$f(n) = 1$

$g(n) = 2$

so $f(n) \# g(n)$

if $n = 3$

$f(n) = 3 \times 2 \times 1 = 6$

$g(n) = 8$

so $f(n) < g(n)$

Thus $f(n) < c_1 g(n)$ so $n! \in \Omega(2^n)$

6) Compare orders of growth of $\log_2(n)$ & $\sqrt{n}$.

Soln: For comparision, we will consider various values of n.

If $n=2$ $\log_2(n) = \log_2^2 = 1$

$\sqrt{n} = \sqrt{2} = 1.414$

If $n=64$ $\log_2(64) = 6$

$\sqrt{64} = 8$

If $n=256$ $\log_2(256) = 8$

$\sqrt{256} = 16$

All these computations show that

$\log_2(n) < \sqrt{n}$

Using limits for comparing orders of Growth.

→ The formal definitions of O, Ω and Θ are indispensable for proving their abstract properties. They are rarely used for comparing the orders of growth of two specific functions.

→ It is more convenient method for computing the limit of the ratio of two functions.

$$\lim_{n\to\infty} \frac{t(n)}{g(n)} = \begin{cases} 0 & \text{implies that } t(n) \text{ has a smaller order of growth than } g(n) \\ c>0 & \text{implies that } t(n) \text{ has the same order of growth as } g(n) \\ \infty & \text{implies that } t(n) \text{ has a larger order of growth than } g(n) \end{cases}$$

Note that.

1) The first two cases mean that $t(n) \in O(g(n))$. the last two mean that $t(n) \in \Omega(g(n))$,

2) The second case means that $t(n) \in \Theta(g(n))$.

→ The limit-based approach is often more convenient than the one based on the definitions because it can take advantage of the powerful calculus techniques developed for computing limits,

Such as L'Hospital's rule

$$\lim_{n\to\infty} \frac{t(n)}{g(n)} = \lim_{n\to\infty} \frac{t'(n)}{g'(n)}$$

and Stirling's formula

$$n! \approx \sqrt{2\pi n}\left(\frac{n}{e}\right)^n \text{ for large values of } n.$$

---

1) Compare the orders of growth of $\frac{1}{2}n(n-1)$ and n^2.

$$\lim_{n\to\infty} \frac{\frac{1}{2}n(n-1)}{n^2} = \frac{1}{2}\lim_{n\to\infty} \frac{n^2-n}{n^2}$$

$$= \frac{1}{2}\lim_{n\to\infty} \left(1-\frac{1}{n}\right) = \frac{1}{2}$$

Since the limit is equal to a positive constant the functions have the same order of growth or $\frac{1}{2}n(n-1) \in \Theta(n^2)$

$$\lim_{n\to\infty} \frac{t(n)}{g(n)} = \begin{cases} 0 & \text{implies that } t(n) \text{ has a smaller order of growth than } g(n) \\ c>0 & \text{implies that } t(n) \text{ has the same order of growth as } g(n) \\ \infty & \text{implies that } t(n) \text{ has a larger order of growth than } g(n) \end{cases}$$

Not that.

1) The first two cases mean that $t(n) \in O(g(n))$. the last two mean that $t(n) \in \Omega(g(n))$,

2) The second case means that $t(n) \in \Theta(g(n))$.

→ The limit-based approach is often more convenient than the one based on the definitions because it can take advantage of the powerful calculus techniques developed for computing limits,

such as L'Hospital's rule

$$\lim_{n\to\infty} \frac{t(n)}{g(n)} = \lim_{n\to\infty} \frac{t'(n)}{g'(n)}$$

and Stirling's formula

$$n! \approx \sqrt{2\pi n}\left(\frac{n}{e}\right)^n \text{ for large values of } n.$$

---

1) Compare the orders of growth of $\frac{1}{2}n(n-1)$ and n^2.

$$\lim_{n\to\infty} \frac{\frac{1}{2}n(n-1)}{n^2} = \frac{1}{2}\lim_{n\to\infty} \frac{n^2-n}{n^2}$$

$$= \frac{1}{2}\lim_{n\to\infty} \left(1-\frac{1}{n}\right) = \frac{1}{2}$$

Since the limit is equal to a positive constant the functions have the same order of growth ⇒ $\frac{1}{2}n(n-1) \in \Theta(n^2)$

BGS Institute of Technology

Department of Computer science & Engineering

INTERNAL AUDITING

DATE: 27/05/2019

Name of the Faculty:	Swetha L.K
Designation:	Assistant Professor
Subject Name with Code	Design and Analysis of Algorithms - 17CS443 - 17CSL47

SL. No.	Contents	EVEN (2018-2019)	
		Theory	Lab
1	Faculty Profile	✓	✓
2	Vision and Mission of the Institute	✓	✓
3	Vision and Mission of the Department	✓	✓
4	Department PEO's and PSOs,	✓	✓
5	Course Outcome	✓	✓
6	Mapping of COs and POs, PEOs, PSOs	✓	✓
7	Assessment Tools and Procedure for Assessment of Cos (IA Test, Quiz, Surprise test, Assignment, University Examination)	X ✓	X ✓
8	Previous University Question Papers	✓	✓
9	COE of Institute and COE of the Department (COE= Calendar of Events)	✓	✓
10	Time Table (Class and Individual)	✓	✓
11	Course Plan (Syllabus Copy along with CO and hours)	✓	✓
12	List of Text and Reference Books	X ✓	X ✓
13	Lesson Plan	✓	
14	Batch wise Assignments	✓	✓
15	Students Roll Call with phone numbers (Procter Details batch wise)	X	X
16	Report of Guest Lectures	✓	✓
17	Notes	✓	✓
18	Question Bank	✓	✓
19	FEED Back Report (Mid of the semester & End of the Semester)	✓	✓
20	Communications with Faculty and Students	✓	✓
21	Academic Diary	✓	✓
22	Course end survey	✓	✓

Make use of live examples or real time example

Shashikala

Signature Of External Auditor

Signature Of Academic Incharge

Signature Of HoD

Dept. of Computer Science & Engg
B.G.S. Institute of Technology

Signature Of principal

Principal
B.G.S.I.T

||Jai Sri Gurudev||

BGS Institute of Technology

Department of Computer Science and Engineering

Academic year 2018-19 (ODD / EVEN)	
Name of the Faculty with Designation	Swetha L.R
Course Name with code	Design and Analysis of Algorithms. 17CS43

Feed Back Report			
No. of Students participated	51/92	Overall Feedback	56%

Course End Survey

CO's	CO.1	CO.2	CO.3	CO.4	CO.5	CO.6
Av. Rating	2.21	2.36	2.27	2.40	2.35	

CO Attainment

CO's	CO.1	CO.2	CO.3	CO.4	CO.5	CO.6
Attainment	1.75	1.59	1.39	1.42	2.02	

PO / PSO Attainment

PO/PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
Attainment	1.21	1.52	0.54		1.07								1.63	

Analysis of CO, PO/PSO Attainment [Review of attainment (course attainment)]

Attainment is satisfactory & suggest to arrange workshop & guest lecturer on this subject.

HOD
Dept. of Computer Science & Engg
B.G.S. Institute of Technology.
B.G. Nagar - 571 448.
Nagamangala Tq, Mandya Dist
Karnataka (INDIA)

||Jai Sri Gurudev||

BGS Institute of Technology

Department of Computer Science and Engineering

Result Analysis CIE				
	Test-1	Test-2	Test-3	IA Final
22 (≥76%)	47	28	54	84
12-22 (≥41% ≤75%)	32	31	26	8
12 (≤40%)	13	33	12	–
Total No of Students	92	92	92	92

Action taken for Slow learners:

Test-1 Remedial class was conducted for slow learners.

Test-2 Solving Previous Year question Paper problems.

Result Analysis SEE					
Course name with Code	Total Appeared	FCD	FC	Pass %	Failed
Design and Analysis of Algorithms. 17CS43	92	06	19	84.7.	14

Remarks: Try to get above 90% result in next year. & arrange Guest lecture for the same.

Faculty

HOD

Dept. of Computer Science & Engg.
B.G.S. Institute of Technology
B.G. Nagar 571 448
Nagamangala Tq. Mandya Dist.
Karnataka (INDIA)

||Jai Sri Gurudev||

BGS Institute of Technology

Department of Computer Science and Engineering

Academic year 2018-19 (ODD / EVEN)	
Name of the Faculty with Designation	Swetha D.R Assistant Professor
Course Name with code	Design and Analysis of Algorithms Lab (17CS47)

Feed Back Report			
No. of Students participated	51/93	Overall Feedback	56%

Course End Survey						
CO's	CO.1	CO.2	CO.3	CO.4	CO.5	CO.6
Av. Rating	2.74	2.85	2.81	2.77	2.75	

CO Attainment						
CO's	CO.1	CO.2	CO.3	CO.4	CO.5	CO.6
Attainment	2.36	2.37	2.36	2.36	2.36	

PO / PSO Attainment														
PO/PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
Attainment	0.78	1.10	0.98		0.78								2.36	

Analysis of CO, PO/PSO Attainment [Review of attainment (course attainment)]

Suggest to attend FDP on this subject & also arrange Guest lecture.

Shathiraj

H O D
Dept. of Computer Science & Engg
B G.S. Institute of Technology,
B.G. Nagar - 571 448.
Nagamangala Tq, Mandya Dist
Karnataka (INDIA)