The Education Group
Ghaziabad • Greater Noida
(Estd. : 1995)

I.T.S ENGINEERING COLLEGE
GREATER NOIDA
(A NAAC Accredited Engineering College)

DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING

COURSE FILE

Course	B.Tech
Year	Second Year
Semester	Odd Semester, 3rd
Subject Name	Basics Data Structure & Algorithms
Subject Code	KOE-035
Faculty Name	Mr. Aditya Dayal Tyagi

(2022-2023)

The Education Group
Ghaziabad • Greater Noida
(Estd. : 1995)

I.T.S ENGINEERING COLLEGE
GREATER NOIDA
(A NAAC Accredited Engineering College)

DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING

INDEX

I.T.S ENGINEERING COLLEGE
(NAAC ACCREDITED)
UNIT OF DURGA CHARITABLE TRUST
46, KNOWLEDGE PARK III, GREATER NOIDA, UTTAR PRADESH-201308
PHONE: 0120-2331000 | FAX: 0120-2331037
EMAIL: ENGG.GN@ITS.EDU.IN | WEBSITE: WWW.ITSENGG.EDU.IN

Vision

"To become a department of academic excellence that would produce technically competent and socially responsible professionals in the field of Electronics, Communication and related domains".

Mission

M1: To achieve an educational excellence through effective teaching learning processes.

M2: To create conducive atmosphere for self learning to face contemporary challenges.

M3: To foster an environment for nurturing spirit of creativity, innovation and entrepreneurship with industry participation.

M3: To imbibe professional ethics, social responsibilities and moral values in students and faculty members.

Program Educational Objectives (PEO)

PEO1: Graduates of program will have multifaceted competency for greater employability and accomplished professional career.

PEO2: Graduates of program will emerge as leader, entrepreneur and will be able to pursue higher education.

PEO3: Graduates of program will have thorough knowledge and skill set to deal with real time complex problems.

PEO4: Graduates of program will be able to adjust with fast changing world with socially responsible and ethical mindset.

I.T.S ENGINEERING COLLEGE
(NAAC ACCREDITED)
UNIT OF DURGA CHARITABLE TRUST
46, KNOWLEDGE PARK III, GREATER NOIDA, UTTAR PRADESH-201308
PHONE: 0120-2331000 | FAX: 0120-2331037
EMAIL: ENGG.GN@ITS.EDU.IN | WEBSITE: WWW.ITSENGG.EDU.IN

Program Outcomes

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.

Program Specific Outcomes (PSO)

PSO1: An Ability to apply knowledge of analog and digital electronics to solve, analysis and design of electronic circuits and systems.

PSO2: An Ability to synthesize, evaluate and analyze communication systems and networks for multidisciplinary tasks.

The Education Group
Ghaziabad • Greater Noida
(Estd. : 1995)

I.T.S ENGINEERING COLLEGE
GREATER NOIDA
(A NAAC Accredited Engineering College)

DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING

Short Code or Abbrivation

Sr. No.	Full Name	Abbrivation	Category	Comments	Explanation
1	Course Outcome	CO	NBA		
2	Lecture	L	Academics		
3	Practical	P	Academics		
4	Program Educational Objective	PEO	NBA		
5	Program Outcome	PO	NBA		
6	Semester	Sem	Academics		
7	Tutorial	T	Academics		
8	**Old question Paper**	**Y2_ECE_3_2019_ST-1**	**Academics**		Year_Branch_semester_Year_sessional test
9	PPT		Academics		YearBranchsemesterLecturenumberPPT_FacultyName

Sr. No.	ession N	Topic Names (Comma Separated)	Target Date (YYYY-MM-DD)
1	1	Introduction to data structure and Algorithms,	2022-09-01
2	2	Performance analysis of Algorithm,	2022-09-02
3	3	time complexity,	2022-09-05
4	4	Big-oh notation,	2022-09-06
5	5	Elementary data organization data structure operations,	2022-09-07
6	6	Operation on arrays representation of arrays in memory,	2022-09-08
7	7	single dimensional and multidimensional arrays,	2022-09-09
8	8	spare matrices Recurrences,	2022-09-10
9	9	Character storing in C String perations,	2022-09-12
10	10	Stack operation PUSH and POP,	2022-09-13
11	11	Array representation of stacks,	2022-09-14
12	12	Recursion,	2022-09-15
13	13	Polish experession,	2022-09-16
14	14	Representation Queue operation on Queue ,	2022-09-19
15	15	Priority Queue D-Queue ,	2022-09-20
16	16	Singly and circularly linked list,	2022-09-21
17	17	List operations Lists implementations ,	2022-09-22
18	18	Basic terminology,	2022-09-23
19	19	Binary Trees Binary tree representation Algebraic/expressions,	2022-09-24
20	20	Complete Binary Trees Extended binary tree,	2022-09-26
21	21	Traversing binary trees & Searching in binary trees,	2022-09-27
22	22	Inserting in binary search trees Complexity of searching algorithm,	2022-09-28
23	23	Heaps general trees,	2022-09-29
24	24	Threaded binary tree,	2022-09-30
25	25	Threaded binary tree,	2022-10-03
26	26	Terminology & representations,	2022-10-06
27	27	Graphs & Multigraphs Directed Graphs,	2022-10-07
28	28	Sequential representation of graphs adjacency Matrices,	2022-10-10
29	29	Transversal,	2022-10-11
30	30	connected component and spanning trees Minimum Cost spanning tree,	2022-10-12
31	31	Prims and Kruskal Algorithm,	2022-10-13
32	32	BFS DFS,	2022-10-14
33	33	Shortest path and transitive closure Activity networks,	2022-10-28
34	34	topological sort and critical paths,	2022-11-01
35	35	Linear search binary Search,	2022-11-02
36	36	Internal and External sorting Bubble sorting,	2022-11-03
37	37	selection sort Insertion sort,	2022-11-04
38	38	quick sort,	2022-11-07
39	39	Two way merge sort,	2022-11-09
40	40	Heap sort,	2022-11-10
41	41	External Sorting Storage Devices,	2022-11-11
42	42	introduction to B tree,	2022-11-14
43	43	B+ tree,	2022-11-15
44	44	File organization and storage management Introduction to hoisting,	2022-11-16

I.T.S ENGINEERING COLLEGE
GREATER NOIDA
(A NAAC Accredited Engineering College)

The Education Group
Ghaziabad • Greater Noida
(Estd. 1995)

MODULE MANAGEMENT

Department: ELECTRONICS & COMMUNICATION ENGINEERING
Course : B.Tech
Program Year : ECE 2nd Year **Academic Session** : 2022-23
Contact Hours/Week : 5 Hours/week
Total Contact Hours: 44
Course Objectives:
1. Able to Understand and Analyze the time and space complexity of an algorithm
2. Able to exemplify and implement stack, queue and list data structures and Evaluate various operation on Stack, Queue and linked list
3. Able to implement various tree traversal algorithm & Implement binary search tree to design applications like expression trees
4. Able to Understand and implement Implement fundamental algorithms (including graph algorithms, and dynamic programming.)
5.Able to discuss & implement various searching, sorting and graph traversal algorithms
Course Learning Outcomes:
After Completition of Curriculum, students would be conversant with:
1: To develop the understanding of Data Structures and its operation and analysis of algorithms.
2:Able to Understand and implement stack, queue and list data structures and Evaluate various operation on Stack, Queue and linked list
3: The students will be able to implement various tree traversal algorithm & Implement binary search tree to design applications like expression trees
4: The students will be able implement Implement fundamental algorithms (including graph algorithms, and dynamic programming.)
5: The students will be able to implement implement various searching, sorting and graph traversal algorithms

Syllabus	Topic	Text Book No.	Chapter No.	Page No.	Reference Reading	Chapter No.	Page No.	PPT
Unit 1 Topic 1	Introduction to data structure and Algorithms	1	1	1.3	1	1	1-8	Y2CSES3LN1PPT ADT
Unit 1 Topic 2	Performance analysis of Algorithm	1	1	1.5	1	1	1-8	Y2CSES3LN2PPT ADT
Unit 1 Topic 3	time & Space complexity	1	2	2.16-2.19	1	1	13-16	Y2CSES3LN3PPT ADT
Unit 1 Topic 4	Big-oh notation	1	2	2.16-2.19	1	1	17	Y2CSES3LN4PPT ADT
Unit 1 Topic 5	data structure operations	1	4	4.2-4.7	1	1	61-65	Y2CSES3LN5,6PPT ADT
Unit 1 Topic 6	Arrays, Operation on arrays	1	4	4.18-4.20	1	1	81-83	Y2CSES3LN7,8,9PPT ADT
Unit 1 Topic 7	multidimensional arrays	1	4	4.24-4.28	1	1	93-95	Y2CSES3LN8,9,10PPT ADT
Unit 1 Topic 8	spare matrices & Recursion	1	4	4.37-4.39	1	1	97	Y2CSES3LN11PPT ADT
Unit 1 Topic 9	Character storing in C, String operations	1	5	5.2-5.8	1	7	299-302	Y2CSES3LN12PPT ADT
Unit 2 Topic 10	Stack, Stack operation, PUSH and POP, ,	1	5	5.2-5.8	1	7	299-302	Y2CSES3LN13PPT ADT
Unit 2 Topic 11	Array representation of stacks	1	5	5.12-5.18	1	7	351	Y2CSES3LN14PPT ADT
Unit 2 Topic 12	Recursion	1	5	5.12-5.18	1	7	342	Y2CSES3LN15PPT ADT
Unit 2 Topic 13	Polish experession	1	5	5.2-5.8	1	7	303	Y2CSES3LN16PPT ADT
Unit 2 Topic 14	Representation of Queue	1	5	5.25	1	7	369	Y2CSES3LN16PPT ADT
Unit 2 Topic 15	Priority Queue , D-Queue				1	7	377	Y2CSES3LN16PPT ADT

Unit 2 Topic 16	Singly and circularly linked list	1	6	6.2-6.4	1	5	165-167	Y2CSES3LN17,1 ADT
Unit 2 Topic 17	List operations Lists implementations	1	6	6.3-6.9	1	5	171	Y2CSES3LN19PPT ADT
Unit 3 Topic 18	Trees : Basic terminology	1	6	6.5-6.13	1	5	184-187	Y2CSES3LN20PPT ADT
Unit 3 Topic 19	Binary Trees, Binary tree representation, algebraic/expressions	1	6	6.5-6.13	1	5	185-192	Y2CSES3LN21PPT ADT
Unit 3 Topic 20	Complete Binary Trees, Extended binary tree	1	6	6.18-6.25	1	2	23-37	Y2CSES3LN22,23PPT ADT
Unit 3 Topic 21	Traversing binary trees & Searching in binary trees	1	6.1	6.32-6.38	1	6	251-253	Y2CSES3LN24PPT ADT
Unit 3 Topic 22	Inserting in binary search trees	1	6.1	6.37-6.45	1	6	263	Y2CSES3LN25PPT ADT
Unit 3 Topic 23	Heaps	1	6.1	6.33,6.37	1	6	263	Y2CSES3LN26PPT ADT
Unit 3 Topic 24	Threaded binary tree.	1	6.1	6.39-6.44	1	6	272-282	Y2CSES3LN26PPT ADT
Unit 3 Topic 25	Threaded binary tree.	1	2	4.13-4.14	1	11	517-519	Y2CSES3LN27,28PPT ADT
Unit 4 Topic 26	Graphs: Terminology & representations	1	9	9.20-9.25	1	11	592-599	Y2CSES3LN29PPT ADT
Unit 4 Topic 27	Graphs & Multigraphs	1	9	9.20-9.26	1	11	592-600	Y2CSES3LN30,31PPT ADT
Unit 4 Topic 28	representation of graphs	1	9	9.2-9.3	1	10	535-538	Y2CSES3LN32PPT ADT
Unit 4 Topic 29	Transversal	1	9	9.8-9.9	1	10	542	Y2CSES3LN32PPT ADT
Unit 4 Topic 30	Minimum Cost spanning tree	1	4	4.9	1	10	538	Y2CSES3LN32PPT ADT
Unit 4 Topic 31	Prims and Kruskal Algorithm	1	6	6.14-6.19	1	10	545	Y2CSES3LN33PPT ADT
Unit 4 Topic 32	BFS, DFS	1	9	9.11-9.15	1	10	557	Y2CSES3LN33PPT ADT
Unit 4 Topic 33	Activity networks and transitive closure	1	7	7.78-7.79	1	10	561	Y2CSES3LN34PPT ADT
Unit 4 Topic 34	topological sort	1	9	9.16	1	10	551	Y2CSES3LN34PPT ADT
Unit 5 Topic 35	Linear search, binary Search	1	8	8.1-8.9	1	9	479-482	Y2CSES3LN35PPT ADT
Unit 5 Topic 36	Internal and External sorting, Bubble sorting	1	8	8.23-8.25	1	9	481	Y2CSES3LN36PPT ADT
Unit 5 Topic 37	selection sort, Insertion sort	1	8	8.21-8.23	1	9	483	Y2CSES3LN37PPT ADT
Unit 5 Topic 38	quick sort	1	8	8.23-8.28	1	9	597	Y2CSES3LN38PPT ADT
Unit 5 Topic 39	Two way merge sort	1	8	8.25-8.29	1	9	514	Y2CSES3LN39PPT ADT
Unit 5 Topic 40	Heap sort	1	8	8.8-8.11	1	9	514-516	Y2CSES3LN40PPT ADT
Unit 5 Topic 41	Storage Devices : Magnetic tapes, Disk Storage	1	8	8.8-8.11	1	9	514-516	Y2CSES3LN41,42PPT ADT
Unit 5 Topic 42	B tree	1	8	8.25	1	9	517	Y2CSES3LN43PPT ADT
Unit 5 Topic 43	B+ tree	1	7	7.1-7.5	1	8	387-389	Y2CSES3LN44PPT ADT
Unit 5 Topic 44	File organization	1	7	7.4	1	7	437	Y2CSES3LN45PPT ADT

Course Evaluation

Criteria for Internal Assesment	Two Sessional Examinations : 50 Marks in theory in each Assesment One Pre university Examination : 100 Marks
Criteria for university Examination	One Theory paper of 100 Marks and 3 hour Duration Total marks for Theory is 100(100 Marks University Examination, 50 Marks of Internal Assesment
Text Books:	1. Lipschutz, "Data Structures" Schaum's Outline Series, TMH 2. Aaron M. Tenenbaum, Yedidyah Langsam and Moshe J. Augenstein "Data Structures Using C and C++" , PHI
Reference Books:	1. G.S. Baluja, Data Structure Using C,Dhanapat Rai Publications 2. Horowitz and Sahani, "Fundamentals of Data Structures", Galgotia Publication 3. Jean Paul Trembley and Paul G. Sorenson, "An Introduction to Data Structures with applications",McGraw Hill 4. G A V Pai, "Data Structures and Algorithms", TMH

Mapping with CO and PO

CO-PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	2	2	3	3							1	1	
CO2		3	2	3	3	1							1	
CO3	2	2	1	3	3	1						1	2	2
CO4	2	3	2	3	3								1	
CO5	2	1	3	3	3		1					1	2	3
AVG	2	2.2	2	3	3	1	1	-	-	-	-	1	1.4	2.5

RUBRIC FOR AVERAGE CO ATTAINMENT & WEAK STUDENTS IDENTIFICATION

Sub.Name	BASICS DATA STRUCTURE & ALGORITHMS		STATUS	WEAK ATTAINEMENT					ASSIGNMENT GIVEN TO WEAK STUDENT (Write "Y" for Yes if Given)				
Sub. Code	KOE-035			CO1	CO2	CO3	CO4	CO5	CO1	CO2	CO3	CO4	CO5
Section	0			W = Weak Students									
Faculty Name	Mr. ADITYA TYAGI												
S.No.	RollNo	Student Name	(P/A/D)	%age attainment < 40%					%age weightage attained				
1	2102220310001	AADARSH	P										
2	2102220310002	ABHAY SHARMA	P										
3	2102220310005	ADITYA RANA	P	W				W	Y				Y
4	2102220310006	ADITYA SHANKAR	P	W				W	Y				Y
5	2102220310007	AKMAL HUSSEN	P					W					Y
6	2102220310008	ALOK KUMAR SINGH	P										
7	2102220310009	ASHWIN YADAV	P	W				W	Y				Y
8	2102220310010	AVINASH A B ROY	P	W				W	Y				Y
9	2102220310011	BHUMIKA PAL	P										
10	2102220310012	DEVRAJ SINGH	A	A	A	A	A	A					
11	2102220310013	GAUTAM NEGI	A	A	A	A	A	A					
12	2102220310014	HARSHIT RAJ	P					W					Y
13	2102220310016	MD GULAB NABI	A	A	A	A	A	A					
14	2102220310018	MD TAUSIF RAJA	A	A	A	A	A	A					
15	2102220310021	RAKESH KUMAR	P										
16	2102220310022	RIYA CHAUDHARY	P	W				W	Y				Y
17	2102220310023	SAHWAG RAJ	P	W				W	Y				Y
18	2102220310024	SAHZAAD BHATTI	P					W					Y
19	2102220310026	SHUSHANT PANJIKER	A	A	A	A	A	A					
20	2102220310027	SIDDHARTH KUMAR	A	A	A	A	A	A					
21	2102220310028	SNEHA	P	W					Y				
22	2102220310029	SONU KUMAR	P	W					Y				
23	2102220310030	URVESH SAIFI	A	A	A								
24	LE	ABHIJEET KUMAR SRIVASTAVA	P	W					Y				
25	LE	RAHUL KUMAR	P										

RUBRIC FOR AVERAGE CO ATTAINMENT & WEAK STUDENTS IDENTIFICATION

Sub.Name	BASICS DATA STRUCTURE & ALGORITHMS
Sub. Code	KOE-035
Section	0
Faculty Name	Mr. ADITYA TYAGI

STATUS
P-Present
A-Absent
D-Detained

	CO WEIGTHEGE					CALCULATED PERCENTAGE					IDENTIFYING WEAK STUDENTS				
	CO1	CO2	CO3	CO4	CO5	CO1%	CO2%	CO3%	CO4%	CO5%	CO1	CO2	CO3	CO4	CO5
	26	0	0	0	24	52.0%	0.0%	0.0%	0.0%	48.0%	W = Weak Students				
S.No.	RollNo	Student Name	(P/A/D)	CO Weightage attained					%age weightage attained					%age attainment < 40%				
1	2102220310001	AADARSH	P	17	0	0	0	17	65.4%				70.8%					
2	2102220310002	ABHAY SHARMA	P	23	0	0	0	20	88.5%				83.3%					
3	2102220310005	ADITYA RANA	P	8	0	0	0	2	30.8%				8.3%	W				W
4	2102220310006	ADITYA SHANKAR	P	4	0	0	0	7	15.4%				29.2%	W				W
5	2102220310007	AKMAL HUSSEN	P	14	0	0	0	3	53.8%				12.5%					W
6	2102220310008	ALOK KUMAR SINGH	P	15	0	0	0	14	57.7%				58.3%					
7	2102220310009	ASHWIN YADAV	P	5	0	0	0	9	19.2%				37.5%	W				W
8	2102220310010	AVINASH A B ROY	P	10	0	0	0	4	38.5%				16.7%	W				W
9	2102220310011	BHUMIKA PAL	P	12	0	0	0	16	46.2%				66.7%					
10	2102220310012	DEVRAJ SINGH	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A
11	2102220310013	GAUTAM NEGI	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A
12	2102220310014	HARSHIT RAJ	P	13	0	0	0	9	50.0%				37.5%					W
13	2102220310016	MD GULAB NABI	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A
14	2102220310018	MD TAUSIF RAJA	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A
15	2102220310021	RAKESH KUMAR	P	16	0	0	0	11	61.5%				45.8%					
16	2102220310022	RIYA CHAUDHARY	P	8	0	0	0	8	30.8%				33.3%	W				W
17	2102220310023	SAHWAG RAJ	P	3	0	0	0	1	11.5%				4.2%	W				W
18	2102220310024	SAHZAAD BHATTI	P	12	0	0	0	2	46.2%				8.3%					W
19	2102220310026	SHUSHANT PANJIKER	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A
20	2102220310027	SIDDHARTH KUMAR	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A

RUBRIC FOR CO SPECIFIC

Sub.Name	BASICS DATA STRUCTURE & ALGORITHMS		Section A - Q1					Section B - Q2				Section C		Total Marks	CO WEIGTHEGE				
Sub. Code	KOE-035	Question No.	1	2	3	4	5	6	7	8	9	10	11		CO1	CO2	CO3	CO4	CO5
Section		CO Mapped	1	1	1	5	5	1	1	5	5	1	5						
Faculty Name	Mr. ADITYA TYAGI	Assigned Marks	2	2	2	2	2	5	5	5	5	10	10	50	26	0	0	0	24
S.No.	RollNo	Student Name	Marks Obtained											M.O.	CO attained Marks				
1	2102220310001	AADARSH	0	1	2	2	2	1	5	5	4	8	4	34	17	0	0	0	17
2	2102220310002	ABHAY SHARMA	2	2	2	2	2	2	5	2	4	10	10	43	23	0	0	0	20
3	2102220310005	ADITYA RANA		1	1	2		1	5		0	0		10	8	0	0	0	2
4	2102220310006	ADITYA SHANKAR	0	1	1	1	0	1	0	2	3	1	1	11	4	0	0	0	7
5	2102220310007	AKMAL HUSSEN	0	1		1		1	5	1	1	7	0	17	14	0	0	0	3
6	2102220310008	ALOK KUMAR SINGH	1	1		2	0	1	5	5	5	7	2	29	15	0	0	0	14
7	2102220310009	ASHWIN YADAV							5	5	1	0	3	14	5	0	0	0	9
8	2102220310010	AVINASH A B ROY				2			5		2	5	0	14	10	0	0	0	4
9	2102220310011	BHUMIKA PAL	2	2	2	2	2	1	5	5	4	0	3	28	12	0	0	0	16
10	2102220310012	DEVRAJ SINGH														0	0	0	
11	2102220310013	GAUTAM NEGI														0	0	0	
12	2102220310014	HARSHIT RAJ	1	0	1	1	1	1	5	5	1	5	1	22	13	0	0	0	9
13	2102220310016	MD GULAB NABI														0	0	0	
14	2102220310018	MD TAUSIF RAJA														0	0	0	
15	2102220310021	RAKESH KUMAR	1	1		2			5	5	2	9	2		16	0	0	0	11
16	2102220310022	RIYA CHAUDHARY	2	1		0	0	0	0	3	2	5	3	16	8	0	0	0	8
17	2102220310023	SAHWAG RAJ	1	1				1	0	1		0			3	0	0	0	1
18	2102220310024	SAHZAAD BHATTI	1			1		6	5		1			14	12	0	0	0	2
19	2102220310026	SHUSHANT PANJIKER														0	0	0	
20	2102220310027	SIDDHARTH KUMAR														0	0	0	
21	2102220310028	SNEHA							5	0	2	1	2	10	6	0	0	0	4
22	2102220310029	SONU KUMAR	2	2		2	0	1	3	1	2		2		8	0	0	0	7
23	2102220310030	URVESH SAIFI														0	0	0	
24	LE	ABHIJEET KUMAR SRIVASTAVA	0			2		0	5		5	4	0	16	9	0	0	0	7
25	LE	RAHUL KUMAR		0		2	0		5	2	4	7		20	12	0	0	0	8

DEPARTMENT OF ELECTRONICS AND COMUNICATION ENGINEERING

BRANCH: ELECTRONICS AND COMMUNICATION ENGINEERING

SEMESTER: 3rd: BASICS DATA STRUCTURE & ALGORITHMS (KOE-035: Sessional Test-1: 2022-2023 : 19.10.2022

S. No.	Roll Number	Name of the Student	SECTION-A (10 MARKS) TARGET LEVEL: 0.8					SECTION-B (20 MARKS) TARGET LEVEL: 2.0				SECTION-C (20 MARKS) TL: 4.0		Total (50 Marks)
			Q. No. 1 (2)	Q. No. 2 (2)	Q. No. 3 (2)	Q. No. 4 (2)	Q. No. 5 (2)	Q. No.6 (5)	Q. No. 7 (5)	Q. No. 8 (5)	Q. No. 9 (5)	Q. No. 10 (10)	Q. No. 11 (10)	
	COURSE OUTCOME		CO1	CO1	CO1	CO5	CO5	CO1	CO1	CO5	CO5	CO1	CO5	
1	2102220310001	AADARSH	0	1	2	2	2	1	5	5	4	8	4	34
2	2102220310002	ABHAY SHARMA	2	2	2	2	2	2	5	2	4	10	10	43
3	2102220310005	ADITYA RANA		1	1	2		1	5		0	0		10
4	2102220310006	ADITYA SHANKAR	0	1	1	1	0	1	0	2	3	1	1	11
5	2102220310007	AKMAL HUSSEN	0	1		1		1	5	1	1	7	0	17
6	2102220310008	ALOK KUMAR SINGH	1	1		2	0	1	5	5	5	7	2	29
7	2102220310009	ASHWIN YADAV							5	5	1	0	3	14
8	2102220310010	AVINASH A B ROY				2			5		2	5	0	14
9	2102220310011	BHUMIKA PAL	2	2	2	2	2	1	5	5	4	0	3	28
10	2102220310012	DEVRAJ SINGH												
11	2102220310013	GAUTAM NEGI												
12	2102220310014	HARSHIT RAJ	1	0	1	1	1	1	5	5	1	5	1	22
13	2102220310016	MD GULAB NABI												
14	2102220310018	MD TAUSIF RAJA												
15	2102220310021	RAKESH KUMAR	1	1		2			5	5	2	9	2	27
16	2102220310022	RIYA CHAUDHARY	2	1		0	0	0	0	3	2	5	3	16
17	2102220310023	SAHWAG RAJ	1	1				1	0	1		0		4
18	2102220310024	SAHZAAD BHATTI	1			1		6	5		1			14
19	2102220310026	SHUSHANT PANJIKER												
20	2102220310027	SIDDHARTH KUMAR												
21	2102220310028	SNEHA							5	0	2	1	2	10
22	2102220310029	SONU KUMAR	2	2		2	0	1	3	1	2		2	15
23	2102220310030	URVESH SAIFI												
24	LE	ABHIJEET KUMAR SRIVASTAVA	0			2		0	5		5	4	0	16
25	LE	RAHUL KUMAR		0		2	0		5	2	4	7		20
	COURSE OUTCOME		CO1	CO1	CO1	CO5	CO5	CO1	CO1	CO5	CO5	CO1	CO5	
	AVERAGE		1.00	1.08	1.50	1.60	0.78	1.31	4.06	3.00	2.53	4.31	2.36	
	PERCENTAGE		50.00	53.85	75.00	80.00	38.89	26.15	81.11	60.00	50.59	43.13	23.57	
	TARGET ACHIEVED		Y	Y	Y	Y	N	N	Y	Y	Y	Y	N	Y
	Total Appeared		13	13	6	15	9	13	18	14	17	16	14	
	Number of Students < TL		4	2	0	1	5	11	3	4	5	6	12	
	No. of Students > TL		9	11	6	14	4	2	15	10	12	10	2	
	% age TL		69.23	84.62	100.00	93.33	44.44	15.38	83.33	71.43	70.59	62.50	14.29	
	SCORE		3	3	3	3	0	0	3	3	3	2	0	
	CO ATTAINMENT LEVEL (AL)		H	H	H	H	N	N	M	H	H	M	N	

TARGET LEVEL (TL)	AL	
> 65% Students secured > 40%	H	3
55% - 65% Students secured > 40%	M	2
45% - 55% Students secured > 40%	L	1
< 45% Students secured > 40%	N	0
AVERAGE CO1	2.21	L
AVERAGE CO5	2.05	

	ST-1	
CO-1	2.21	
CO-2		
CO-3		
CO-4		
CO-5	2.05	

RUBRIC FOR AVERAGE CO ATTAINMENT & WEAK STUDENTS IDENTIFICATION

Sub.Name	BASICS DATA STRUCTURE & ALGORITHMS		STATUS	WEAK ATTAINEMENT					ASSIGNMENT GIVEN TO WEAK STUDENT (Write "Y" for Yes if Given)				
Sub. Code	KOE-035			CO1	CO2	CO3	CO4	CO5	CO1	CO2	CO3	CO4	CO5
Section	0			W = Weak Students									
Faculty Name	Mr. ADITYA TYAGI												
S.No.	RollNo	Student Name	(P/A/D)	%age attainment < 40%					%age weightage attained				
1	2102220310001	AADARSH	P		W		W			Y		Y	
2	2102220310002	ABHAY SHARMA	P										
3	2102220310005	ADITYA RANA	P		W		W			Y		Y	
4	2102220310006	ADITYA SHANKAR	P		W		W			Y		Y	
5	2102220310007	AKMAL HUSSEN	P		W		W			Y		Y	
6	2102220310008	ALOK KUMAR SINGH	P										
7	2102220310009	ASHWIN YADAV	P		W		W			Y		Y	
8	2102220310010	AVINASH A B ROY	P		W		W			Y		Y	
9	2102220310011	BHUMIKA PAL	P		W		W			Y		Y	
10	2102220310012	DEVRAJ SINGH	A	A	A	A	A	A					
11	2102220310013	GAUTAM NEGI	A	A	A	A	A	A					
12	2102220310014	HARSHIT RAJ	P		W		W			Y		Y	
13	2102220310016	MD GULAB NABI	A	A	A	A	A	A					
14	2102220310018	MD TAUSIF RAJA	A	A	A	A	A	A					
15	2102220310021	RAKESH KUMAR	P		W		W			Y		Y	
16	2102220310022	RIYA CHAUDHARY	P		W		W			Y		Y	
17	2102220310023	SAHWAG RAJ	P		W		W			Y		Y	
18	2102220310024	SAHZAAD BHATTI	P		W					Y			
19	2102220310026	SHUSHANT PANJIKER	A	A	A	A	A	A					
20	2102220310027	SIDDHARTH KUMAR	A	A	A	A	A	A					
21	2102220310028	SNEHA	P		W					Y			
22	2102220310029	SONU KUMAR	P		W					Y			
23	2102220310030	URVESH SAIFI	A	A	A								
24	LE	ABHIJEET KUMAR SRIVASTAVA	P										
25	LE	RAHUL KUMAR	P										

RUBRIC FOR AVERAGE CO ATTAINMENT & WEAK STUDENTS IDENTIFICATION

Sub.Name	BASICS DATA STRUCTURE & ALGORITHMS
Sub. Code	KOE-035
Section	0
Faculty Name	Mr. ADITYA TYAGI

STATUS P-Present A-Absent D-Detained

	CO1	CO2	CO3	CO4	CO5
CO WEIGTHEGE	0	24	0	26	0
CALCULATED PERCENTAGE	0.0%	48.0%	0.0%	52.0%	0.0%
IDENTIFYING WEAK STUDENTS	W = Weak Students				

S.No.	RollNo	Student Name	(P/A/D)	CO Weightage attained					%age weightage attained					%age attainment < 40%				
1	2102220310001	AADARSH	P	0	7	0	4	0		29.2%		15.4%			W		W	
2	2102220310002	ABHAY SHARMA	P	0	13	0	22	0		54.2%		84.6%						
3	2102220310005	ADITYA RANA	P	0	1	0	9	0		4.2%		34.6%			W		W	
4	2102220310006	ADITYA SHANKAR	P	0	3	0	7	0		12.5%		26.9%			W		W	
5	2102220310007	AKMAL HUSSEN	P	0	2	0	6	0		8.3%		23.1%			W		W	
6	2102220310008	ALOK KUMAR SINGH	P	0	16	0	11	0		66.7%		42.3%						
7	2102220310009	ASHWIN YADAV	P	0	6	0	2	0		25.0%		7.7%			W		W	
8	2102220310010	AVINASH A B ROY	P	0	0	0	0	0		0.0%		0.0%			W		W	
9	2102220310011	BHUMIKA PAL	P	0	6	0	9	0		25.0%		34.6%			W		W	
10	2102220310012	DEVRAJ SINGH	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A
11	2102220310013	GAUTAM NEGI	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A
12	2102220310014	HARSHIT RAJ	P	0	0	0	2	0		0.0%		7.7%			W		W	
13	2102220310016	MD GULAB NABI	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A
14	2102220310018	MD TAUSIF RAJA	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A
15	2102220310021	RAKESH KUMAR	P	0	0	0	0	0		0.0%		0.0%			W		W	
16	2102220310022	RIYA CHAUDHARY	P	0	6	0	6	0		25.0%		23.1%			W		W	
17	2102220310023	SAHWAG RAJ	P	0	0	0	0	0		0.0%		0.0%			W		W	
18	2102220310024	SAHZAAD BHATTI	P	0	9	0	11	0		37.5%		42.3%			W			
19	2102220310026	SHUSHANT PANJIKER	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A
20	2102220310027	SIDDHARTH KUMAR	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A

RUBRIC FOR CO SPECIFIC

Sub.Name	BASICS DATA STRUCTURE & ALGORITHMS		Section A - Q1					Section B - Q2				Section C		Total Marks	CO WEIGTHEGE				
Sub. Code	KOE-035	Question No.	1	2	3	4	5	6	7	8	9	10	11		CO1	CO2	CO3	CO4	CO5
Section		CO Mapped	2	2	4	4	4	2	2	4	4	2	4						
Faculty Name	Mr. ADITYA TYAGI	Assigned Marks	2	2	2	2	2	5	5	5	5	10	10	50	0	24	0	26	0
S.No.	RollNo	Student Name	Marks Obtained											M.O.	CO attained Marks				
1	2102220310001	AADARSH	0	0	1	0	1	3	2	2	0	2	0	11	0	7	0	4	0
2	2102220310002	ABHAY SHARMA	2	0	2	2	2	2	2	5	5	7	6	35	0	13	0	22	0
3	2102220310005	ADITYA RANA	0	0	1		0		1	3	5		0	10	0	1	0	9	0
4	2102220310006	ADITYA SHANKAR	1	0		1	0		2	2	0	0	4	10	0	3	0	7	0
5	2102220310007	AKMAL HUSSEN		0	0	0		0	2	2		0	4	8	0	2	0	6	0
6	2102220310008	ALOK KUMAR SINGH	1	0	0		0	4	5	5	4	6	2	27	0	16	0	11	0
7	2102220310009	ASHWIN YADAV							0	2		6	0	8	0	6	0	2	0
8	2102220310010	AVINASH A B ROY		0				0	0	0	0	0		0	0	0	0	0	0
9	2102220310011	BHUMIKA PAL	1	2	2	2	0	1	2	0	0	0	5	15	0	6	0	9	0
10	2102220310012	DEVRAJ SINGH	1	1	1			0	0	0			1			2	0	2	
11	2102220310013	GAUTAM NEGI	2	2	2	1	0	4	5	5	0	10	10			23	0	18	
12	2102220310014	HARSHIT RAJ	0	0	1	0		0		0	1	0	0	2	0	0	0	2	0
13	2102220310016	MD GULAB NABI														0	0	0	
14	2102220310018	MD TAUSIF RAJA														0	0	0	
15	2102220310021	RAKESH KUMAR													0	0	0	0	0
16	2102220310022	RIYA CHAUDHARY	1	0	2	0		3	0			2	4	12	0	6	0	6	0
17	2102220310023	SAHWAG RAJ													0	0	0	0	0
18	2102220310024	SAHZAAD BHATTI	0.5	0.5	2	0	0	4	2	5	4	2		20	0	9	0	11	0
#REF!	2102220310026	SHUSHANT PANJIKER	2	1	2	0		3	1	1	4	0				7	0	7	
19	2102220310027	SIDDHARTH KUMAR	0	0	0	0		0	2	0		0	1			2	0	1	
20	2102220310028	SNEHA	0	0			0	1	0	0	4	2	0	7	0	3	0	4	0
21	2102220310029	SONU KUMAR													0	0	0	0	0
22	2102220310030	URVESH SAIFI	0	0	1	0	0	3	5	0	0	4	2			12	0	3	
23	LE	ABHIJEET KUMAR SRIVASTAVA	1	0	0	0	0	0	5	1	0	6	3	16	0	12	0	4	0
24	LE	RAHUL KUMAR	0	0	2	0	0	2	4	5	3	7	5	28	0	13	0	15	0

DEPARTMENT OF ELECTRONICS AND COMUNICATION ENGINEERING

BRANCH: ELECTRONICS AND COMMUNICATION ENGINEERING

SEMESTER: 3rd: BASICS DATA STRUCTURE & ALGORITHMS (KOE-035: Sessional Test-2: 2022-2023 : 14.12.2022

S. No.	Roll Number	Name of the Student	SECTION-A (10 MARKS) TARGET LEVEL: 0.8					SECTION-B (20 MARKS) TARGET LEVEL: 2.0				SECTION-C (20 MARKS) TL: 4.0		Total (50 Marks)
			Q. No. 1 (2)	Q. No. 2 (2)	Q. No. 3 (2)	Q. No. 4 (2)	Q. No. 5 (2)	Q. No.6 (5)	Q. No. 7 (5)	Q. No. 8 (5)	Q. No. 9 (5)	Q. No. 10 (10)	Q. No. 11 (10)	
	COURSE OUTCOME		CO2	CO2	CO4	CO4	CO4	CO2	CO2	CO4	CO4	CO2	CO4	
1	2102220310001	AADARSH	0	0	1	0	1	3	2	2	0	2	0	11
2	2102220310002	ABHAY SHARMA	2	0	2	2	2	2	2	5	5	7	6	35
3	2102220310005	ADITYA RANA	0	0	1		0		1	3	5		0	10
4	2102220310006	ADITYA SHANKAR	1	0		1	0		2	2	0	0	4	10
5	2102220310007	AKMAL HUSSEN		0	0	0		0	2	2		0	4	8
6	2102220310008	ALOK KUMAR SINGH	1	0	0		0	4	5	5	4	6	2	27
7	2102220310009	ASHWIN YADAV							0	2		6	0	8
8	2102220310010	AVINASH A B ROY		0				0	0	0	0	0		0
9	2102220310011	BHUMIKA PAL	1	2	2	2	0	1	2	0	0	0	5	15
10	2102220310012	DEVRAJ SINGH	1	1	1			0	0	0			1	4
11	2102220310013	GAUTAM NEGI	2	2	2	1	0	4	5	5	0	10	10	41
12	2102220310014	HARSHIT RAJ	0	0	1	0		0		0	1	0	0	2
13	2102220310016	MD GULAB NABI												
14	2102220310018	MD TAUSIF RAJA												
15	2102220310021	RAKESH KUMAR												
16	2102220310022	RIYA CHAUDHARY	1	0	2	0		3	0			2	4	12
17	2102220310023	SAHWAG RAJ												
18	2102220310024	SAHZAAD BHATTI	0.5	0.5	2	0	0	4	2	5	4	2		20
19	2102220310026	SHUSHANT PANJIKER	2	1	2	0		3	1	1	4	0		14
20	2102220310027	SIDDHARTH KUMAR	0	0	0	0		0	2	0		0	1	3
21	2102220310028	SNEHA	0	0			0	1	0	0	4	2	0	7
22	2102220310029	SONU KUMAR												
23	2102220310030	URVESH SAIFI	0	0	1	0	0	3	5	0	0	4	2	15
24	LE	ABHIJEET KUMAR SRIVASTAVA	1	0	0	0	0	0	5	1	0	6	3	16
25	LE	RAHUL KUMAR	0	0	2	0	0	2	4	5	3	7	5	28
	COURSE OUTCOME		CO1	CO1	CO1	CO5	CO5	CO1	CO1	CO5	CO5	CO1	CO5	
	AVERAGE		0.74	0.34	1.19	0.43	0.25	1.76	2.11	2.00	2.00	3.00	2.76	
	PERCENTAGE		36.76	17.11	59.38	21.43	12.50	35.29	42.11	40.00	40.00	30.00	27.65	
	TARGET ACHIEVED		Y	Y	Y	Y	N	N	Y	Y	Y	Y	N	Y
	Total Appeared		17	19	16	14	12	17	19	19	15	18	17	
	Number of Students < TL		8	15	4	10	10	8	7	9	8	11	10	
	No. of Students > TL		9	4	12	4	2	9	12	10	7	7	7	
	% age TL		52.94	21.05	75.00	28.57	16.67	52.94	63.16	52.63	46.67	38.89	41.18	
	SCORE		3	3	3	3	0	0	3	3	3	2	0	
	CO ATTAINMENT LEVEL (AL)		H	H	H	H	N	N	M	H	H	M	N	

TARGET LEVEL (TL)	AL	
> 65% Students secured > 40%	H	3
55% - 65% Students secured > 40%	M	2
45% - 55% Students secured > 40%	L	1
< 45% Students secured > 40%	N	0
AVERAGE CO1	2.21	L
AVERAGE CO5	2.05	

	ST-1	
CO-1	2.21	
CO-2		
CO-3		
CO-4		
CO-5	2.05	

RUBRIC FOR AVERAGE CO ATTAINMENT & WEAK STUDENTS IDENTIFICATION

Sub.Name	BASICS DATA STRUCTURE & ALGORITHMS		STATUS	WEAK ATTAINEMENT					ASSIGNMENT GIVEN TO WEAK STUDENT (Write "Y" for Yes if Given)				
Sub. Code	KOE-035			CO1	CO2	CO3	CO4	CO5	CO1	CO2	CO3	CO4	CO5
Section	0			W = Weak Students									
Faculty Name	Mr. ADITYA TYAGI												
S.No.	RollNo	Student Name	(P/A/D)	%age attainment < 40%					%age weightage attained				
1	2102220310001	AADARSH	P				W	W				Y	Y
2	2102220310002	ABHAY SHARMA	P				W					Y	
3	2102220310005	ADITYA RANA	P			W	W				Y	Y	
4	2102220310006	ADITYA SHANKAR	P		W	W	W			Y	Y	Y	
5	2102220310007	AKMAL HUSSEN	P										
6	2102220310008	ALOK KUMAR SINGH	A	A	A	A	A	A					
7	2102220310009	ASHWIN YADAV	P			W	W	W			Y	Y	Y
8	2102220310010	AVINASH A B ROY	P	W	W	W	W		Y	Y	Y	Y	
9	2102220310011	BHUMIKA PAL	P		W					Y			
10	2102220310012	DEVRAJ SINGH	P	W	W	W	W	W	Y	Y	Y	Y	Y
11	2102220310013	GAUTAM NEGI	A	A	A	A	A	A					
12	2102220310014	HARSHIT RAJ	P			W	W				Y	Y	
13	2102220310016	MD GULAB NABI	A	A	A	A	A	A					
14	2102220310018	MD TAUSIF RAJA	P	W	W	W	W	W	Y	Y	Y	Y	Y
15	2102220310021	RAKESH KUMAR	P			W	W				Y	Y	
16	2102220310022	RIYA CHAUDHARY	P		W					Y			
17	2102220310023	SAHWAG RAJ	P	W	W	W	W		Y	Y	Y	Y	
18	2102220310024	SAHZAAD BHATTI	P	W	W	W	W	W	Y	Y	Y	Y	Y
19	2102220310026	SHUSHANT PANJIKER	P	W	W		W		Y	Y		Y	
20	2102220310027	SIDDHARTH KUMAR	P	W	W	W	W	W	Y	Y	Y	Y	Y
21	2102220310028	SNEHA	P	W	W	W	W		Y	Y	Y	Y	
22	2102220310029	SONU KUMAR	P	W	W	W	W	W	Y	Y	Y	Y	Y
23	2102220310030	URVESH SAIFI	P			W	W				Y	Y	
24	LE	ABHIJEET KUMAR SRIVASTAVA	P	W	W	W	W	W	Y	Y	Y	Y	Y
25	LE	RAHUL KUMAR	P	W		W	W		Y		Y	Y	

RUBRIC FOR AVERAGE CO ATTAINMENT & WEAK STUDENTS IDENTIFICATION

Sub.Name	BASICS DATA STRUCTURE & ALGORITHMS
Sub. Code	KOE-035
Section	0
Faculty Name	Mr. ADITYA TYAGI

STATUS P-Present A-Absent D-Detained

S.No.	RollNo	Student Name	(P/A/D)	CO WEIGTHEGE					CALCULATED PERCENTAGE					IDENTIFYING WEAK STUDENTS				
				CO1	CO2	CO3	CO4	CO5	CO1%	CO2%	CO3%	CO4%	CO5%	CO1	CO2	CO3	CO4	CO5
				20	20	20	20	20	20.0%	20.0%	20.0%	20.0%	20.0%	W = Weak Students				
				CO Weightage attained					%age weightage attained					%age attainment < 40%				
1	2102220310001	AADARSH	P	9	10	14	6	6	45.0%	50.0%	70.0%	30.0%	30.0%				W	W
2	2102220310002	ABHAY SHARMA	P	14	13	14	7	19	70.0%	65.0%	70.0%	35.0%	95.0%				W	
3	2102220310005	ADITYA RANA	P	8	8	7	2	14	40.0%	40.0%	35.0%	10.0%	70.0%			W	W	
4	2102220310006	ADITYA SHANKAR	P	9	3	0	2	10	45.0%	15.0%	0.0%	10.0%	50.0%		W	W	W	
5	2102220310007	AKMAL HUSSEN	P	10	13	18	9	17	50.0%	65.0%	90.0%	45.0%	85.0%					
6	2102220310008	ALOK KUMAR SINGH	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A
7	2102220310009	ASHWIN YADAV	P	15	10	6	5	7	75.0%	50.0%	30.0%	25.0%	35.0%			W	W	W
8	2102220310010	AVINASH A B ROY	P	3	0	0	0	10	15.0%	0.0%	0.0%	0.0%	50.0%	W	W	W	W	
9	2102220310011	BHUMIKA PAL	P	21	3	17	10	11	105.0%	15.0%	85.0%	50.0%	55.0%		W			
10	2102220310012	DEVRAJ SINGH	P	6	7	0	0	0	30.0%	35.0%	0.0%	0.0%	0.0%	W	W	W	W	W
11	2102220310013	GAUTAM NEGI	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A
12	2102220310014	HARSHIT RAJ	P	22	14	6	2	18	110.0%	70.0%	30.0%	10.0%	90.0%			W	W	
13	2102220310016	MD GULAB NABI	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A
14	2102220310018	MD TAUSIF RAJA	P	1	3	3	3	0	5.0%	15.0%	15.0%	15.0%	0.0%	W	W	W	W	W
15	2102220310021	RAKESH KUMAR	P	19	10	4	0	16	95.0%	50.0%	20.0%	0.0%	80.0%			W	W	
16	2102220310022	RIYA CHAUDHARY	P	9	2	14	9	18	45.0%	10.0%	70.0%	45.0%	90.0%		W			
17	2102220310023	SAHWAG RAJ	P	1	3	2	0	10	5.0%	15.0%	10.0%	0.0%	50.0%	W	W	W	W	
18	2102220310024	SAHZAAD BHATTI	P	0	0	0	0	0	0.0%	0.0%	0.0%	0.0%	0.0%	W	W	W	W	W
19	2102220310026	SHUSHANT PANJIKER	P	2	4	11	6	18	10.0%	20.0%	55.0%	30.0%	90.0%	W	W		W	
20	2102220310027	SIDDHARTH KUMAR	P	7	7	5	5	6	35.0%	35.0%	25.0%	25.0%	30.0%	W	W	W	W	W
21	2102220310028	SNEHA	P	5	2	6	5	15	25.0%	10.0%	30.0%	25.0%	75.0%	W	W	W	W	

RUBRIC FOR CO SPECIFIC

Sub.Name	BASICS DATA STRUCTURE & ALGORITHMS		Section A - Q1										Section B - Q2					Section C					Total Marks	CO WEIGTHEGE				
Sub. Code	KOE-035	Question No.	A	B	C	D	E	F	G	H	I	J	A	B	C	D	E	3	4	5	6	7		CO1	CO2	CO3	CO4	CO5
Section		CO Mapped	1	1	2	2	3	3	4	4	5	5	1	2	3	4	5	1	2	3	4	5						
Faculty Name	Mr. ADITYA TYAGI	Assigned Marks	2	2	2	2	2	2	2	2	2	2	6	6	6	6	6	10	10	10	10	10	100	20	20	20	20	20
S.No.	RollNo	Student Name	Marks Obtained																				M.O.	CO attained Marks				
1	2102220310001	AADARSH	2	2	1	1	1	1	1				5	6	6				2	6	5	6	45	9	10	14	6	6
2	2102220310002	ABHAY SHARMA	2	2	1	1	1	1	2		2	1		9	3		10	10	2	9	5	6	67	14	13	14	7	19
3	2102220310005	ADITYA RANA	2			2	1	1					3	2			10	3	4	5	2	4	39	8	8	7	2	14
4	2102220310006	ADITYA SHANKAR	1										2				10	6	3		2		24	9	3	0	2	10
5	2102220310007	AKMAL HUSSEN	2	2	1	2			1			1		5	10		10	6	5	8	8	6	67	10	13	18	9	17
6	2102220310008	ALOK KUMAR SINGH																					0	0	0	0	0	0
7	2102220310009	ASHWIN YADAV	1	1		1	1						8	6			1	5	3	5	5	6	43	15	10	6	5	7
8	2102220310010	AVINASH A B ROY											3				10						13	3	0	0	0	10
9	2102220310011	BHUMIKA PAL	2	2		1	1	1	2		1		7		10			10	2	5	8	10	62	21	3	17	10	11
10	2102220310012	DEVRAJ SINGH		1									4	7				1					13	6	7	0	0	0
11	2102220310013	GAUTAM NEGI	2	2		2	2	2	2				10		6		10	10	3	10	9		70	24	5	20	11	10
12	2102220310014	HARSHIT RAJ	2	1	1	1						1	9	8			10	10	4	6	2	7	62	22	14	6	2	18
13	2102220310016	MD GULAB NABI																					0	0	0	0	0	0
14	2102220310018	MD TAUSIF RAJA		1										1					2	3	3		10	1	3	3	3	0
15	2102220310021	RAKESH KUMAR		1	1		1	1					8	6			10	10	3	2		6	49	19	10	4	0	16
16	2102220310022	RIYA CHAUDHARY	1	2	1	1	1						6		10		10			3	9	8	52	9	2	14	9	18
17	2102220310023	SAHWAG RAJ		1										3			10			2			16	1	3	2	0	10
18	2102220310024	SAHZAAD BHATTI																					0	0	0	0	0	0
19	2102220310026	SHUSHANT PANJIKER		2		1	1							3	5		10			5	6	8	41	2	4	11	6	18
20	2102220310027	SIDDHARTH KUMAR				2	2					2	7	4					1	3	5	4	30	7	7	5	5	6
21	2102220310028	SNEHA					1							1			10	5	1	5	5	5	33	5	2	6	5	15
22	2102220310029	SONU KUMAR		1										2						2	2	3	10	1	2	2	2	3
23	2102220310030	URVESH SAIFI		1		1	1					1		6			10	10	1	3	4	5	43	11	8	4	4	16
24	LE	ABHIJEET KUMAR SRIVASTAVA		1	1	1												5		6	1	4	19	6	2	6	1	4
25	LE	RAHUL KUMAR	1	2	2	2	2	1	1		2			2			10	3	4	4	4	5	45	6	10	7	5	17

DEPARTMENT OF ELECTRONICS AND COMUNICATION ENGINEERING

BRANCH: ELECTRONICS AND COMMUNICATION ENGINEERING

SEMESTER: 3rd: BASICS DATA STRUCTURE & ALGORITHMS (KOE-035): Pre University Test: 2021-2022 : 22.02.2023

S. No.	Roll Number	Name of the Student	SECTION-A (20 MARKS) TARGET LEVEL: 0.8										SECTION-B (30 MARKS) TARGET LEVEL: 2.4					SECTION-C (50 MARKS) TL: 4.0					Total (100) Marks
			Question No.1										Question No.2										
			A (2)	B (2)	C (2)	D (2)	E (2)	F (2)	G (2)	H (2)	I (2)	J (2)	A (6)	B (6)	C (6)	D (6)	E (6)	Q. No. 3 (10)	Q. No. 4 (10)	Q. No. 5 (10)	Q. No. 6 (10)	Q. No. 7 (10)	
COURSE OUTCOME			CO1	CO1	CO2	CO2	CO3	CO3	CO4	CO4	CO5	CO5	CO1	CO2	CO3	CO4	CO5	CO1	CO2	CO3	CO4	CO5	
1	2102220310001	AADARSH	2	2	1	1	1	1	1				5	6	6				2	6	5	6	45
2	2102220310002	ABHAY SHARMA	2	2	1	1	1	1	2		2	1		9	3		10	10	2	9	5	6	67
3	2102220310005	ADITYA RANA	2			2	1	1					3	2			10	3	4	5	2	4	39
4	2102220310006	ADITYA SHANKAR	1										2				10	6	3		2		24
5	2102220310007	AKMAL HUSSEN	2	2	1	2			1			1		5	10		10	6	5	8	8	6	67
6	2102220310008	ALOK KUMAR SINGH																					
7	2102220310009	ASHWIN YADAV	1	1		1	1						8	6			1	5	3	5	5	6	43
8	2102220310010	AVINASH A B ROY											3				10						13
9	2102220310011	BHUMIKA PAL	2	2		1	1	1	2		1		7		10			10	2	5	8	10	62
10	2102220310012	DEVRAJ SINGH		1									4	7				1					13
11	2102220310013	GAUTAM NEGI	2	2		2	2	2	2				10		6		10	10	3	10	9		70
12	2102220310014	HARSHIT RAJ	2	1	1	1						1	9	8			10	10	4	6	2	7	62
13	2102220310016	MD GULAB NABI																					
14	2102220310018	MD TAUSIF RAJA		1										1					2	3	3		10
15	2102220310021	RAKESH KUMAR		1	1		1	1					8	6			10	10	3	2		6	49
16	2102220310022	RIYA CHAUDHARY	1	2	1	1	1						6		10		10			3	9	8	52
17	2102220310023	SAHWAG RAJ		1										3			10			2			16
18	2102220310024	SAHZAAD BHATTI																					
19	2102220310026	SHUSHANT PANJIKER		2		1	1							3	5		10			5	6	8	41
20	2102220310027	SIDDHARTH KUMAR				2	2					2	7	4					1	3	5	4	30
21	2102220310028	SNEHA					1							1			10	5	1	5	5	5	33
22	2102220310029	SONU KUMAR		1										2						2	2	3	10
23	2102220310030	URVESH SAIFI		1		1	1					1		6			10	10	1	3	4	5	43
24	LE	ABHIJEET KUMAR SRIVASTAVA		1	1	1												5		6	1	4	19
25	LE	RAHUL KUMAR	1	2	2	2	2	1	1		2			2			10	3	4	4	4	5	45
COURSE OUTCOME			CO1	CO1	CO2	CO2	CO3	CO3	CO4	CO4	CO5	CO5	CO1	CO2	CO3	CO4	CO5	CO1	CO2	CO3	CO4	CO5	
AVERAGE			1.64	1.47	1.13	1.36	1.23	1.14	1.50	###	1.67	1.20	6.00	4.44	7.14	###	9.40	6.71	2.67	4.84	4.72	5.81	
PERCENTAGE			81.8	73.5	56.3	67.9	61.5	57.1	75.0	###	83.3	60.0	###	74.0	###	###	###	67.1	26.7	48.4	47.2	58.1	N
Total Appeared			Y	N	Y	Y	N	N	N	N	N	N	Y	Y	N	N	N	Y	N	N	N	N	
Number of Students < TL			11	17	8	14	13	7	6	0	3	5	12	16	7	0	15	14	15	19	18	16	
No. of Students > TL			0	0	0	0	0	0	0	0	0	0	1	3	0	0	1	2	10	5	4	0	
% age TL			11	17	8	14	13	7	6	0	3	5	11	13	7	0	14	12	5	14	14	16	
SCORE			###	###	###	###	###	###	###	###	###	###	91.7	81.3	###	###	93.3	85.7	33.3	73.7	77.8	###	
CO ATTAINMENT LEVEL (AL)			3	2	2	3	0	0	0	0	0	1	3	3	0	0	0	3	3	3	0	1	
TARGET LEVEL (TL)			H	M	M	H	N	N	N	N	N	L	H	H	N	N	N	H	H	H	N	L	

> 65% Students secured > 40%	H	3
55% - 65% Students secured > 40%	M	2
45% - 55% Students secured > 40%	L	1
< 45% Students secured > 40%	N	0
AVERAGE CO1	2.75	L
AVERAGE CO2	2.75	
AVERAGE CO3	0.75	
AVERAGE CO4	0	
AVERAGE CO5	0.5	

CO-1	0.55	1.5	2.8	
CO-2			2.8	
CO-3			0.8	
CO-4			0	
CO-5			0.5	

I.T.S ENGINEERING COLLEGE
GREATER NOIDA
(A NAAC Accredited Engineering College)

The Education Group
Ghaziabad • Greater Noida
(Estd. : 1995)

Universty Syllabus

KOE-035 Basics Data Structure and Algorithms

L	T	P
3	1	0

Units	Topics
1	Introduction to data structure and Algorithms: Performance analysis of Algorithm, time complexity, Big-oh notation, Elementary data organization data structure operations, Recurrences, Arrays, Operation on arrays, representation of arrays in memory, single dimensional and multidimensional arrays, spare matrices, Character storing in C, String operations.
2	Stack And Queue and Link List: Stack operation, PUSH and POP, Array representation of stacks, Operation associated with stacks Application of stacks, Recursion, Polish experession, Representation Queue, operation on Queue , Priority Queue , D-Queue , Singly and circularly linked list, List operations Lists implementations
3	Trees : Basic terminology, Binary Trees, Binary tree representation, Algebraic/expressions, Complete Binary Trees, Extended binary tree, representing binary tress in memory, linked representation of Binary trees, Traversing binary trees & Searching in binary trees, Inserting in binary search trees, Complexity of searching algorithm, Heaps, general trees, Threaded binary tree.
4	Graphs: Terminology & representations, Graphs & Multigraphs, Directed Graphs, Sequential representation of graphs, adjacency Matrices, Transversal, connected component and spanning trees, Minimum Cost spanning tree, Prims and Kruskal Algorithm, BFS, DFS, Shortest path and transitive closure, Activity networks, topological sort and critical paths.
5	Searching and Sorting: Linear search, binary Search, Internal and External sorting, Bubble sorting, selection sort, Insertion sort, quick sort, Two way merge sort, Heap sort, sorting on different keys, practical consideration for internal sorting, External Sorting, Storage Devices : Magnetic tapes, Disk Storage, Sorting with disks and Indexing techniques, introduction to B tree and B+ tree, File organization and storage management, Introduction to hoisting.

Recommended Books

TEXT BOOKS: -

1. Lipschutz, "Data Structures" Schaum's Outline Series, TMH
2. Aaron M. Tenenbaum, Yedidyah Langsam and Moshe J. Augenstein "Data Structures Using C and C++" , PHI

REFERENCES:

1. G.S. Baluja, Data Structure Using C,Dhanapat Rai Publications
2. Horowitz and Sahani, "Fundamentals of Data Structures", Galgotia Publication
3. Jean Paul Trembley and Paul G. Sorenson, "An Introduction to Data Structures with applications",McGraw Hill
4. G A V Pai, "Data Structures and Algorithms", TMH

The Education Group
Ghaziabad ◆ Greater Noida
(Estd. : 1995)

I.T.S ENGINEERING COLLEGE
GREATER NOIDA
(A NAAC Accredited Engineering College)

2022-23 ODD SEMESTER ACADEMIC CALENDAR I.T.S ENGINEERING COLLEGE B.TECH, MBA

The Education Group
Ghaziabad ◆ Greater Noida
(Estd. : 1995)

I.T.S ENGINEERING COLLEGE
GREATER NOIDA
(NAAC Accredited)

Vision: To be the Technical Institution of Choice

Mission: To make incessant endeavor to create learning processes in response to changing technical paradigms.

ACADEMIC CALENDAR

ODD SEMESTER 2022-23 (FOR B.TECH 2nd year)

AUGUST, 2022

SUN	MON	TUE	WED	THU	FRI	SAT
	1	2	3	4	5	6
7	8	9	10	11	12	13
14	15	16	17	18	19	20
21	22	23	24	25	26	27
28	29	30	31			

WD: 21, HD: 4

- 9th August: Holiday (Moharram)
- 12th August: Holiday (Rakshabandhan)
- 15th August: Holiday (Independence day)
- 18th August: Holiday (Janmashtami)

SEPTEMBER, 2022

SUN	MON	TUE	WED	THU	FRI	SAT
				1	2	3
4	5	6	7	8	9	10
11	12	13	14	15	16	17
18	19	20	21	22	23	24
25	26	27	28	29	30	

WD: 24, (TD: 22), HD: Nil

- 1st Sept: Commencement of classes for B.Tech 2nd year
- 10th Sept and 24th Sept: Will be Teaching Day

OCTOBER, 2022

SUN	MON	TUE	WED	THU	FRI	SAT
30	31					1
2	3	4	5	6	7	8
9	10	11	12	13	14	15
16	17	18	19	20	21	22
23	24	25	26	27	28	29

WD: 18, (TD: 15), HD: 6

- 04th to 05th October: Holidays for Ram Navmi, Dusshera
- 17th to 22nd October: Sessional Test 1
- 24rd to 27th October: Holidays for Diwali

NOVEMBER, 2022

SUN	MON	TUE	WED	THU	FRI	SAT
		1	2	3	4	5
6	7	8	9	10	11	12
13	14	15	16	17	18	19
20	21	22	23	24	25	26
27	28	29	30			

WD: 23, (TD: 21), HD: 1

- 8th November: Holiday (Guru Nanak Birthday)

DECEMBER, 2022

SUN	MON	TUE	WED	THU	FRI	SAT
				1	2	3
4	5	6	7	8	9	10
11	12	13	14	15	16	17
18	19	20	21	22	23	24
25	26	27	28	29	30	31

WD: 25, (TD: 22), HD: Nil

- 5th Nov. to 10th December: Sessional Test 2
- 30th December: Last teaching day (tentative)

JANUARY, 2023

SUN	MON	TUE	WED	THU	FRI	SAT
1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28
29	30	31				

WD: 23, (TD: 21), HD: 1

- 4th Jan. to 13th Jan: Pre-University Test
- 24th January: End Semester Theory Examination
- 26th January: Holiday (Republic Day)

Note:

1. Holiday marked with * will be declared on visibility of Moon
2. 75% attendance online/offline (as applicable) is mandatory to appear in Sessional Test/PUT as well as in University End Semester Examination
3. Sessional & Pre University Test will be of 02:00 hrs and 03:00 hrs duration respectively or as advised by AKTU during the online teaching.
4. Students are advised to attend all online classes/offline class and reg. labs as scheduled in the time table to maintain attendance as per university norms & guilelines.
5. Due to the Covid-19 pandemic situation the Academic Calendar may be revised, subject to the Government guidelines.
6. This is a tentative Academic Calender. This may change according to academic requirments & Govt guidelines.

(Registrar) (Dean SW) (Director)

I.T.S ENGINEERING COLLEGE
GREATER NOIDA
(A NAAC Accredited Engineering College)

The Education Group
Ghaziabad • Greater Noida
(Estd. : 1995)

Faculty Time Table

Session : 2022-23
Semester : Odd
Name of Faculty : Mr. Aditya Tyagi
Branch/Sem/Sec : Electronics & Communication Engineering / III
Subject & Code : Basics Data Structure and Algorithms (KOE-035)

DAY	Session/Time	9:10-10:05	10:05-10:55	10:55-11:45	11:45-12:35	12:35-01:30	1:30-2:20	2:20-3:10	3:10-4:00	4:00-4:50
MON			DSA (KOE035)							
TUE	DSA-430				DSA (KOE035)					
WED	DSA-430		DSA (KOE035)							
THU		DSA (KOE035)								
FRI				DSA (KOE035)						

The Education Group
Ghaziabad • Greater Noida
(Estd. : 1995)

I.T.S ENGINEERING COLLEGE
GREATER NOIDA
(A NAAC Accredited Engineering College)

List of Students and Academic Profile

Session :		2022-23	
Name of Faculty :		Aditya Tyagi	
Branch/SEM/Sec :		Electronics & Communication Engineering / III	
Subject & Code :		Basics Data Structure and Algorithms (KOE-035)	
Sr.No	**Roll No**	**Student Name**	Subjects
1	2102220310001	Aadarsh	
2	2102220310002	ABHAY SHARMA	
3	2102220310005	ADITYA RANA	
4	2102220310006	ADITYA SHANKAR	
5	2102220310007	Akmal Hussain	
6	2102220310008	ALOK KUMAR SINGH	
7	2102220310009	Ashwin Yadav	
8	2102220310010	Avinash A B Roy	
9	2102220310011	Bhumika Pal	
10	2102220310012	Devraj Singh	
11	2102220310013	GAUTAM NEGI	
12	2102220310014	Harshit Raj	
13	2102220310016	MD GULAB NABI	
14	2102220310018	Md Tausif Raja	
15	2102220310021	Rakesh Kumar	
16	2102220310022	Riya Chaudhary	
17	2102220310023	Sahwag Raj	
18	2102220310024	SAHZAAD BHATTI	
19	2102220310026	SHUSHANT	
20	2102220310027	Siddharth Kumar	
21	2102220310028	Sneha	
22	2102220310029	Sonu Kumar	
23	2102220310030	Urvesh Saifi	
24	LE	Abhijeet Srivastava	
25	LE	Rahul Kumar	

I.T.S ENGINEERING COLLEGE
GREATER NOIDA
(A NAAC Accredited Engineering College)

The Education Group
Ghaziabad • Greater Noida
(Estd. : 1995)

Teaching Learning Evaluation Process

Session :	2022-23	Semester : ODD		
Name of Faculty :	Aditya Tyagi			
Branch/Sem/Sec :	Electronics & Communication Engineering / III	L	T	P
Subject & Code :	Basics Data Structure and Algorithms (KOE-035)	3	1	0

A. Evaluation Plan

B. Evaluation Process

Students are evaluated based on following process

Subject Code	Name of Subject	Periods			Evaluation Scheme					Subject Total	Credit
					SESSIONAL EXAM				End Semester		
		L	T	P	CT	AT	TA	Total			
KOE-035	Basics Data Structure and Algorithms	3	1	0	30	10	10	50	100	150	4

Details of the process is given in Assignment and Evaluation Sheets.

The Education Group
Ghaziabad • Greater Noida
(Estd. : 1995)

I.T.S ENGINEERING COLLEGE
GREATER NOIDA
(A NAAC Accredited Engineering College)

DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING

Teaching Learning Evaluation PLAN (TLEP)

Session: 2022-23	Semester: Odd
Name of Faculty: Aditya Tyagi	
Sem/Sec.: III	
Subject and Code: Basics Data Structure and Algorithms (KOE-035)	
No. of Lectures Planned: 44	No. of Lectures Delivered:

L	T	P
5	0	0

S.No.	Topic	No of Lecture Scheduled	Pedagogy	Unit wise Objective	Unit wise Learning Outcome
UNIT-1:				Able to Understand and analyze the time and space complexity of an algorithm	To develop the understanding of Data Structures and its operation and analysis of algorithms.
1	Introduction to data structure and Algorithms	1	L		
2	Performance analysis of Algorithm	1	L		
3	time & Space complexity	1	L		
4	Big-oh notation	1	L		
5	data structure operations	1	L		
6	Arrays, Operation on arrays	1	L		
7	multidimensional arrays	1	L		
8	spare matrices & Recursion	1	L		
9	Character storing in C, String operations	1	L		
Unit-2:				Able to exemplify and implement stack, queue and list ADT to manage the memory using static and dynamic allocations.	The students will be able to implement Stacks and Queues in Static and dynamic ways
10	Stack, Stack operation, PUSH and POP, ,	1	L		
11	Array representation of stacks	1	L		
12	Recursion	1	L		
13	Polish expression	1	L		
14	Representation of Queue	1	L		
15	Priority Queue , D-Queue	1	L		
16	Singly and circularly linked list	1	L		
17	List operations Lists implementations	1	L		
Unit-3:				Able to implement binary search tree to design applications like expression trees.	The students will be able to implement various Tree Traversal Algorithm. Conversion of General Trees into Binary Trees.
18	Trees : Basic terminology	1	L		
19	Binary Trees, Binary tree representation,	1	L		
20	Complete Binary Trees, Extended binary tree	1	L		
21	Traversing binary trees & Searching in binary trees	1	L		
22	Inserting in binary search trees	1	L		
23	Heaps	1	L		
24	Threaded binary tree.	1	L		
25	Threaded binary tree.	1	L		
Unit-4:				Able to Understand and	Able to Understand and implement
26	Graphs: Terminology & representations	1	L		
27	Graphs & Multigraphs	1	L		

28	representation of graphs	1	L	implement fundamental algorithms (including graph algorithms, and dynamic programming)	Able to Understand and implement fundamental algorithms (including graph algorithms, and dynamic programm
29	Transversal	1			
30	Minimum Cost spanning tree	1			
31	Prims and Kruskal Algorithm	1			
32	BFS, DFS	1	L		
33	Activity networks and transitive closure	1	L		
34	topological sort	1	L		
Unit-5:					
35	Linear search, binary Search	1	L	Able to Discuss various searching & sorting algorithms.	The students will be able implement various searching and sorting techniques and also will able to find the Best techniques.
36	Internal and External sorting, Bubble sorting	1	L		
37	selection sort, Insertion sort	1	L		
38	quick sort	1	L		
39	Two way merge sort	1	L		
40	Heap sort	1	L		
41	Storage Devices : Magnetic tapes, Disk Storage	1	L		
	B tree	1	L		
43	B+ tree	1	L		
44	File organization	1	L		

I.T.S ENGINEERING COLLEGE
GREATER NOIDA
(A NAAC Accredited Engineering College)

The Education Group
Ghaziabad • Greater Noida
(Estd. : 1995)

DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING

Monthly Attendance Record

Session	:	2022-23	Semester: ODD
Name of Faculty	:	Aditya Tyagi	
Branch/Sem/Sec	:	Electronics & Communication Engineering / III	
Subject & Code	:	Basics Data Structure and Algorithms (KOE-035)	

			Months ---->	Sept		Oct		Nov.		Dec		Sep-Dec	
			Total Lectures ---->	21		10		15		11		57	
Sr.No	Roll No	Students Name		Lecture Attended	% Attendance	Lecture Attended	% Attendance	Lecture Attended	% Attendance	Lecture Attended	% Attendance	Lecture Attended	% Attendance
1	2102220310001	Aadarsh		4	19	6	60	9	60	9	82	28	**49**
2	2102220310002	ABHAY SHARMA		12	57	7	70	12	80	9	82	40	**70**
3	2102220310005	ADITYA RANA		13	62	6	60	8	53	3	27	30	**53**
4	2102220310006	ADITYA SHANKAR		11	52	4	40	8	53	8	73	31	**54**
5	2102220310007	Akmal Hussain		12	57	7	70	9	60	7	64	35	**61**
6	2102220310008	ALOK KUMAR SINGH		15	71	6	60	8	53	9	82	38	**67**
7	2102220310009	Ashwin Yadav		9	43	0	0	7	47	9	82	25	**44**
8	2102220310010	Avinash A B Roy		12	57	4	40	9	60	5	45	30	**53**
9	2102220310011	Bhumika Pal		17	81	5	50	15	100	4	36	41	**72**
10	2102220310012	Devraj Singh		8	38	4	40	12	80	2	18	26	**46**
11	2102220310013	GAUTAM NEGI		11	52	4	40	8	53	2	18	25	**44**
12	2102220310014	Harshit Raj		12	57	6	60	8	53	6	55	32	**56**
13	2102220310016	MD GULAB NABI		14	67	4	40	12	80	5	45	35	**61**
14	2102220310018	Md Tausif Raja		6	29	1	10	6	40	3	27	16	**28**
15	2102220310021	Rakesh Kumar		17	81	5	50	7	47	8	73	37	**65**
16	2102220310022	Riya Chaudhary		14	67	5	50	8	53	4	36	31	**54**
17	2102220310023	Sahwag Raj		8	38	5	50	7	47	3	27	23	**40**
18	2102220310024	SAHZAAD BHATTI		8	38	6	60	11	73	6	55	31	**54**
19	2102220310026	SHUSHANT		14	67	5	50	12	80	4	36	35	**61**
20	2102220310027	Siddharth Kumar		10	48	2	20	8	53	5	45	25	**44**
21	2102220310028	Sneha		11	52	7	70	14	93	11	100	43	**75**
22	2102220310029	Sonu Kumar		16	76	2	20	4	27	3	27	25	**44**
23	2102220310030	Urvesh Saifi		15	71	0	0	7	47	6	55	28	**49**
24	LE	Abhijeet Srivastava		13	62	3	30	9	60	6	55	31	**54**
25	LE	Rahul Kumar		7	33	0	0	7	47	7	64	21	**37**

The Education Group
Ghaziabad • Greater Noida
(Estd. : 1995)

I.T.S ENGINEERING COLLEGE
GREATER NOIDA
(A NAAC Accredited Engineering College)

DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING

ASSIGNMENT PLAN

Session :	2022-23	**Semester : Odd**	
Name of Faculty :	Aditya Tyagi		
Branch/Sem/Sec :	Electronics & Communication Engineering / III		
Subject & Code :	Basics Data Structure and Algorithms (KOE-035)		

Assignment No	Unit No.	Topics Covered	Date of Issue	Date of Submission	Date of Return after Evaluation
1	I	Introduction to data structure and Algorithms: Performance analysis of Algorithm, time complexity, Big-oh notation, Elementary data organization data structure operations, Recurrences, Arrays, Operation on arrays, representation of arrays in memory, single dimensional and multidimensional arrays, spare matrices, Character storing in C, String operations.	13-9-22	15-9-22	16-9-22
2	II	Stack And Queue and Link List: Stack operation, PUSH and POP, Array representation of stacks, Operation associated with stacks Application of stacks, Recursion, Polish experession, Representation Queue, operation on Queue , Priority Queue , D-Queue , Singly and circularly linked list, List operations Lists implementations	29-9-22	1/10/2022	3/10/2022
3	III	Trees : Basic terminology, Binary Trees, Binary tree representation, Algebraic/expressions, Complete Binary Trees, Extended binary tree, representing binary tress in memory, linked representation of Binary trees, Traversing binary trees & Searching in binary trees, Inserting in binary search trees, Complexity of searching algorithm, Heaps, general trees, Threaded binary tree.	3/11/2022	4/11/2022	7/11/2022
4	IV	Graphs: Terminology & representations, Graphs & Multigraphs, Directed Graphs, Sequential representation of graphs, adjacency Matrices, Transversal, connected component and spanning trees, Minimum Cost spanning tree, Prims and Kruskal Algorithm, BFS, DFS, Shortest path and transitive closure, Activity networks, topological sort and critical paths.	25/11/2022	28-11-22	30-11-22
5	V	Searching and Sorting: Linear search, binary Search, Internal and External sorting, Bubble sorting, selection sort, Insertion sort, quick sort, Two way merge sort, Heap sort, sorting on different keys, practical consideration for internal sorting, External Sorting, Storage Devices : Magnetic tapes, Disk Storage, Sorting with disks and Indexing techniques, introduction to B tree and B+ tree, File organization and storage management, Introduction to hoisting.	9/12/2022	12/12/2022	14/12/2022

Signature of H.O.D

Signature of Faculty

ITS ENGINEERING COLLEGE GREATER NOIDA
TUTORIAL - 1

Q.N.1 Find the postfix form of the expression (A+ B) *(C*D - E)*F / G

Q.N.2 Find the prefix form of the expression A-B/ (C * D ^ E)

Q.N.3 What will be the equivalent prefix expression for the following infix expression
(A+B)-(C+D*E)/F*G

Q.N.4 Find the result of evaluating the postfix expression 5, 4, 6, +, *, 4, 9, 3, /, +, *

Q.N.5 Find the postfix form of the expression $((a + b) * (c + d)) \wedge f$

Q.N.6 Convert the following infix expressions into its equivalent postfix expressions;
(i) (A + B ^D) / (E - F)+G
(ii) A*(B+D)/ E - F*(G +H / K)

Q.N.7 Illustrate the steps for converting an infix expression into a postfix expression for the following expression (a + b) *(c + d) /(e + f) - g .

Q.N 8 Convert an infix expression to a post fix expression with the following infix expression on your input
(m+ n) * (k + p) / (g / b)- (a - b / c)

Q.N.9 Convert an infix expression to a post fix expression with the following infix expression as input
Q = [(A + B) / (C + D) - (E / F)]+ (G + H)/ I

Q.N.10 Draw the expression tree of the following infix expression. Convert it in to Prefix and Postfix expressions.
((a + b)+ c * (d + e)+ f)* (g + h)

ITS ENGINEERING COLLEGE GREATER NOIDA
SOLUTIONS OF TUTORIAL-1

Ans.1 AB+ CD*E - FG /**

Ans.2 -A/B*C^DE

Ans.3 -+AB*/+C*DEFG

ANS.4 350

Ans. 5 a b + c d +*f ^

Ans. 6 The postfix expression are :- (A B D ^ + E F - / G +) and
A B D + * E / F G H K / + * -

Ans.7 (ab+cd+*ef+g-/)

ANS .8 The postfix expression is
mn+kp+*gb//abc - /

Ans.9 POSTFIX:- AB+CD+EF/-/GH+I/+

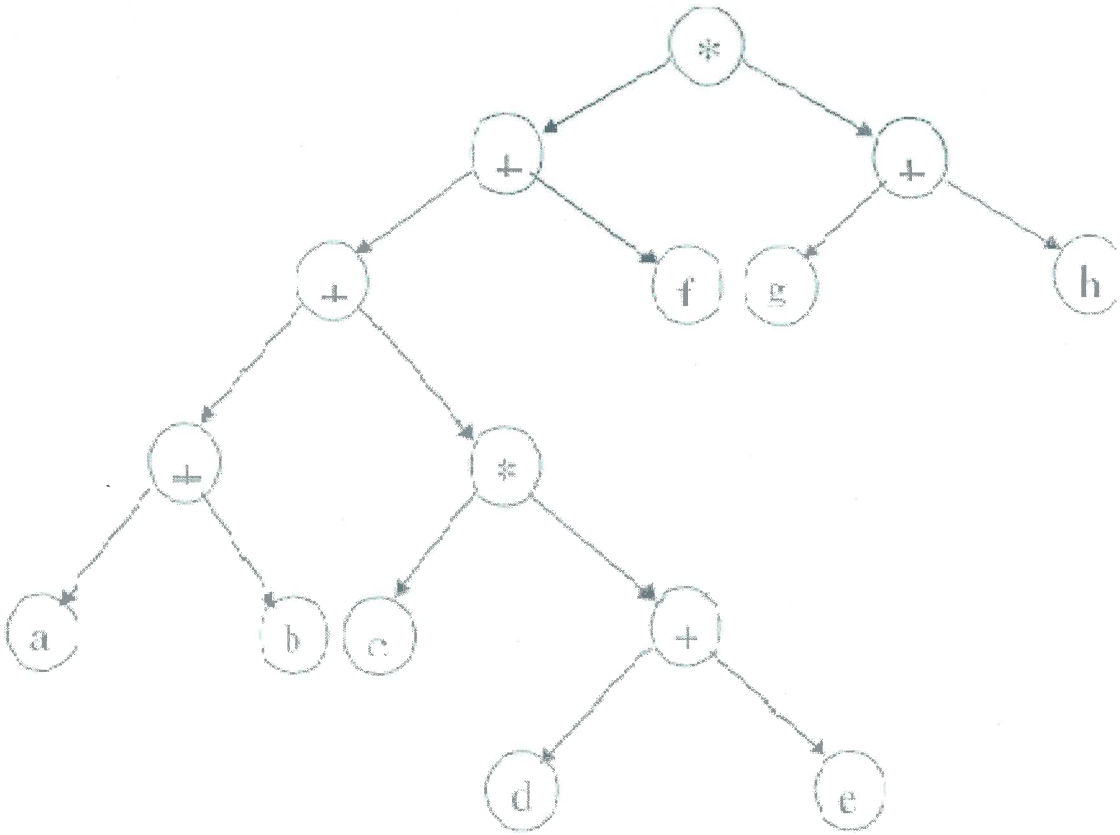
Ans.10The postfix expression is:

((a+b)+c*(d+e)+f)*(g+h)
= ((ab+)+c*(de+)+f)*(gh+)
= ((ab+)+(cde+*)+f)*(gh+)
= ((ab+cde+*+)+f)*(gh+)
= (ab+cde+*+f+)*(gh+)
=**(ab+cde+*+f+gh+*)**

The prefix expression is:

((a+b)+c*(d+e)+f)*(g+h)
= ((+ab)+c*(+de)+f)*(+gh)
= ((+ab)+(*c+de)+f)*(+gh)
= ((++ab*c+de)+f)*(+gh)
= (+++ab*c+def)*(+gh)
= **(*+++ab*c+def+gh)**

Expression Tree is



ITS ENGINEERING COLLEGE GREATER NOIDA
TUTORIAL - 2

Q.1 List out the areas in which data structures are applied extensively?

Q.2 Consider the following stack of characters, where STACK is allocated N = 8 memory cells

STACK : A,C,D,F,K,_,_,_. (_ means empty allocated cell)

Describe the stack as the following operations takes place:

(a) POP(STACK, ITEM)

(b) POP(STACK, ITEM)

(c) POP(STACK, ITEM)

(d) PUSH(STACK, R)

(e) PUSH(STACK,L)

(f) PUSH(STACK, S)

(g) PUSH(STACK,P)

(h) POP(STACK, ITEM)

Q.3 Give the formula of row major order and column major order.

Q.4 Let a and b denote positive integers. Suppose a function Q is defined recursively as follows:

$$Q(a,b) = \begin{cases} 0 & \text{if } a < b \\ Q(a-b,b)+1 & \text{if } b \leq a \end{cases}$$

(a) Find the value of Q(2,3) and Q(14,3)

(b) What does this function do ? Find Q(5861,7).

Q.5 Translate infix expression into its equivalent post fix expression: (A+B^D)/(E-F)*G

Q.6 Translate infix expression into its equivalent post fix expression:

A*(B+D)/E-F*(G*H/K)

Q.7. Convert the following expression into prefix form

(A + B) * C / D + E ↑ F / G

ITS ENGINEERING COLLEGE GREATER NOIDA
SOLUTIONS OF TUTORIAL-2

Ans.1

1. Compiler Design,
2. Operating System,
3. Database Management System,
4. Statistical analysis package,
5. Numerical Analysis,
6. Graphics,
7. Artificial Intelligence,
8. Simulation

Ans.2 STACK: A, C, R, L, S, _, _, _,

Ans.3 Column Major Order

LOC(A[J,K]) = Base(A) + w[M (K - 1) + (J - 1)]

Row Major Order

LOC(A[J,K]) = Base(A) + w[N (J - 1) + (K - 1)]

Ans.4

(a) 0 AND 4

(b) Each time b is subtracted from a, the value of Q is increased by 1. Hence Q(a, b) finds the quotient when a is divided by b. Thus,
Q(5861,7) = 837

Ans.5 ABD^+EF-/G*

Ans.6 ABD + * E / FGH * K / * -

Ans.7 + / * + ABCD / ^ EFG

ITS ENGINEERING COLLEGE GREATER NOIDA
TUTORIAL - 3

Q.N.1 What are circular queues? Write down routines for inserting and deleting.

Q.N.2 Consider the following queue of characters, where QUEUE is a circular array which is allotted six memory cells.

FRONT = 2,REAR = 4, QUEUE: _, A, C, D, _, _

Describe the queue as the following operations takes place.

(a) F is added to the queue.
(b) Two letters are deleted
(c) K.L and M are added to the queue.
(d) two letters are deleted
(e) R is added to the queue
(f) two letters are deleted
(g) S is added to queue.
(h) two letters are deleted.
(i) one letter is deleted
(j) one letter is deleted

Q.N.3 Suppose a queue is maintained by a circular array QUEUE with N = 12 memory cells. Find the number of elements in QUEUE if

(a) FRONT = 4 , REAR = 8
(b) FRONT = 10, REAR = 3
(c) FRONT = 5 , REAR = 6. And then two elements are deleted.

ITS ENGINEERING COLLEGE GREATER NOIDA
SOLUTIONS OF TUTORIAL-3

Ans.1 **Circular queue:** Static queues have a very big drawback that once the queue is FULL, even though we delete few elements from the "front" and relieve some occupied space, we are not able to add anymore elements as the "rear" has already reached the Queue's rear most position.

The solution lies in a queue in which the moment "rear" reaches its end; the "first" element will become the queue's new "rear". This type of queue is known as circular queue having a structure like this in which, once the Queue is full the "First" element of the Queue becomes the "Rear" most element, if and only if the "Front" has moved forward; *Circular Queue using array:-*

insert(queue,n,front,rear,item)

This procedure inserts an element item into a queue.

1. If front = 1 and rear = n, or if front = rear + 1, then:

Write: overflow, and return

2. [find new value of rear]

If front = NULL , then : [queue initially empty.]

Set front = 1 and rear=1.

Else if rear = n, then:

Set rear=1.

Else:

Set rear = rear + 1.

[end of structure.]

3. Set queue[rear] = item. [this inserts new element.]

4.Return .

delete(queue,n,front,rear,item)

This procedure deletes an element from a queue and assigns it to the variable item.

1. [queue already empty?]

If front = NULL , then:

Write: underflow, and return.

2. Set item = queue[front].

3. [find new value of front]

If front = rear , then : [queue has only one element to start].

Set front = NULL and rear = NULL.

Else if front = n, then:

Set front=1.

Else:

Set front = front + 1.

[end of structure.]

4. Return .

Ans.2

(a) QUEUE: _, A, C, D, F, _

(b) QUEUE: _, _, _, D, F, _

(c) QUEUE: L,M, _, D, F,K

(d) QUEUE: L,M, _, _, _, K

(e) QUEUE: L,M, R, _, _, K

(f) QUEUE: _,M, R, _, _, _

(g) QUEUE: _,M, R, S, _, _

(h) QUEUE: _, _, _, S, _, _

(i) QUEUE: _, _, _, _, _, _

(j) Underflow

Ans.3

(a) 5

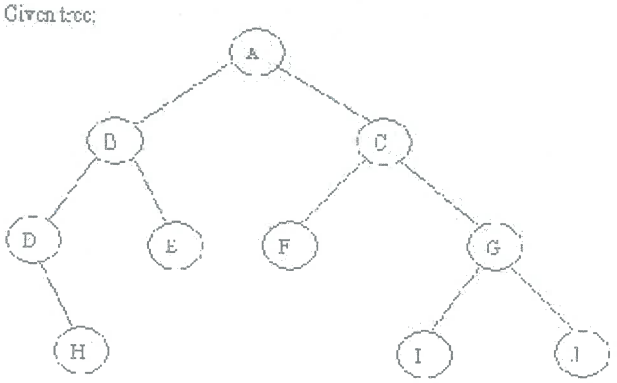
(b) 6

(c) 2

ITS ENGINEERING COLLEGE GREATER NOIDA
TUTORIAL - 4

Q.N.1 Traverse the given tree using In order, Preorder and Post order traversals

Given tree:



Q.N.2 Consider the algebraic expression

E = (5x+z) (3a-b)2

Draw the expression tree corresponding to E

Q.N.3 Draw a binary Tree for the expression : A * B - (C + D) * (P / Q)

Q.N.4 What are expression trees? Represent the following expression using a tree. Comment on the result that you get when this tree is traversed in Preorder, Inorder and postorder.

(a-b) / ((c*d)+e)

Q.N.5 The following values are to be stored in a hash table

25, 42, 96, 101, 102, 162, 197

Describe how the values are hashed by using division method of hashing with a table size of 7. Use chaining as the method of collision resolution.

Q.N.6 Given the following in order and preorder traversal reconstruct a binary tree

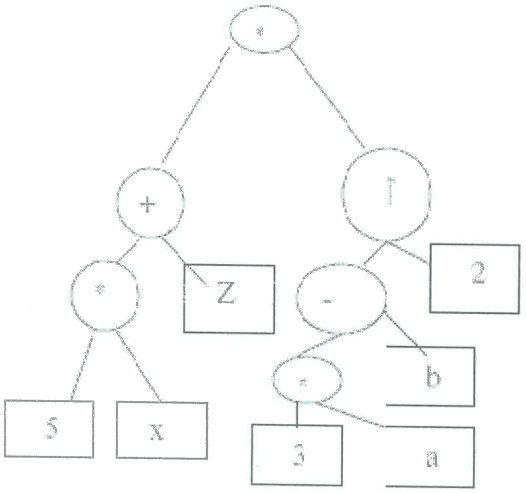
In order sequence	D, G, B, H, E, A, F, I, C
Pre order sequence	A, B, D, G, E, H, C, F, I

ITS ENGINEERING COLLEGE GREATER NOIDA
SOLUTIONS OF TUTORIAL-4

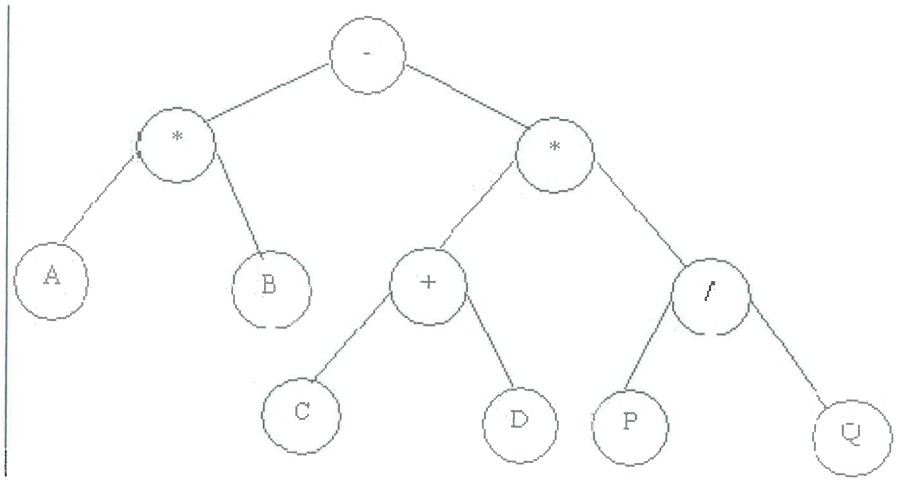
Ans.1

•Inorder : D H B E A F C I G J
•Preorder: A B D H E C F G I J
•Postorder: H D E B F I J G C A

Ans.2



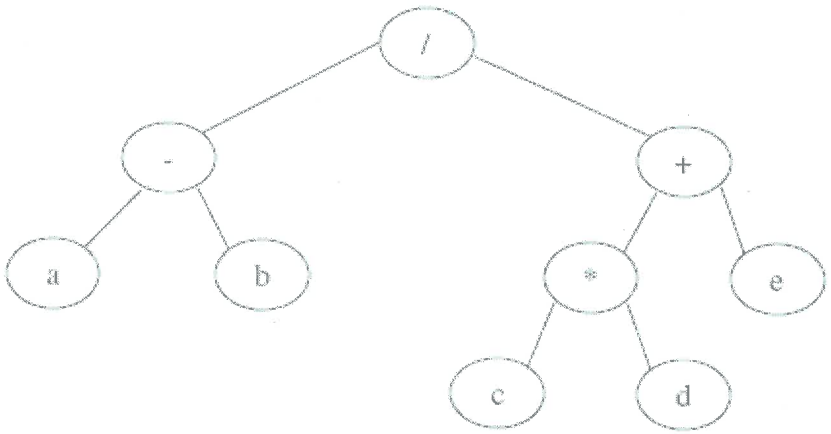
Ans.3



Ans .4

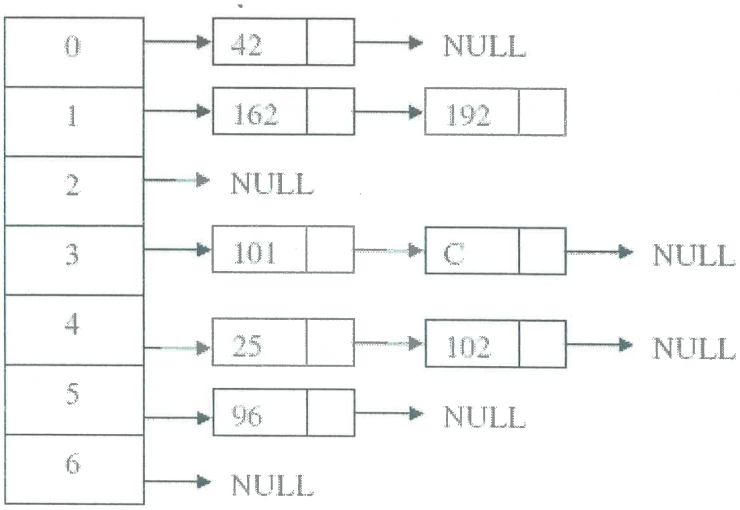
The leaves of an expression tree are operands, such as constants or variable names, and the other nodes contain operators. This particular tree happens to be binary, because all of the operations are binary, and although this is the simplest case, it is possible for nodes to have more than two children. It is also possible for a node to have only one child, as is the case with the unary minus operator. We can evaluate an expression tree, T, by applying the operator at the root to the values obtained by recursively evaluating the left and right subtrees.

The expression tree for the expression: (a – b) / ((c * d) + e))



The traversal of the above expression tree gives the following result:-
Preorder:- (/ - a b + * c d e)
This expression is same as the "prefix notation" of the original expression.
Inorder:- (a – b) / ((c * d) + e)
Thus the inorder traversal gives the actual expression.
Postorder:- (a b – c d * e + /)
Thus the postorder traversal of this gives us the "posfix notation" or the "Reverse Polish notation" of the original expression.

Ans.5
Table size=7
25%7=4
42%7=0
96%7=5
101%7=3
102%7=4
162%7=1
197%7=1
So collision resolution can be resolved as follows:

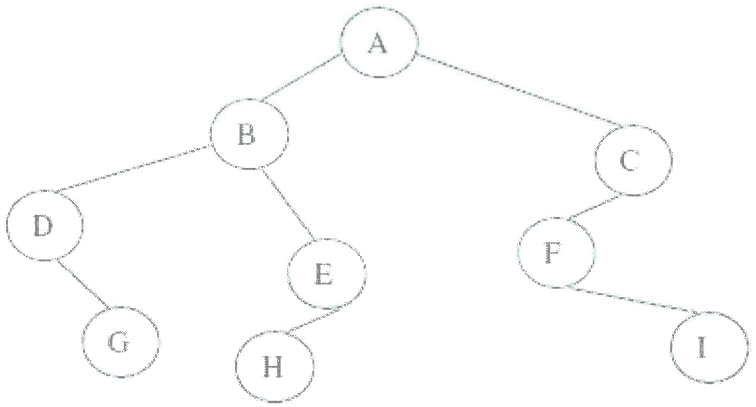


Ans.6

The given *In-order sequence:-* D, G, B, H, E, A, F, I, C

Pre-order sequence:- A, B, D, G, E, H, C, F, I

The binary tree T is drawn from its root downward by choosing the first node in its pre-order as root of T then study left and right child recursively. The tree T is shown below:



ITS ENGINEERING COLLEGE GREATER NOIDA
TUTORIAL - 5

Q.N.1 Draw the B-tree of order 3 created by inserting the following data arriving in sequence

92 24 6 7 11 8 22 4 5 16 19 20 78

Q.N.2 What is a Binary Search Tree (BST)? Make a BST for the following sequence of numbers.

45, 36, 76, 23, 89, 115, 98, 39, 41, 56, 69, 48

Traverse the tree in Preorder, Inorder and postorder.

Q.N.3 Sort the following sequence of keys using merge sort.

66, 77, 11, 88, 99, 22, 33, 44, 55

Q.N.4 Draw a B-tree of order 3 for the following sequence of keys:

2, 4, 9, 8, 7, 6, 3, 1, 5, 10

Q.N.5 Sort the following array using quick sort method.

24 56 47 35 10 90 82 31

Q.N.6 Create a heap with following list of keys:

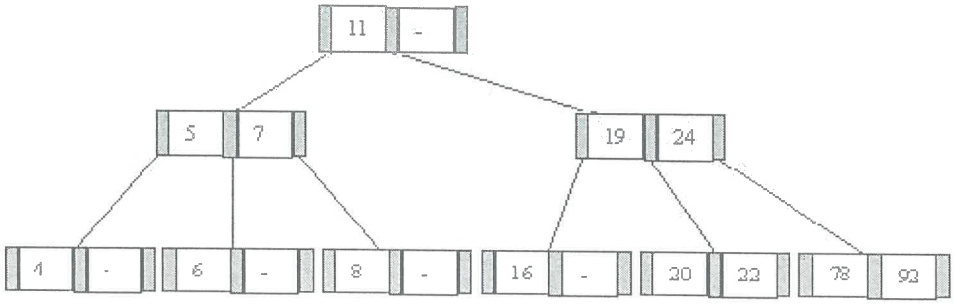
8, 20, 9, 4, 15, 10, 7, 22, 3, 12

Q.N.7 Draw a B-tree of order 3 for the following sequence of keys.

3,5,11,10,9,8,2,6,12

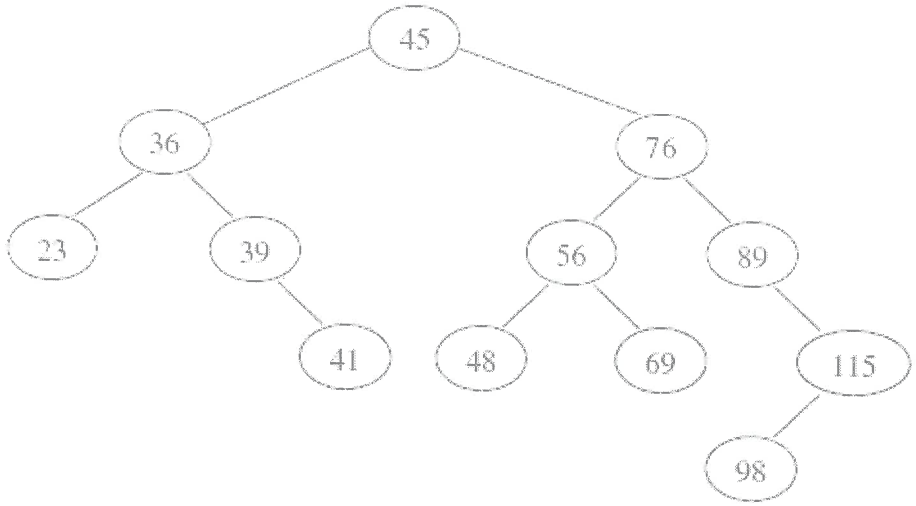
ITS ENGINEERING COLLEGE GREATER NOIDA
SOLUTIONS OF TUTORIAL-5

Ans.1



Ans.2 A binary search tree B is a binary tree each node of which satisfies the following conditions:

1. The value of the left-subtree of 'x' is less than the value at 'x'
2. The value of the right-subtree of 'x' is greater than value at 'x'
3. the left-subtree and right-subtree of binary search tree are again binary search tree.

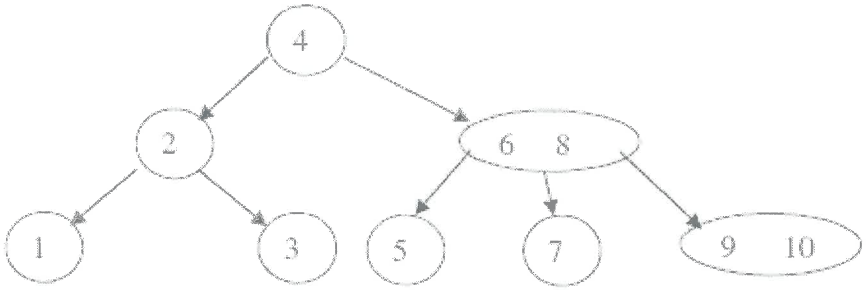


Preorder:-
23, 36, 39, 41, 45, 48, 56, 69, 76, 89, 98, 115
Inorder:-
45, 36, 23, 39, 41, 76, 56, 48, 69, 89, 115, 98
Postorder:-
23, 41, 39, 36, 48, 69, 56, 98, 115, 89, 76

Ans.3 Sorting using Merge sort:-
Original File [66] [77] [11] [88] [99] [22] [33] [44] [55]

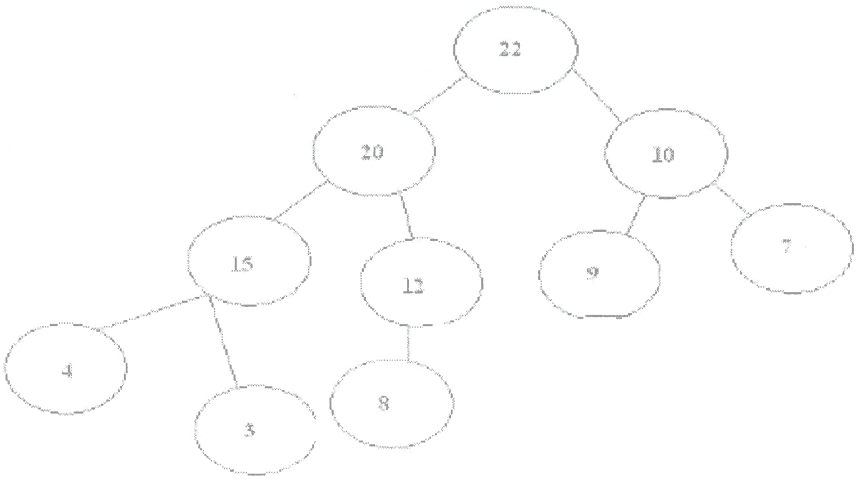
Pass1 [66 77] [11 88] [22 99] [33 44] [55]
Pass2 [11 66 77 88] [22 33 44 99] [55]
Pass3 [11 22 33 44 66 77 88 99] [55]
Pass4 [11 22 33 44 55 66 77 88 99]

Ans.4

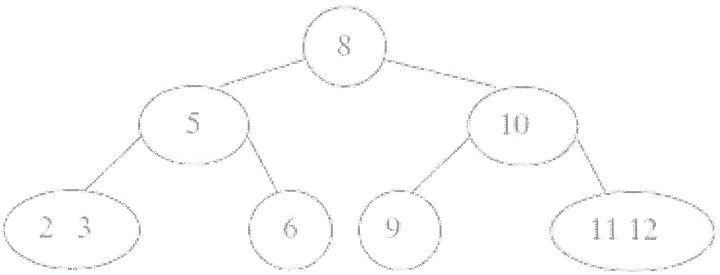


Ans.5 The given data is :-
24 56 47 35 10 90 82 31
Pass 1:- (10) 24 (56 47 35 90 82 31)
Pass 2:- 10 24 (56 47 35 90 82 31)
Pass 3:- 10 24 (47 35 31) 56 (90 82)
Pass 4:- 10 24 (35 31) 47 56 (90 82)
Pass 5:- 10 24 (31) 35 47 56 (90 82)
Pass 6:- 10 24 31 35 47 56 (90 82)
Pass 7:- 10 24 31 35 47 56 (82) 90
Pass 8:- 10 24 31 35 47 56 82 90

Ans.6

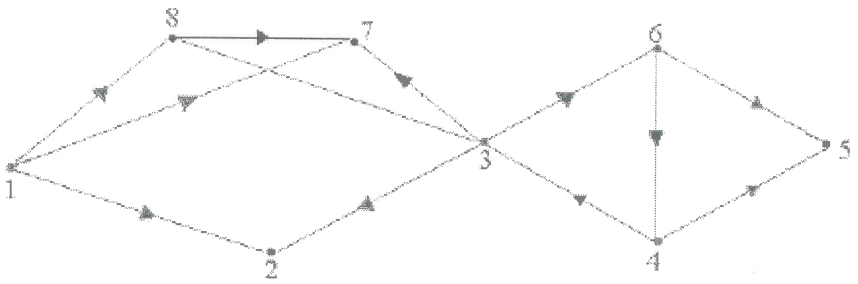


Ans.7

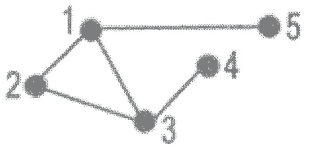


ITS ENGINEERING COLLEGE GREATER NOIDA
TUTORIAL - 6

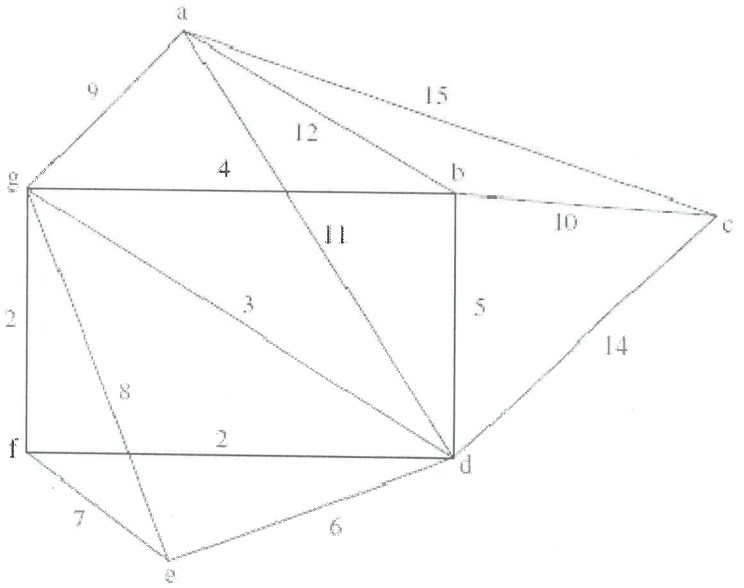
Q.N.1 Show the result of running BFS and DFS on the directed graph given below using vertex 3 as source. Show the status of the data structure used at each stage



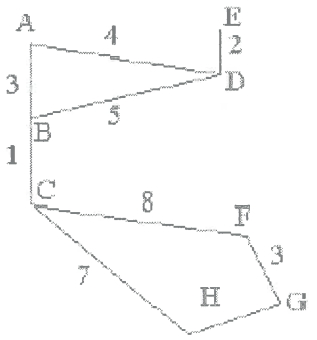
Q.N.2 Explain the representations of graph. Represent the given graph using any two methods



Q.N.3 What is a Spanning tree of a graph? Execute Prim's Kruskal's algorithm to find the minimum spanning tree of the following graph.



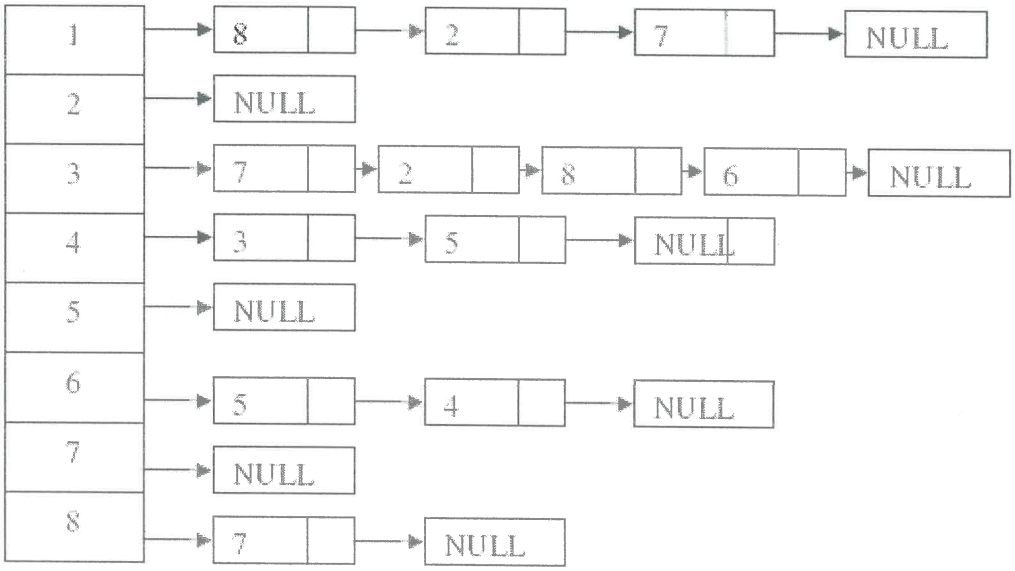
Q.N.4 What is the difference between Prims algorithm and Kruskals algorithm for finding the minimum-spanning tree of a graph? Execute both Prim's and Kruskal's algorithms on the following graph.



ITS ENGINEERING COLLEGE GREATER NOIDA
SOLUTIONS OF TUTORIAL-6

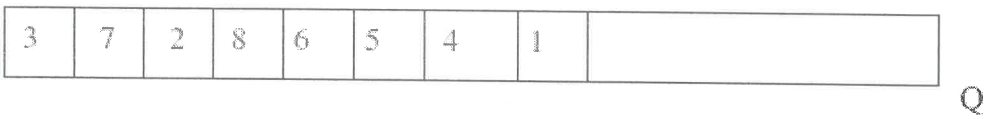
Ans.1

Depth first search (DFS):



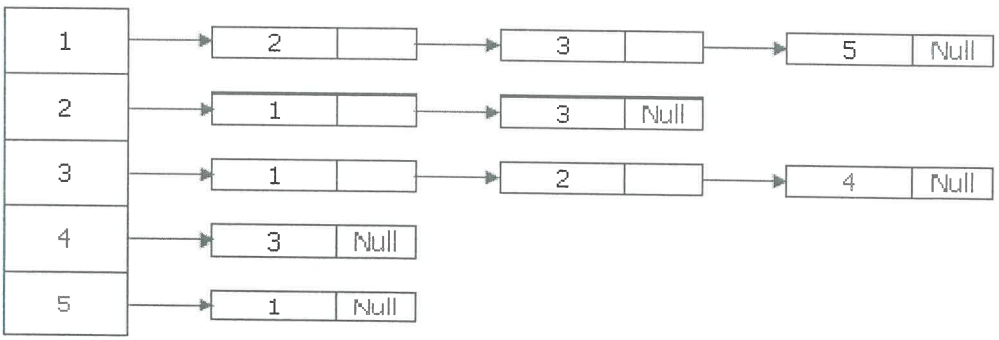
Depth first search (DFS) starting from vertex 3 as source and traversing above adjacency list one by one, we get following result:
3-7-2-8-6-5-4-1

Breath First Search(BFS):



Elements are inserted from rear and deleted from front. Before removal of an element, insert its element in the queue. So result of BFS in the given graph is:
3-7-2-8-6-5-4-1

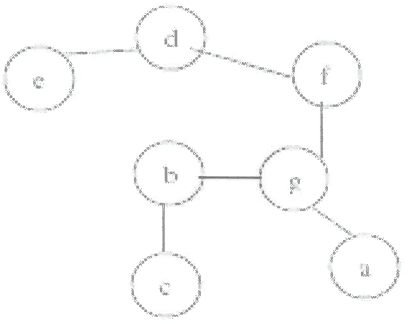
Ans.2 ***Adjacency list representation:***



Adjacency Matrix representation:

	1	2	3	4	5
1	0	1	1	0	1
2	1	0	1	0	0
3	1	1	0	1	0
4	0	0	1	0	0
5	1	0	0	0	0

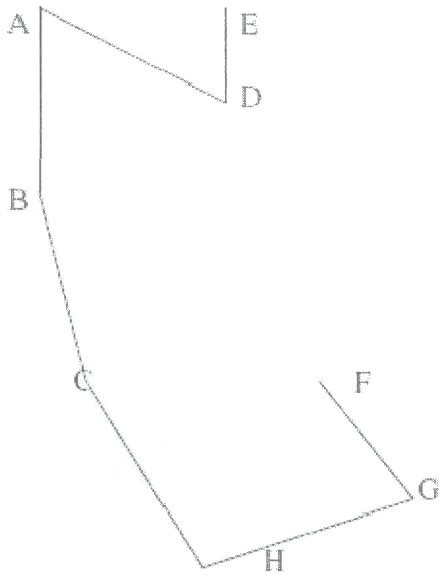
Ans.3 A Spanning Tree is any tree consisting of vertices of graph tree and some edges of graph is called a spanning tree.



Ans.4 **Difference Between Prism's and Kruskal's Algorithm**

In Kruskal's algorithm, the set A is a forest. The safe edge added to A is always a least-weight edge in the paragraph that connects two distinct components. In Prim's algorithm, the set A forms a single tree. The safe edge added to A is always a least-weight edge connecting the tree to a vertex not in the tree.

The minimum spanning tree is:-



min cost = 2+4+3+1+7+0+3 = 20 units.

Assignment – 1(Unit -1)					
Subject	Basics Data Structure and Algorithms			Code	KOE - 035
Faculty Name	Aditya Tyagi	Date of Issue	15/9/2022	Date of Submission	20/09/2022

Course Outcome:

CO 1: Analyze the time and space complexity of an algorithm. (Bloom Taxonomy Level L_4)
CO2: Discuss various algorithm design techniques for developing algorithms. (Bloom Taxonomy Level L_1)

KL- Bloom's Knowledge Level (L_1, L_2, L_3, L_4, L_5, L_6)

L_1-Remember, L_2- Understand, L_3- Apply, L_4- Analyze, L_5- Evaluate, L_6- Create

Note: Attempt all Question (Each question carry 2 marks). **Total Marks - 10**

Q.N.1.Discuss sparse matrices with example. How can we represent sparse matrices in computer memory?

Q.N.2 Discuss recursion. What are the advantages and disadvantages of recursion.

Q.N.3 What do you mean by algorithm complexity? What is time space trade off? Also explain row major order and column major order with formula & specific example.

Q.N.4 Analyze Tower of Hanoi problem with example. Write down the three recursive steps for Tower of Hanoi problem.

Q.N. 5 How can we analyze complexity using asymptotic notation? Describe commonly used asymptotic notations and give their significance.

Assignment – 2(Unit -2)					
Subject	Basics Data Structure and Algorithms			Code	KOE - 035
Faculty Name	Aditya Tyagi	Date of Issue	28/10/2022	Date of Submission	02/11/2022

Course Outcome:

CO5: Evaluate various operation on Queue , Priority Queue , D-Queue. (Bloom Taxonomy Level L_5)

KL- Bloom's Knowledge Level (L_1, L_2, L_3, L_4, L_5, L_6)

L_1-Remember, L_2- Understand, L_3- Apply, L_4- Analyze, L_5- Evaluate, L_6- Create

Note: Attempt all Question (Each question carry 2 marks). **Total Marks - 10**

Q.N.1 Write an algorithm to traverse a one way linked list in reverse order.

Q.N.2 What do you mean by linked list? Write down the algorithm for insertion at the beginning of a linked list.

Q.N.3 Explain header linked list with the help of suitable example. How can link list be used for polynomials representations? Add two polynomials with the help of linked list.

Q.N. 4 Differentiate between Dequeue and Priority queue with example. Write a program in C to implement linked list.

Q.N. 5 Write an algorithm to delete a node with a given item of information from the linked list.

Assignment – 3(Unit -3)					
Subject	Basics Data Structure and Algorithms			Code	KOE - 035
Faculty Name	Aditya Tyagi	Date of Issue	03/11/2022	Date of Submission	04/11/2022

Course Outcome:

CO1: Analyze the time and space complexity of an algorithm. (Bloom Taxonomy Level L_4)
KL- Bloom's Knowledge Level (L_1, L_2, L_3, L_4, L_5, L_6)

L_1-Remember, L_2- Understand, L_3- Apply, L_4- Analyze, L_5- Evaluate, L_6- Create

Note: Attempt all Question (Each question carry 2 marks). **Total Marks - 10**

Q.N.1 Define tree. Explain array representation and link list representation of tree.

Q.N.2 Define tree traversal algorithms and also write down the C function.

Q.N.3 Write down the short notes on Threaded binary tree and 2-Tree

Q.N.4 Suppose the following sequence of the binary tree in preorder and in order Respectively:

Preorder: S,B,Q,A,C,K,F,P,D,E,R,H.

Inorder: Q,B,K,C,F,A,S,P,E,D,H,R.

Draw the suitable tree diagram.

Q.N.5 Write the Huffman Algorithm and generate a tree having minimum weighted path Length for the following sequence, with the help of Huffman Algorithm.

Symbols:	A	B	C	D	E	F	G	H
Weights:	15	5	18	16	6	17	13	10

Q.N. 6 Draw the binary tree corresponding to each of the following algebraic expression:

- E = (a-3b) (2x-y)3
- E = (2a+5b)3 (x-7y)4

Assignment – 4(Unit -4)					
Subject	Basics Data Structure and Algorithms			Code	KOE - 035
Faculty Name	Aditya Tyagi	Date of Issue	25/11/2022	Date of Submission	28/11/2022

Course Outcome:

CO4: Understand & discuss various searching, sorting and graph traversal algorithms. (Bloom Taxonomy Level L_2)

KL- Bloom's Knowledge Level (L_1, L_2, L_3, L_4, L_5, L_6)

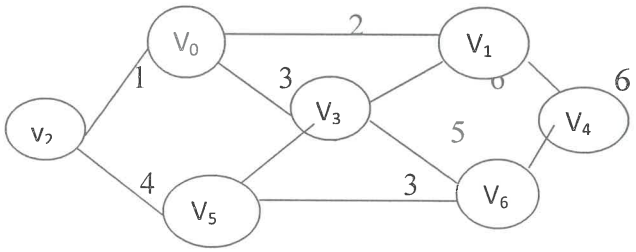
L_1-Remember, L_2- Understand, L_3- Apply, L_4- Analyze, L_5- Evaluate, L_6- Create

Note: Attempt all Question (Each Question carry 2 marks). **Total Marks - 10**

Q.N.1: Define Graph, Multigraph and complete graph with example.

Q.N.2: Discuss in brief the different representation of a graph.

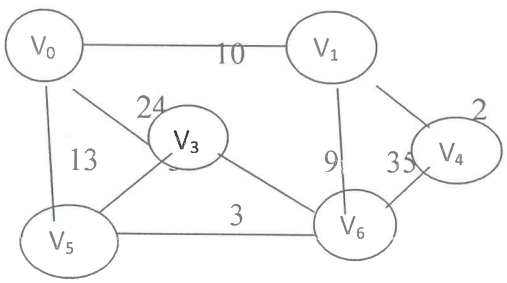
Q.N.3: Define Spanning tree. Write the Prim's algorithms to find the minimum cost spanning tree Of the following:



Q.N.4: Write and explain the breadth first search (BFS) and depth first search (DFS) graph traversal algorithms. What are their complexities?

Q.N.5: Describe the Dijikstra's algorithms for finding shortest path with help of suitable example

Q.N.6: Find the minimum cost spanning tree for the following graph using Kruskal's algorithms



Assignment – 5(Unit -5)					
Subject	Basics Data Structure and Algorithms			Code	KOE - 035
Faculty Name	Aditya Tyagi	Date of Issue	09/12/2022	Date of Submission	12/12/2022

Course Outcome:

CO4: Understand & discuss various searching, sorting and graph traversal algorithms. (Bloom Taxonomy Level L_2)

KL- Bloom's Knowledge Level (L_1, L_2, L_3, L_4, L_5, L_6)

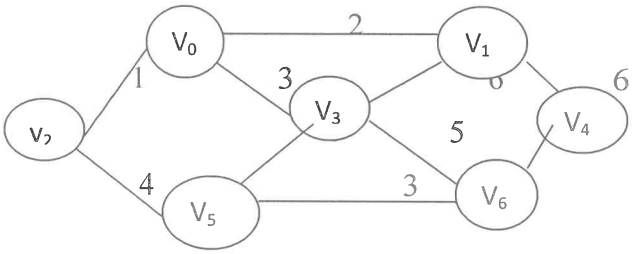
L_1-Remember, L_2- Understand, L_3- Apply, L_4- Analyze, L_5- Evaluate, L_6- Create

Note: Attempt all Question (Each Question carry 2 marks). **Total Marks - 10**

Q.N.1: Define Graph, Multigraph and complete graph with example.

Q.N.2: Discuss in brief the different representation of a graph.

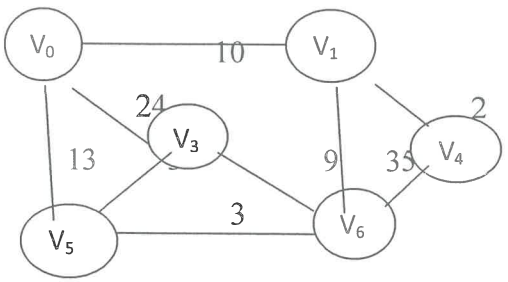
Q.N.3: Define Spanning tree. Write the Prim's algorithms to find the minimum cost spanning tree Of the following:



Q.N.4: Write and explain the breadth first search (BFS) and depth first search (DFS) graph traversal algorithms. What are their complexities?

Q.N.5: Describe the Dijikstra's algorithms for finding shortest path with help of suitable example

Q.N.6: Find the minimum cost spanning tree for the following graph using Kruskal's algorithms



The Education Group
Ghaziabad • Greater Noida
(Estd. : 1995)

I.T.S ENGINEERING COLLEGE
GREATER NOIDA
(A NAAC Accredited Engineering College)

DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING

Evaluation Sheet

Session :	2022-23	Semester : Odd	
Name of Faculty :	Aditya Tyagi		
Branch/Sem/Sec :	Electronics & Communication Engineering / III		
Subject & Code :	Basics Data Structure and Algorithms (KOE-035)		

Sr.No	Roll No	Students Name	Evaluation Parameters								Internal Assesment			University Marks (100)
			A1 (2)	A2 (2)	A3 (2)	A4 (2)	A5 (2)	ST1 (50)	ST2 (50)	PUT (100)	CT (30)	TA (20)	Total(50)	
1	2102220310001	Aadarsh	2	1	2	2	1	34	11	45				
2	2102220310002	ABHAY SHARMA	2	1	1	2	1	43	35	67				
3	2102220310005	ADITYA RANA	2	2	1	2	2	10	10	39				
4	2102220310006	ADITYA SHANKAR	2	2	1	2	2	11	10	24				
5	2102220310007	Akmal Hussain	2	2	2	2	2	17	8	67				
6	2102220310008	ALOK KUMAR SINGH	2	2	2	2	2	29	27	A				
7	2102220310009	Ashwin Yadav	2	1	2	2	1	14	8	43				
8	2102220310010	Avinash A B Roy	2	2	1	2	2	14	0	13				
9	2102220310011	Bhumika Pal	2	2	2	2	2	28	15	62				
10	2102220310012	Devraj Singh	2	2	2	2	2	A	4	13				
11	2102220310013	GAUTAM NEGI	2	2	2	2	2	A	41	70				
12	2102220310014	Harshit Raj	2	2	2	2	2	22	2	62				
13	2102220310016	MD GULAB NABI	2	1	2	2	1	A	A	A				
14	2102220310018	Md Tausif Raja	2	2	2	2	2	D	A	10				
15	2102220310021	Rakesh Kumar	2	2	1	2	2	27	A	49				
16	2102220310022	Riya Chaudhary	2	2	1	2	2	16	12	52				
17	2102220310023	Sahwag Raj	2	1	2	2	1	4	A	16				
18	2102220310024	SAHZAAD BHATTI	2	1	2	2	1	14	20	A				
19	2102220310026	SHUSHANT	2	2	2	2	2	A	14	41				
20	2102220310027	Siddharth Kumar	1	1	1	1	1	A	3	30				
21	2102220310028	Sneha	1	1	1	1	1	10	7	33				
22	2102220310029	Sonu Kumar	2	1	2	2	1	15	A	10				
23	2102220310030	Urvesh Saifi	2	2	1	2	2	A	15	43				
24	LE	Abhijeet Srivastava	2	2	1	2	2	16	16	19				
25	LE	Rahul Kumar	2	1	2	2	1	20	28	45				

A1,A2,A3... Assignment ; ST 1,ST2 : Sessional Test ; PUT : Pre University Test, CT: Class Test Marks based on Sessional Exam; AT : Attandance Marks ; TA : Teachers Assesment Marks based on Assingnments

I.T.S ENGINEERING COLLEGE
GREATER NOIDA
(A NAAC Accredited Engineering College)

The Education Group
Ghaziabad • Greater Noida
(Estd. : 1995)

DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING

List of Weak Students & Action Taken

Session :	2021-22
Name of Faculty :	Aditya Tyagi
Branch/Sem/Sec :	Electronics & Communication Engineering / III
Subject & Code :	Basics Data Structure and Algorithms (KOE-035)

Sr.No	Roll No	Students Name	Marks ST-1	% Attandance	Action Taken (Please write Comments)		
					Communication to Parents	Counselling of Students	Arrangement of Extra Classes
1	2102220310023	Sahwag Raj	4	41.94	Father informed about lov	advised to be more regular in cla	yes on saturday or in office hour, as per requirement
2	2102220310005	ADITYA RANA	10	61.29	Father informed about lov	advised to focus on subject	yes on saturday or in office hour, as per requirement
3	2102220310028	Sneha	10	58.06	Father informed about lov	advised to be more regular in cla	yes on saturday or in office hour, as per requirement
4	2102220310006	ADITYA SHANKAR	11	48.39	Brother Informed	advised to focus on subject	yes on saturday or in office hour, as per requirement
5	2102220310009	Ashwin Yadav	14	29.03	Father informed about lov	advised to be more regular in cla	yes on saturday or in office hour, as per requirement
6	2102220310010	Avinash A B Roy	14	51.61	Father Informed	advised to be more regular in cla	yes on saturday or in office hour, as per requirement
7	2102220310024	SAHZAAD BHATTI	14	45.16	Father Informed	advised to be more regular in cla	yes on saturday or in office hour, as per requirement

Note: Ensure to communicate the parents periodically .

The Education Group
Ghaziabad • Greater Noida
(Estd. : 1995)

I.T.S ENGINEERING COLLEG
GREATER NOIDA
(A NAAC Accredited Engineering Colleg

DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING

List of Weak Students & Action Taken

Session :	2022-23
Name of Faculty :	Aditya Tyagi
Branch/Sem/Sec :	Electronics & Communication Engineering / III
Subject & Code :	Basics Data Structure and Algorithms (KOE-035)

Sr.No	Roll No	Students Name	Marks ST-2	% Attandance	Action Taken (Please write Comments)		
					Communication to Parents	Counselling of Students	Arrangement of Extra Classes
1	2102220310010	Avinash A B Roy	0	54.35	Father informed about low performance and attendance	advised to be more regular in class	yes on saturday or in office hour, as per requirement
2	2102220310014	Harshit Raj	2	56.52	Father informed about low performance and attendance	advised to focus on subject	yes on saturday or in office hour, as per requirement
3	2102220310027	Siddharth Kumar	3	43.48	Father informed about low performance and attendance	advised to be more regular in class	yes on saturday or in office hour, as per requirement
4	2102220310012	Devraj Singh	4	52.17	Brother Informed	advised to be more regular in class	yes on saturday or in office hour, as per requirement
5	2102220310028	Sneha	7	69.57	Father informed about low performance and attendance	advised to be more regular in class	yes on saturday or in office hour, as per requirement
6	2102220310007	Akmal Hussain	8	60.87	Father informed about low performance and attendance	advised to focus on subject	yes on saturday or in office hour, as per requirement
7	2102220310009	Ashwin Yadav	8	34.78	Father informed about low performance and attendance	advised to be more regular in class	yes on saturday or in office hour, as per requirement
8	2102220310005	ADITYA RANA	10	58.70	Brother Informed	advised to be more regular in class	yes on saturday or in office hour, as per requirement
9	2102220310006	ADITYA SHANKAR	10	50.00	Father informed about low performance and attendance	advised to be more regular in class	yes on saturday or in office hour, as per requirement
10	2102220310001	Aadarsh	11	41.30	Father informed about low performance and attendance	advised to focus on subject	yes on saturday or in office hour, as per requirement
11	2102220310022	Riya Chaudhary	12	58.70	Father informed about low performance and attendance	advised to be more regular in class	yes on saturday or in office hour, as per requirement
12	2102220310026	SHUSHANT	14	67.39	Brother Informed	advised to be more regular in class	yes on saturday or in office hour, as per requirement

The Education Group
Ghaziabad • Greater Noida
(Estd. : 1995)

I.T.S ENGINEERING COLLEGE
GREATER NOIDA
(A NAAC Accredited Engineering College)

DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING

List of Weak Students & Action Taken

Session :	2022-23
Name of Faculty :	Aditya Tyagi
Branch/Sem/Sec :	Electronics & Communication Engineering / III
Subject & Code :	Basics Data Structure and Algorithms (KOE-035)

Sr.No	Roll No	Students Name	Mark PUT	% Attandance	Action Taken (Please write Comments)		
					Communication to Parents	Counselling of Students	Arrangement of Extra Classes
1	2102220310018	Md Tausif Raja	10	28.07	Father Informed about poor performance and irregular in class	advised to focus on key concepts	PUT paper is given to solve and extra classes
2	2102220310029	Sonu Kumar	10	43.86	Father Informed about poor performance and irregular in class	advised to focus on key concepts	PUT paper is given to solve and extra classes
3	2102220310010	Avinash A B Roy	13	52.63	Mother Informed about poor performance and irregular in class	advised to focus on key concepts	PUT paper is given to solve and extra classes
4	2102220310012	Devraj Singh	13	45.61	Father Informed about poor performance and irregular in class	advised to focus on key concepts	PUT paper is given to solve and extra classes
5	2102220310023	Sahwag Raj	16	40.35	Father Informed about poor performance and irregular in class	advised to focus on key concepts	PUT paper is given to solve and extra classes
6	LE	Abhijeet Srivastava	19	54.39	Mother Informed about poor performance and irregular in class	advised to focus on key concepts	PUT paper is given to solve and extra classes
7	2102220310006	ADITYA SHANKAR	24	54.39	Father Informed about poor performance and irregular in class	advised to focus on key concepts	PUT paper is given to solve and extra classes

The Education Group
Ghaziabad • Greater Noida
(Estd. : 1995)

I.T.S ENGINEERING COLLEGE
GREATER NOIDA
(A NAAC Accredited Engineering College)

DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING

List of Top Ten Students

Session :	2022-23
Name of Faculty :	Aditya Tyagi
Branch/Sem/Sec :	Electronics & Communication Engineering / III
Subject & Code :	Basics Data Structure and Algorithms (KOE-035)

Sr.No	Roll No	Top Ten Students of ST 1	Roll No	Top Ten Students of ST 2	Roll No	Top Ten Students of PUT
1	2102220310002	ABHAY SHARMA	2102220310013	GAUTAM NEGI	2102220310013	GAUTAM NEGI
2	2102220310001	Aadarsh	2102220310002	ABHAY SHARMA	2102220310002	ABHAY SHARMA
3	2102220310008	ALOK KUMAR SINGH	LE	Rahul Kumar	2102220310007	Akmal Hussain
4	2102220310011	Bhumika Pal	2102220310008	ALOK KUMAR SINGH	2102220310011	Bhumika Pal
5	2102220310021	Rakesh Kumar	2102220310024	SAHZAAD BHATTI	2102220310014	Harshit Raj
6	2102220310014	Harshit Raj	LE	Abhijeet Srivastava	2102220310022	Riya Chaudhary
7	LE	Rahul Kumar	2102220310030	Urvesh Saifi	2102220310021	Rakesh Kumar
8	2102220310007	Akmal Hussain	2102220310011	Bhumika Pal	LE	Rahul Kumar
9	LE	Abhijeet Srivastava			2102220310001	Aadarsh
10	2102220310022	Riya Chaudhary			2102220310030	Urvesh Saifi

Signature of HOD

Signature of Faculty

I.T.S Engineering College

Greater Noida
(NAAC Accredited)

Question Bank
Basics Data Structure & Algorithms(KOE-035)

Q1.Write an algorithm to convert a valid arithmetic infix expression into its equivalents postfix expression. Trace your algorithm for

A-B/C+D*E+F

Q2. Use quick sort algorithm to sort 15,22,30,10,15,64,1,13,9,52.Is it a stable sorting algorithm- justify

Q3. Discuss the different cases of rotations in AVL tree.

Q4. Explain circular queue and priority queue data structure in detail?

Q5. (I) How can be represent a polynomial in a linked list ? Write an algorithm to add two polynomials represented by linked list?

(II) Explain the term garbage collection compaction?

Q6.Define tree .How a tree can be stored in memory Explain with an example?

Q7. If the inorder traversal of a binary tree is BIDACGEHF and its postorder traversal is IDBGCHFEA determine the binary tree?

Q8. Write a program in C for binary search and what is the worst case time complexity of binary search?

Q9. Write an algorithm to insert and delete a node from doubly linked list , Illustrate with an example use your algorithm to develop function in C?

Q10. (I) Obtain the minimum number of entries that can be made in a B-Tree of order m and of level l.

(II)Use merge sort algorithm to sort the following elements

15,10,5,20,25,30,40,35

Q11. Write down the algorithm for bubble sort and explain how you can sort an unsorted array of integers by using quick sort? Find out the time complexity of your algorithm?

Q12.Define Hash function state different types of Hash function give their algorithm and explain them by suitable diagram?

Q13. Write the function in C to insert and delete a node in an existing binary search tree.

Q14. The preorder and inorder traversals of binary tree is given below , construct the binary tree.

Preorder: EAFKCDHGB

Inorder: EACKFHDBG

Q15. Explain the followings

(I) Heap Sort (II) Radix Sort

Q16. Convert the following Infix expression into Postfix expression

A*(B+D)/E-F*(G+H/K)

Q17. What is tower of Hanoi problem ? Explain the solutions of the tower of Hanoi problem where the number of disks are 4 and number of pegs are three?

Q18. Define the recursion. Write a recursion and non-recursive program to calculate the functional of the given number?

Q19. Write a algorithm to evaluate an expression given in postfix notaion?

Q20. Explain the tree traversals and write algorithm for inorder and postorder traversal of a binary tree?

Q21. What is STACK. Write the algorithm for PUSH and POP method?

Q22 Explain the circular link list and illustrate it by writing the c code?

Q23. Explain the steps of selection sort with example? Write a c code to sort a list using selection sort?

Q24. Explain D-Queue and its types in detail?

Q25. Write a c code to delete an element from doubly link list?

Q26. Explain the following
a) Explain pointer with the help of example?

b) What is dynamic memory allocation explain it with the help of Syntax.

Q27. Explain Binary search tree and its property in detail. Also describe the functioning for inserting and deleting an element?

Q28. Explain Hash function. Explain Collision resolution strategies.

Q29.Write an algorithm to count the number of nodes between given two nodes in a linked list?

Q30.

(I) Explain the merits and demerits of static and dynamic memory allocation techniques?

(I) Define tail recursion by giving suitable example?

BASICS DATA STRUCTURE & ALGORIRHMS(KOE-035)

Question Bank

Unit – I

1. State the field value, record & file with example.
2. Give the brief description of traversing, sorting, and searching.
3. Describe the complexity of algorithm.
4. Explain the space-time trade off of an algorithm.
5. Write the algorithm for largest no. in the array
6. Write the algorithm for linear search with complexity.
7. What do you mean by worst case, average case& best case?
8. What do you mean by sub algorithm & types of sub algorithm?
9. What do you mean by string? What is length of string?
10. Explain the type of sorting.
11. Explain all the string operation.
12. What do you mean by array . is it linear structure or not?
13. How do you represent the linear array in memory?
14. Write an algorithm for traversing linear array.
15. Write an algorithm for inserting an element in linear array.
16. Write an algorithm for deleting an element from linear array
17. Write also for matrix multiplication.
18. What do you mean by sparse matrix
19. List out the areas in which data structures are applied extensively?
20. Why do we Use a Multidimensional Array?
21. What is the data structures used to perform recursion?

Unit -II

22. What do you mean by stacks?
23. What do you mean by linked list?
24. How do you represent a linked list in memory
25. What do you mean by traversing of linked list?
26. Write an algorithm for searching linked list when list is unsorted.
27. Write an algorithm for searching linked list when list is sorted
28. Write an algorithm for inserting an element at first position.
29. Write an algorithm for inserting an element after given node.
30. Write an algorithm for deleting a node following a given node.
31. What is header-linked list? Write the types of header-linked list.
32. Write the algorithm for traversing a circular header linked list.
33. What do you mean by two way linked lists?
34. Write the algorithm for inserting the element in two way linked list
35. What do you mean by queues?
36. Explain linked representation of queue.
37. What are the operations on queue?
38. What do you mean by circular queue,d-queue & priority queue
39. Explain the algorithm for create, add, delete operation.
40. If you are using C language to implement the heterogeneous linked list, what pointer type will you use?
41. Minimum number of queues needed to implement the priority queue?
42. What is the benefit of using a queue linked list?

Unit - III

43. Explain binary tree representation.
44. Explain algebraic expression.
45. What do you mean by complete binary tree?
46. What do you mean by extended binary tree?
47. Explain linked representation & array representation of tree.
48. Write algorithm for traversing binary tree.
49. What do you mean by extended by tree?
50. What do you mean by threaded by tree.
51. Explain traversing of threaded by tree.
52. Write the algorithm for sequential search.
53. Write the algorithm for binary search.
54. What do you mean by hashing?
55. What is hash table
56. What is hash function
57. What do you mean by collision resolution strategies?
58. How will in order, pre order and post order traversals print the elements of a tree?
59. What is the "depth" of a node in a binary tree?
60. What is the "depth" of a binary tree?
61. What is the "size" of a binary tree?
62. What, specifically, does it mean to say a binary tree is "balanced"?
63. What does it mean to say that a balanced binary tree is "left justified"?
64. What does it mean to "traverse" a binary tree?
65. If a binary tree represents an arithmetic expression, in what order should the nodes be evaluated?
66. How many leaves are there in a complete binary tree of depth N (where the root is at depth 0)?

67. How many nodes are there in a complete binary tree of depth N (where the root is at depth 0)?

Unit - IV

68. Explain all the terms of graph.
69. Explain linked representation of graph.
70. Explain multi graph.
71. Explain directed graph.
72. Explain sequential representation of tree..
73. Explain BFS and DFS graph traversal.
74. What do you mean by file organization?
75. Explain all the file operations.
76. Explain all the file organizations.
77. What do you mean by indexed sequential files?
78. What do you mean by direct sequential files?
79. Explain B+ tree.
80. What is the difference between indexing and hashing?
81. Different between primary and secondary indices.

Unit - V

82. Explain insertion sort.
83. Explain bubble sort.
84. Explain quick sort.
85. Explain two way merge sort.
86. Explain heap sort.
87. What do you mean by binary search tree?
88. Explain deletion of BST.
89. Explain insertion of BST.
90. Explain complexity of search algorithm.

91. What do you mean by path length?
92. What do you mean by AVL Tree?
93. What do you mean by B tree?
94. Write an algorithm for bubble sort?
95. What do you mean by linear search? Explain its algorithm.
96. What do you mean by binary search? Explain its algorithm.
97. How binary search is different from linear search?
98. Explain sorting on different key.
99. Write algorithm for insertion sort.
100. Write algorithm for bubble sort.
101. Write algorithm for quick sort.
102. What is the average number of comparisons in a sequential search?
103. Which sort show the best average behavior?
104. What do you mean by minimum cost spanning tree?
105. In which Prim's and Kruskal's algorithm whose performance is better than other and why?

(Following Paper Code and Roll no. to be filled in your Answer Book)

SUBJECT CODE: KOE-035 Roll no. : _____

B. Tech: [SECOND YEAR]
Sessional Test-1 (Odd Semester: 2022-23)

SEMESTER: III **BRANCH: ECE/ME/CE**

Subject Name: Basics Data Structure and Algorithms

Date of Examination: 19-10-22

Time: 120 mins. ***Total Marks: 50***

Note: *Do as Directed. Missing data if any may be suitably assumed and mentioned. Symbols have their usual meaning.*

CO1: Analyze the time and space complexity of an algorithm. [L_4]
CO2: Implement fundamental algorithms (including sorting algorithms, graph algorithms, and dynamic programming) [L_3]
CO3: Discuss various algorithm design techniques for developing algorithms. [L_1]
CO4: Understand & discuss various searching, sorting and graph traversal algorithms[L_2]
CO5: Evaluate various operation on Queue , Priority Queue , D-Queue. [L_5]

SECTION-A

Attempt **ALL** parts. All parts carry **EQUAL** marks. **[2*5=10]**

1. Discuss big-oh notation along with appropriate diagram. **(CO1)**
2. What do you mean by algorithm complexity? What is time space trade off? **(CO1)**
3. Discuss various string handling functions available in C language. **(CO1)**
4. Briefly describe overflow and underflow condition of stack. **(CO5)**
5. State various applications of Stack **(CO5)**

SECTION-B

Attempt **ALL** questions from this section. Internal Choices are indicated. **[5*4=20]**

6. What is Recursion? Write the three recursive steps to solve Tower of Hanoi problem. **(CO1)**
7. Evaluate the postfix expression 5, 4, 6, +, *, 4, 9, 3, /, +, * **(CO1)**

OR

Write the formula for 'row major order' and 'column major order'. The array DATA [20, 20] is stored in memory in 'row major order'. If the base address is 100 and element size is 4 bytes.
Calculate the address of element DATA [5, 15] **(CO1)**

8. Elaborate the benefits of Sparse Matrix. How can we represent Sparse matrix in memory ? **(CO5)**
9. Explain Stack with push and pop operations. Write down the algorithm for push & pop operations using array. **(CO5)**

OR

Explain Stack with push and pop operations. Write down the algorithm for push & pop operations using linked list. **(CO5)**

SECTION-C

Attempt **ALL** questions from this section. Internal Choices are indicated. **[10*2=20]**

11. Write an algorithm to convert Infix notation into Postfix notation of an expression. Convert the following infix expression into postfix form: (m + n) * (k + p) / (g / b) - (a - b / c). **(CO1)**

OR

Write down the algorithm for evaluation of postfix expression. Convert the following expression into prefix and postfix form ((A + B) + C * (D + E) + F) * (G + H) **(CO1)**

12. Explain queues with example. Write down the algorithm for insertion and deletion in queue using circular array. **(CO5)**

OR

Discuss the advantages of Linked List over Array. Write an algorithm to insert a node before last node in one way linked list. **(CO5)**

PAPER ID-411533

Subject Code: KOE035

Roll No: | | | | | | | | | | | | | |

BTECH
(SEM III) THEORY EXAMINATION 2021-22
BASIC DATA STRUCTURE AND ALGORITHMS

ime: 3 Hours *Total Marks: 100*

Note: Attempt all Sections. If you require any missing data, then choose suitably.

SECTION A

1. Attempt *all* questions in brief. **2*10 = 20**

Qno	Questions	CO
(a)	What is **big oh** in asymptotic notation?	1
(b)	Write the application of sparse matrix.	1
(c)	What is the condition if circular queue is full?	2
(d)	Write the two advantages of circular singly linked list over singly linked list.	2
(e)	Differentiate internal sorting and external sorting also enlists the name of one sorting techniques of each.	5
(f)	What is difference between tree and graph?	4
(g)	Show the maximum number of node in a binary tree of height h is 2^{h+1}-1.	3
(h)	What is difference between polish notation and reverse polish notation?	2
(i)	Write the advantages of B^+ tree?	3
(j)	How to select Pivot element in quick short?	5

SECTION B

2. Attempt any *three* of the following: **10*3 = 30**

Qno	Questions	CO
(a)	What is difference between static and dynamic memory allocation?	1
(b)	Write an algorithm to evaluate postfix expression using stack.	2
(c)	How to delete a node in binary search tree? Explain with the help of example.	3
(d)	Explain Dijiskatra Algorithm with the help of example.	4
(e)	Binary search is more efficient than Linear search. Justify your answer.	5

SECTION C

3. Attempt any *one* part of the following: **10*1 = 10**

Qno	Questions	CO
(a)	In 2-D array, each element of an array X [5] [4] requires 4 bytes of storage. Base address of X is 80. Determine the location of X [3] [2]. When the array is stored at Row major order and column major order.	1
(b)	Write a program in 'C' to implementation of reverse singly linked list.	2

4. Attempt any *one* part of the following: **10 *1 = 10**

Qno	Questions	CO
(a)	Convert the following infix expression into postfix expression using stack. A*(B+D)/E-F*(G+H/K)	2
(b)	Write a program in **'C'** to implementation of QUEUE.	2

PAPER ID-411533

Roll No: | | | | | | | | | | | | | |

BTECH
(SEM III) THEORY EXAMINATION 2021-22
BASIC DATA STRUCTURE AND ALGORITHMS

5. **Attempt any *one* part of the following:** **10*1 = 10**

Qno	Questions	CO
(a)	Write an algorithm to in-order tree traversal of binary tree. Also Construct the binary tree of the following given traversal order In-order : M, E, P, A, Q, T, R, C, F, K. Post-order: M, P, E, Q, R, C, T, K, F, A.	3
(b)	Construct the steps to configure a B- tree of order 5 for the following data: 78, 21, 11, 97, 85, 74, 63, 45, 42, 57, 20, 16, 19, 32, 30, 31	3

6. **Attempt any *one* part of the following:** **10*1 = 10**

Qno	Questions	CO
(a)	Discuss the breadth first search traversal algorithm with example.	4
(b)	What is Minimum cost of spanning tree? Explain kruskal's algorithm with example.	4

7. **Attempt any *one* part of the following:** **10*1 = 10**

Qno	Questions	CO
(a)	Write a quick sort algorithm. Use quick sort algorithm to sort the following element: 15, 22, 30, 10, 15, 64, 1, 3, 9, and 52.	5
(b)	Write short notes on the following: (i) Priority Queue. (ii) Threaded binary tree	5

Printed Pages: 02 | Sub Code: NEC401

Paper Id: 131270 | Roll No. | | | | | | | | | | |

B.TECH.
(SEM IV) THEORY EXAMINATION 2018-19
DATA STRUCTURE

Time: 3 Hours | *Total Marks: 100*

Note: Attempt all Sections. If require any missing data; then choose suitably.

SECTION A

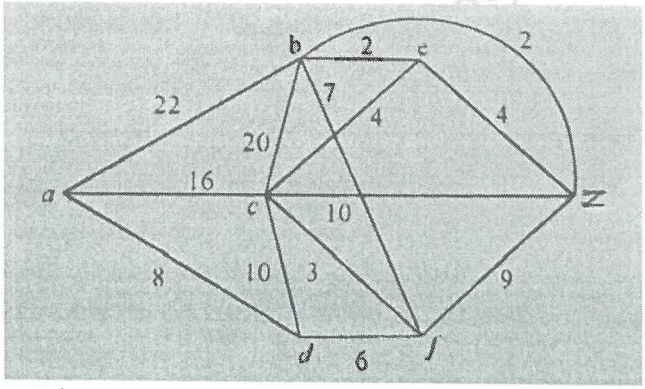
1. Attempt *all* questions in brief. **2 x 10 = 20**

a) Define the term (i) Entity (ii) file
b) Define 3D array with example?
c) Why stack is called a LIFO data structure?
d) How does a linear queue compare with circular queue?
e) Define the non-recursive traversal of binary search tree?
f) Differentiate between complete binary tree and full binary tree?
g) Define the degree of a vertex?
h) Define Adjacency List with example?
i) What is a sparse matrix? How is it stored in the memory of a computer?
j) Define radix sort with example?

SECTION B

2. Attempt any *three* of the following: **10x3=30**

a) What do you think about Algorithm, give example? How to express the time and space complexity, define with help of example?
b) Differentiate between prefix and postfix expression? Write a program to input an infix expression and convert it into prefix form?
c) Define tree with suitable example? Discuss the different tree terminologies?
d) By applying Dijikstra's algorithm find the shortest path between the vertices *a* and *z* in the following graph, where the numbers associated with the edges are the distances between the vertices?



e) Explain binary search tree and its operations. Make a binary search tree for the following sequence of numbers, show all steps: 45, 32, 90, 34, 68, 72, 15, 24, 30, 66, 11, 50, 10.

SECTION C

3. **Attempt any *one* part of the following:** **10x1=10**

a) What do you mean by array? Classify them with example and what are the application of array?

b) Compare the linear linked list and doubly linked list according to their advantages and disadvantages? Write a function that removes all duplicate elements from a linear linked list?

4. **Attempt any *one* part of the following:** **10x1=10**

a) What is the principle of recursion? Discuss the different types of recursion?

b) What do you mean by queue? Discuss the operation of insert and delete performed by queue?

5. **Attempt any *one* part of the following:** **10x1=10**

a) Write a program to traverse the threaded binary tree is in-order, post-order and pre-order?

b) Define Huffman algorithm with suitable example? Draw the Hoffman tree-

Data Item	A	B	C	D	E	F	G	H
Weight	22	5	11	19	2	11	25	5

6. **Attempt any *one* part of the following:** **10x1=10**

a) Explain with an example to find minimum cost spanning tree using kruskal algorithm.

b) Explain Breadth First Search? Give example to support your answer?

7. **Attempt any *one* part of the following:** **10x1=10**

a) Perform the Merge Sort on following set of elements. Also, write merge sort algorithm. 18, 25, 4, 26, 10, 15, 20, 5.

b) Write and explain the bubble sort algorithm for a given set of n data's where k^{th} is the largest data.

Printed Pages : 1 Roll No. | | | | | | | | | | NEC401

B.TECH.

THEORY EXAMINATION (SEM–IV) 2016-17

DATA STRUCTURE

Time : 3 Hours *Max. Marks : 100*

Note : Be precise in your answer. In case of numerical problem assume data wherever not provided.

SECTION A

1. Answer all the questions. **10x2=20**

a) Given a 2-D Array A [-100: 100, -5: 50]. Find the address of element A [99, 49] considering base address 10 and each element requires 4 bytes for storage. Follow row major order.

b) Write down the difference between static and dynamic memory.

c) What is the advantage of doubly linked list over singly linked list? What is an algorithm?

d) What is recursion? A recursive procedure should have two properties. What are they?

e) Define the following: (i) Tree (ii) Level of a node. (iii) Height of a tree.

f) Write down any four applications of queues.

g) Define garbage collection and compaction

h) What is a sparse matrix? How is it stored in the memory of a computer?

i) Differentiate between Linear and Non-Linear Data Structures with examples.

j) Define adjacency matrix with suitable example.

SECTION B

2. Answer any five questions from this section. **5x10=50**

a) Explain Breadth First Search with suitable example.

b) Explain Kruskal's algorithm to find minimum spanning tree in a weighted directed graph. Can there be two minimum spanning trees of given weighted directed graph?

c) Convert E=abcde^^*+ postfix expression to infix and prefix using stack.

d) Write an algorithm for finding solution to the Towers of Hanoi problem. Explain the working.

e) Write a C-Function for Linked List Implementation of stack. Write all the Primitive Operations.

f) Perform the Merge Sort on following set of elements. Also, write merge sort algorithm. 18, 25, 4, 26, 10, 15, 20, 5.

g) Why circular queue is used over simple queue? Write algorithms to implement all operations in a circular queue using arrays.

h) Explain binary search tree and its operations. Make a binary search tree for the following sequence of numbers, show all steps : 45,32,90,34,68,72,15,24,30,66,11,50,10 .

SECTION C

Answer any two questions of the following. Each question carries equal marks. 2x15=30

3. a) Draw a binary tree which has following traversal

Inorder : D J G B A E H C F I

Preorder : A B D G J C E H F I

b)Explain threaded binary tree with suitable example.

4. i) What are doubly linked lists? Write a C program to create doubly linked list.

ii) Define internal sorting techniques

5. Write short notes on any three of the following
   a) Huffman Algorithm
   b) Depth First Search
   c) Priority Queue
   d) Abstract Data Type(ADT)