Subject Name: Data Structure Subject Code:3130702

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UNIT - 1 : INTRODUCTION TO DATA STRUCTURE

Topic 1: Data Management Concepts, Data Types: Primitive and Non-Primitive, Performance Analysis & Measurement(Time & Space Analysis of algorithm-Average, Best & Worst case Analysis), Types of Data Structure- Linear &Non-Linear Data Structure

Sr. No	SHORT QUESTIONS (1 Mark) / MCQ / True-False/Fill in the blanks	Marks
1.	Define primitive data structure. **(June'16,Jan'17)[LJIET]** **primitive data structure:** The data structures, typically those data structure that are directly operated upon by machine level instructions i.e. the fundamental data types such as int, float, double are known as primitive data structures.	01
2.	Define Non – Primitive: (**Jan'17)[LJIET]** The data structures, which are not primitive are called non-primitive data structures.	01
3.	Arithmetic expression evaluation is an explanation of which data structure? **(May'17)[LJIET]**	01
4.	Define Linear Data Structure: (**Jan'17)[LJIET]** A list, which shows the relationship of adjacency between elements, is said to be linear data structure. The most, simplest linear data structure is a 1-D array, but because of its deficiency, list is frequently used for different kinds of data. Ex:- Array, Stack, Queue, Linked List.	01
5.	Non-linear data structure:-**(Jan'17)[LJIET]** A list, which doesn't show the relationship of adjacency between elements, is said to be non-linear data structure. – Ex:- Tree and Graph	01
6.	Explain space and time complexity. **(June'16)[LJIET]** ***Time complexity*(Jan'17)[LJIET]** is a function describing the amount of time an algorithm takes in terms of the amount of input to the algorithm. ***Space complexity*** is a function describing the amount of memory (space) an algorithm takes in terms of the amount of input to the algorithm.	01
7.	Define data structure. **(Jan'16)[LJIET]** A mathematical or logical model of a particular organization of data is called data structure	01
8.	What is the 2's complement representation for integer 5 in modulo 16? **(May'17)[LJIET]**	01
9.	What is the result of 7+7 using 2's complement representation and modulo 16 arithmetic **(May'17)[LJIET]**	01
10.	What is the worst case time complexity of searching an element in a list? How ?**(Jan'16)[LJIET]**	01
11.	What is normalization in floating point storage representation?**(Nov'17 Old)[LJIET]**	01
12.	What is 2's complement representation for integer -4 in modulo 16? **(Nov'17 Old)[LJIET]**	01
13.	Define: Recursion **(Jan'17)[LJIET]**	01

Sr. No	DESCRIPTIVE QUESTIONS	Marks
1.	What does abstract data type means?**(Dec' 2010 Old)[LJIET]**	02
2.	What is the difference between linear and nonlinear data structure.**(Dec' 2010 Old)[LJIET]**	02
3.	Write an algorithm for finding average of given numbers. Calculate time complexity **(May'17)[LJIET]**	03
4.	Write a function to calculate N!(Factorial) of nonnegative integer. Calculate Time complexity.**(Nov'2017)[LJIET]**	03
5.	Which data structures are considered as nonprimitive data structures?**(Nov'2017 Old)[LJIET]**	
6.	Differentiate the following terms: a. Linear and Non-Linear Data Structures b. Primitive and Non-Primitive Data Structures**(May' 2011 Old)[LJIET]**	04
7.	What is Data Structure? Give the difference between Linear and Non Linear Data Structures.**OR**Define Data Structure and differentiate between linear and nonlinear data structures.**(Dec'2011 Old, June'2019)[LJIET]**	03
8.	What do you mean by Data Structure? Give the difference between Primitive and Non-primitive data structures.**(Dec'13 OLD)[LJIET]**	3.5
9.	How primitive data type floating point is stored in computer?**(Nov'2017)[LJIET]**	03
10.	Differentiate between linear and nonlinear data structure. **(May'2018 New)[LJIET]**	03
11.	Which data structure is used in a time sharing single centralprocessing unit and one main memory computer system wheremany users share the system simultaneously? How users areadded for use of the system?**(Nov'2017)[LJIET]**	04

12.	Define Time & Space complexity-**(March'10 OLD)**.Calculate time complexity for expression- **(May'12 OLD)[LJIET]**
	for (k=0; k<n; k++) {
	rows[k] = 0; for(j=0; j<n; j++)
	{
	rows[k] = rows[k] + matrix[k][j]; total = total + matrix[k][j];
	}
	}
		2.5 / 04

13.	Discuss best case, average case and worst case time analysis with example. **(Jan'15 Old) [LJIET]**	04
14.	Write an algorithm for calculating square of the number for allthe prime numbers ranging between 1 to n. Perform time andspace analysis. **(Nov'2017)[LJIET]**	04
15.	Write algorithm to sum the values in vector V and find out the execution time required. **(June'15 Old) [LJIET]**	04
16.	Define data structure.(**June'2013 Old)[LJIET]** List the various linear and non-linear data structures and explain them in brief with application. Or Give the difference between Linear and Non Linear Data structures .**(Dec'2009 old)[LJIET] or** Briefly explain various linear and non-linear data structures along with their applications.(**June'2013 Old ,June'2015)[LJIET]**	07/05
17.	Define Algorithm. Write an algorithm to multiply two matrices. Also Perform Time Analysis for the same.**(May' 2011 old)[LJIET]**	07
18.	Write a short note on performance analysis and performance measurement of an algorithm. **(Jan'15) [LJIET]**	07
19.	What is Data Structure? Explain linear and non-linear data structures with examples.**(May'2018OLD) [LJIET]**	07

20.	What is data structure? Explain different types of data structures with applications.**(Jan'17 OLD) [LJIET] Or** What is data structure? Explain linear and non-linear data structure with example.**(Jan'15 OLD, May'12 OLD) [LJIET]**	**07,03**
21.	What is the problem with sign and magnitude representation ifaddition of +7 with -6 is performed? Evaluate 7+7 using 2'scomplement representation and modulo 16 arithmetic.**(Nov'2017)[LJIET]**	**03**
22.	Evaluate 3+4, -3+4 and -7-7 using 1's complement representation and modulo 16 arithmetic. **(Nov'2017 Old)[LJIET]**	**03**
23.	What does abstract data type means? Briefly explain linear and non lineardata structures. **(Jan'16 Old, June'17 Old) [LJIET]**	**07**
24.	List and explain all primitive and non-primitive data types. **(Nov'18 Old) [LJIET]**	**07**
25.	What is Recursion? Write a pseudocode in 'C' language to find the multiplication of two natural numbers. **(Nov'18) [LJIET]**	**03**
26.	Explain average case timing analysis for Search Algorithm. **(Nov'18) [LJIET]**	**04**

UNIT-2:
LINEAR DATA STRUCTURE

Topic 1:Array: Representation of Array, Application of Array, Sparse Matrix and Representation		
Sr. No.	**SHORT QUESTIONS (1 Mark) / MCQ / True-False/Fill in the blanks**	**Marks**
1.	Write an expression for finding the address of matrix element A[i,j]?**(Nov'2017 Old)[LJIET]**	**01**
2	One dimensional arrays and structures can each be thought of as a group of items. What are the principal differences between them?**(Nov'2017 OLD)[LJIET]**	**01**
3	How to find smallest and second smallest element in Array?**(Nov'2017 Old)[LJIET]**	**01**
Sr. No.	**DESCRIPTIVE QUESTIONS**	**Marks**
1.	Short note: Storage representation of 2 Dimensional arrays. **(Dec'2011 Old)[LJIET]**	**04**
2.	Explain Multidimensional Array. How it is stored in memory? **(Dec'13 OLD)[LJIET]**	**3.5**
3.	What is Sparse Matrix? Explain **(Dec'2010 Old)[LJIET]**	**02**
4.	Given a two dimensional array Z1(2:9, 9:18) stored in column-major order with base address 100 and size of each element is 4 bytes, find address of the element Z1(4, 12). **(May'12 Old) [LJIET]**	**3.5**
5.	Discuss the basic operations performed with linear structure. **(Dec'2009 old)[LJIET]**	**05**
6.	Explain the equation that find out the address of the element of the one dimensional array. Assume necessary data.**(June'15 Old) [LJIET]**	**07**
7.	Define sparse matrix. Briefly explain representation of sparse matrix with the help of link list and array.**(June'13 Old) [LJIET]**	**07**
8.	Derive the formula to calculate address A[i, j] of 2-D array, for a Row-major order storage representation. A 2-D array defined as A[r, c] where $1 \leq r \leq 4$, $5 \leq c \leq 8$, requires 2 bytes of memory for each element. If the array is stored in Row-major order form, calculate the address of A[3,7] given the Base address as 2000.**(Jan'17 OLD) [LJIET]**	**07**
9.	What is a sparse matrix? Explain memory representation of a sparse matrix. **(Jan'17 OLD)[LJIET] Or** What is sparse matrix? Explain memory representation of sparse matrix **[LJIET] (May'2012 Old)[LJIET]**	**07/04**
10.	Given a two dimensional array A1(1:8, 7:14) stored in row-major order with base address 100 and size of each element is 4 bytes, find address of the element A1(4, 12). **(Jan'16 Old) [LJIET]**	**07**
11.	A two dimensional array is stored row by row, then what is the address of matrix element A[i,j] for n row and m column matrix? How array representation of polynomial 2x2+5xy+y2 can be done?**(Nov'2017)[LJIET]**	**03**
12.	Explain row-major representation and column-major representation of array with suitable examples**(May'2018 Old)[LJIET]**	**07**
13.	Explain the concept of static memory allocation and dynamic memory allocation with appropriate examples. Also mention the advantages and disadvantages of each**(May'2018 Old)[LJIET]**	**07**

14.	**Topic 2: Stack: Stack Definitions &Concepts, operations on Stack, Application of stack**	
Sr. No	**SHORT QUESTIONS (1 Mark) / MCQ / True-False/Fill in the blanks**	**Marks**
1	List the applications of Stack. **(June'16 New) [LJIET]**	**01**
2	List operations performed on a stack. **(Jan'16 New) [LJIET]**	**01**
Sr. No	**DESCRIPTIVE QUESTIONS**	**Marks**
1.	Write an algorithm to change the i^{th} value of stack to value X. **(Dec'2010 Old)[LJIET]**	**02**
2.	Enlist and briefly explain various applications of stack.**(Jan'2017)[LJIET]**	**03**
3.	What are the applications of the stack? **(May'12 OLD) [LJIET]**	**3.5**
4.	Differentiate peep() and pop() functions **(Jun'14 old) [LJIET]**	**03**
5.	Write an algorithm to check if an expression has balanced parenthesis using stack. **(Jan'16)[LJIET]**	**3**
6.	Write a pseudo-code for PUSH and POP operations of stack.**(Jan'17, June'2019) [LJIET]**	**03, 04**
7.	Consider the stack S of characters, where S is allocated 8 memory cells. S: A,C,D, F, K, _, _, _ Describe the stack as the following operations take place. Pop(), Pop() ,Push(L), Push(P), Pop(), Push(R), Push (S), Pop()**(May'2018)[LJIET]**	**04**
8.	Write an algorithm which will check that the given string belongs to following grammar or not. L={wcw^R| wϵ{a,b}*} (Where w^R is the reverse of w) **(Dec'2010 Old)[LJIET]**	**05**
9.	Write an algorithm for inserting an element and deleting an element in a stack.**(Nov 2017 OLD)[LJIET]**	**07**
10.	What is Stack? **(Jan'15) [LJIET]**Write down algorithms for performing POP and PEEP operations on a stack. **(Dec'13 OLD)[LJIET]**List out different operation of it and write algorithm for any two operation.**(Jan'15) [LJIET]**	**07**
11.	Write steps of procedure to insert an element to the top of the stack and remove top element from a stack. **(June'15 Old)[LJIET]**	**07**
12.	Write algorithm for push, pop **Or** Explain PUSH and POP operation of the stack with algorithm**. (Jan'13 Old, Jan'15 Old,Jan'12 Old, Nov'18)[LJIET]** change operation on stack **(Mar'11)[LJIET].** Using above functions determine if an input character string is of the form a^ib^i where i>= 1 i.e. no. of a should be equal to no. of b. **(Mar'2010 Old)[LJIET]. OR** Write an algorithm for stack operations Push, Pop and Empty. Assume stack is implemented using array. **(May'2013 Old)[LJIET]**	**07**
13.	(i) In which case insertion and deletion cannot be performed in stack?**(Nov '2017)[LJIET]** (ii) How stack can be used to recognize strings aca,bcb,abcba,bacab,abbcbba? Show the trace of contents of stack for recognizing the string abcba. C	**07**
14.	Convert the following infix expression to postfix form using Stack. ((A – (B + C)) × D) / (E + F)**(Jan'17 Old) [LJIET] or** Convert following infix expressions to the postfix expressions. Shows stack trace. A/B$C+D*E/F-G+H (A+B)*D+E/(F+G*D)+C **(June'2013 Old,June'17 Old) [LJIET]**	**07**
15.	Write algorithm OR code for PUSH, POP and DISPLAY function of the STACK.**(Jan'17 Old)[LJIET] Or** Write an algorithm to implement PUSH and POP Operations on Stack.**(Jan'16 Old)[LJIET] Or** Explain Push and POP operation of the stack with algorithm. **(June'17 Old)[LJIET] or** Write down algorithms for performing push and pop	**07**

	operations on a stack **(May'2011 Old)[LJIET] Or** Write an algorithm to implement PUSH, POP and CHANGE Operations on Stack. **(Dec'2011 Old)[LJIET]**	
16.	Write an algorithm to reverse a string of characters using stack.**(June'15 New)[LJIET] or** Write an algorithm to reverse a string using stack. **(June'16)[LJIET]**	**07**
17.	Write recursive algorithm for computing factorial. Which datastructure can be used to implement this algorithm?**OR**Write recursive algorithm to compute factorial of a given number. Which data structure can be used to implement this algorithm?**(Nov'2017, June'19)[LJIET]**	**04**
18.	Write a C program to implement a stack with all necessary overflow and underflow checks using array **(Jan'16)[LJIET]**	**07**
19.	Write a 'C' program to implement a stack using an array**(May'2018 OLD)[LJIET]**	**07**
20.	Write a C program to reverse a string using stack. (**June'19)[LJIET]**	**07**
21.	Convert Infix Expression A ^ B * C - D + E / F / (G + H) into Postfix expression using stack (**Nov'18)[LJIET]**	**07**
	Topic 3: Stack: Polish Expression, Reverse-polish Expression &Their Compilation, Recursion, Tower of Hanoi	**07**
	SHORT QUESTIONS (1 Mark) / MCQ / True-False/Fill in the blanks	
Sr. No		**Marks**
1.	What is the reverse polish notation for infix expression a / b *c ?**(May'2017)[LJIET]**	**01**
2.	Write suffix (reverse polish) and prefix (polish) notation for the following**. (Nov'2017 Old)[LJIET]** 1) a*(b+c) 2) a+b*c	**01**
3	The following postfix expression with single digit operands is evaluated using a stack: 8 2 3 ^ / 2 3 * + 5 1 * - ^ is the exponentiation operator. What will be the top two elements of the stack after the first * is evaluated? **(Nov'2017 Old)[LJIET]**	**01**
Sr. No	**DESCRIPTIVE QUESTIONS**	**Marks**
1.	Give difference between recursion and iteration. **(Dec'2010 Old)[LJIET]**	**02**
2.	Convert the following string into prefix : A-B/(C*D^E) **(Dec'2010 Old)[LJIET]**	**02**
3.	What is recursion? Write program for GCD using recursion. (OR) Explain recursion using suitable example. **(Dec'2009 old, May'2011 Old)[LJIET]**	**02 / 04**
4.	Write an algorithm to return the value of ith element from top of the stack. **(May'2017)[LJIET]**	**03**
5.	Evaluate the following postfix expression using a stack. Show the steps. 2 $ 3 + 5 * 2 $ 2 – 12 $ 6**OR**Evaluate the following postfix expression in tabular form showing stack after every step. 7 6 + 4 * 4 10 + - 5 + (**May'2018, June'19)[LJIET]**	**03**
6.	Evaluate the following postfix expression using stack AB+CD/*GH*+ ((where A=2,B=4,C=6,D=3,G=8,H=7) **(Jun'14 OLD)[LJIET]**	**04**
7.	Convert following Infix expression into Postfix expression. Show each step. A + B ^ C^ D - E * F / G **(Dec'13 OLD)[LJIET]**	**3.5**
8.	Write an algorithm for inserting an element in a stack, removing an element from stack **(May, 2017)[LJIET]**	**04**
9.	Convert the following infix expression into postfix.**(Jan'2017)[LJIET]** A + B – C * D * E $ F $ G	**3.5**
10.	Convert the following expression to postfix expression.((7-2)*4+(6/2^1*9))**(Nov'18 Old)[LJIET]**	**04**
11.	Write an algorithm to convert parenthesized infix expression to postfix. **(May'2011 Old) [LJIET]**	**03**

12.	Write short note: Evaluation of Postfix Expression using Stack. **(Dec'2011 Old)[LJIET]**	**04**
13.	What is Tower of Hanoi? Explain it with n=3**.(May'12 OLD) [LJIET]**	**04**
14.	Write a recursive algorithm to find factorial.**(June'15 Old)[LJIET]**	**04**
15.	Evaluate the following infix expression.**(Jan'15 Old)[LJIET]** 2 $ 3 + 5 * 2 $ 2 – 6 / 6	**07**
16.	Evaluate the following postfix expression using stack: (a) 9 3 4 * 8 + 4 / - (b) 5 6 2 + * 1 2 4 / - + **(June'16)[LJIET]**	**04**
17.	Write an algorithm to convert infix expression into postfix expression with Parenthesis. **(May'12 Old)[LJIET]**	**05**
18.	What is postfix notation? What are its advantages? Convert the following infix expression to postfix. A$B-C*D+E$F/G **(Jan'16)[LJIET]**	**03**
19.	What is prefix notation? Convert the following infix expression into prefix. A + B – C * D * E $ F $ G**(Jan'13)[LJIET]**	**04**
20.	Which data structure is used to find greatest common divisor? Explain**(Nov 2017 OLD)[LJIET]**	**03**
21.	Write an algorithm to convert infix expression to postfix expression.**(Dec'2009 old)[LJIET]**	**04 / 05**
22.	What is the advantage of postfix expression over infix expression? Write an algorithm of postfix expression evaluation. **(June'13 Old)[LJIET]**	**05**
23.	Convert the following expression to postfix notation. Show the contents of the stack while conversion. 12 / (7 - 3) + 2 * (1 + 5)**(June'16 Old)[LJIET]**	**07**
24.	Write an algorithm for evaluation of postfix expression and evaluation the following expression in tabular form. (i) 5 4 6 + * 4 9 3 / + * (ii) 7 5 2 + * 4 1 1 + / **(Dec'2009 Old) [LJIET]** (i) 5 4 6 + * 4 9 3 / + * (ii) 3 5 * 6 2 / + **(Jan'13 Old)[LJIET]** (i) +*AB-C+C*BA (A= 4, B=8,C=12) **(May'12 Old)[LJIET]**	**07 / 03**
25.	Transform the following expression to postfix(reverse polish)and evaluate postfix expression by assuming A=1,B=2,C=3,D=4,E=6,F=6,G=1,I=3 & J=3. A +B-C*D/E +F$G/(I+J) **(Mar'2010 Old)[LJIET]**	**07 / 03**
26.	Trace the conversion of infix to postfix form in tabular form. (i) (A+B*C/D-E+F/G/(H+I)) (ii) (A+B)*C+D/(B+A*C)+**(Dec'2009 Old) [LJIET]** (i) A/B$C+D*E/F-G+H (ii) (A+B)*D+E/(F+G*D)+C **(Jun'13 Old) [LJIET** (i) A + (B - C) * D (ii) A ^ B * C \ D (iii) (A + B) \ C * D ^ E **(Jan'13 Old) [LJIET]** (i) a – b / c * d + e * f / g **(Dec'2011 Old) [LJIET]** (i) Convert In Postfix ((A-(B+C))*D) $(E+F)**(Jan'15 Old) [LJIET]** (ii)Convert In Prefix ((A-(B+C))*D) $(E+F) **(Jan'15 old)[LJIET]**	**05 / 07**
27.	Translate the following string into polish notation and trace the content of stack A - (B / C + (D % E * F) / G) * H **(Jun'14OLD)[LJIET]**	**07**
28.	Write an algorithm to convert infix to postfix expression and explain it with example **OR** Give the algorithm to convert infix expression to reverse polish expression.**(Jun'14 OLD)(June'17Old, Nov'18 Old)[LJIET]**	**07**
29.	Translate following string into Polish notation and trace the content (a+b ^ c ^ d)*(e+f/ d) **(Dec'10 Old)[LJIET]**	**07**

30.	What is an advantage of Polish Expression over infix notation? Write an algorithm to convert an infix expression into reverse Polish Expression. **(June'15 Old)[LJIET]**	**07**
31.	What is recursion? What care should be taken in writing recursive function? Give example of any one recursive function. **(Dec'2011 Old)[LJIET]**	**07**
32.	Write a 'C' program or an algorithm to convert the infix expression without parenthesis to postfix expression.**(Jan'15) [LJIET]**	**07**
33.	Convert A+(B*C-(D/E^F)*G) infix expression into postfix format showing stack status after every step in tabular form. **(Jan'15)[LJIET]**	**07**
34.	Convert following POLISH(Prefix) expression to REVERSE POLISH(Suffix) notation.**(June'15 Old) [LJIET]** a. ++abc b. +a+bc c. +a*bc d. *a+bc	**07**
35.	Translate the following string into Polish notation and trace the content of stack (a + b ^ c ^ d) * (e + f / d) **(Dec'2010 Old)[LJIET]**	**07**
36.	Consider the following arithmetic expression P, written in postfix notation. Translate it in infix notation and evaluate. P: 12, 7, 3, -, /, 2, 1, 5, +, *, + **(Dec'2009 Old)[LJIET]**	**03**
37.	Convert (A+B)*C-D^E^(F*G) infix expression into prefix format showing stack status after every step in tabular form. **(June'15) [LJIET]**	**07**
38.	Define recursion. What care should be taken in writing recursive function? Give a recursive solution for the problem of "Towers of Hanoi". **(June'16 Old,June'17 Old) [LJIET]**	**07**
39.	What is importance of postfix notation? Write the algorithm for converting an infix expression to postfix notation. **(June'16 Old) [LJIET]**	**07**
40.	Write an algorithm for evaluation of postfix expression and evaluate the following expression showing every status of stack in tabular form. 5 6 2 - * 4 9 3 / + * **(Jan'16 Old) [LJIET]**	**07**
41.	(i) Convert a+b*c-d/e*h to postfix. (ii) Convert ((a+b^c^d)*(e+f/d)) to postfix. (iii)Which stack operations are needed for performing conversion from infix to postfix? Write the algorithm**(Nov'2017)[LJIET]**	**07**
42.	Write an algorithm to return the value of ith element from top of the stack. **(May'17) [LJIET]**	**03**
43.	Enlist difference between recursive and iterative algorithms. Write any one recursive function showing the stack contents while function call and return **(Jan'16 Old) [LJIET]**	**07**
44.	Evaluate the following postfix expression using a stack. Show the stack contents. AB*CD$-EF/G/+ A=5, B=2, C=3, D=2, E=8, F=2, G=2 **(Jan'16) [LJIET]**	**07**
45.	Write an algorithm to convert an infix expression to postfix expression. Show the working of the algorithm for the following expression. A+B*C/D$E-(F*G)**(May'18) [LJIET]**	**07**
46.	State and explain the applications of stacks with examples. **(May'18Old) [LJIET]**	**07**
47.	Convert following infix expression to postfix using stack x^ y / (5 - z) + 10*e**(May'18Old) [LJIET]**	**07**
48.	Evaluate the given post-fix expression using stack: 9 1 / 9 3 / 9 1 / + − Show stacks status at each step. **(Nov'18Old)[LJIET]**	**04**
49.	Write an algorithms to convert Infix Expression (without parenthesis) into Postfix Expression. **(Nov'18)[LJIET]**	**07**

50.	Evaluate the Postfix Expression 6 2 3 + - 3 8 2 / + * 2 $ 3 + using Stack. **(Nov'18)[LJIET]**	**03**
	Topic 4: Queue: Representation of Queue, Operation of Queue, Circular Queue	
Sr. No	**SHORT QUESTIONS (1 Mark) / MCQ / True-False/Fill in the blanks**	**Marks**
1	Mention variations of the queue data structure **(Jan'16)[LJIET]**	**01**
2	Explain Difference between Stack and Queue. **(Dec'2009 Old)[LJIET]**	**01 / 02**
Sr. No	**DESCRIPTIVE QUESTIONS**	**Marks**
1.	What do you mean by FIFO and LIFO? **(Dec'2011 Old)[LJIET]**	**02**
2.	Write an algorithm for circular queue that insert an element at *rear* end. **(May'12 Old)[LJIET]**	**04**
3.	Consider the following queue, where queue is a circular queue having 6 memory cells. Front=2, Rear=4 Queue: _, A, C, D, _, _ Describe queue as following operation take place: F is added to the queue Two letters are deleted R is added to the queue S is added to the queue One letter is deleted **(Dec'2010 Old)[LJIET]**	**02**
4.	Write the algorithm to Insert a value in Circular Queue.**(Nov'18 Old)[LJIET]**	**03**
5.	Write algorithm for inserting an element in circular queue.**(June'19) [LJIET]**	**3.5**
6.	Consider a dequeue given below which has LEFT=1, RIGHT=5**(JUNE'14 Old)[LJIET]** _ A B C D E _ _ _ _ . Now perform the following operations on the dequeue 1. Add F on the left. 2. Add G on the right. 3. Add H on the right. 4. Delete two alphabets from left 5. Add I on the right	**04**
7.	Write an algorithm for Double Ended Queue that insert an element at *front* end. **(May'12 Old)[LJIET]**	**04**
8.	How many stacks are needed to implement a queue. Consider the situation where no other data structure like arrays, linked list is available.**(May'17)[LJIET]**	
9.	Give the difference between Simple Queue and Circular Queue. **(Dec'11) [LJIET]** (OR) Compare Simple Queue and Circular Queue. **(Dec'13 OLD,June'15) [LJIET]**	**04**
10.	Write an algorithm for simple queue with ENQUEUE operations **(June'2016 New)[LJIET]**	**03/3.5**
11.	What is the advantage of circular queue? Write an algorithmfor inserting 'A','B','C',delete 'A' and 'B'and insert 'D' and'E' in circular queue . **(Nov'2017)[LJIET]**	**07**
12.	Explain the concept of circular queue. Compare circular queue with simple queue. **(June'2016)[LJIET]**	**04**
13.	Perform following operations in a circular queue of length 4 and give the Front, Rear and Size of the queue after each operation. 1) Insert A, B 2) Insert C 3) Delete 4) Insert D **(Jan'2016)[LJIET]**	**04**
14.	Discuss variations of Queue. **(May'2018)[LJIET]**	**04**

15.	Write an algorithm/program to implement Insert & Delete operation into a Circular Queue using array representation of Queue. **(Dec'2011 Old) [LJIET]** **(OR)** Explain insert and delete function of circular queue. **(Jan'2013 Old)[LJIET]** Write an algorithm to implement insert and delete operation into a Circular Queue using array representation of Queue. **(Dec'13 OLD) [LJIET]** **(OR)** Write a Program to perform insert and delete operations on a circular Queue. **(May'2011 Old, June'17 Old) [LJIET]**	**04/07**
16.	Write algorithm OR code for INSERT, DELETE and DISPLAY function of the QUEUE.**(Jan'2017 OLD)[LJIET]**	**06**
17.	How does an algorithm for inserting an element in queue and inserting an element in circular queue differ? Write algorithms. **(Nov 2017 OLD)[LJIET]**	**07**
18.	What is circular Queue? Write an algorithm for insert and delete and element from the circular queue. **(June'15 Old) [LJIET]**	**07**
19.	Write an algorithm to perform insert and delete operation on single queue.**(June'15 New, Jan'2017 OLD) [LJIET] or** Write an algorithm to perform various operations (insert, delete and display) for simple queue. **(Jan'2017)[LJIET] Or** Write an algorithm for inserting and deleting an element from queue**(June'15 Old) [LJIET]**	**07**
20.	Write differences between simple queue and circular queue. Write an algorithm for insert and delete operations for circular queue.**(Jan'2017)[LJIET]**	**07**
21.	Consider a circular queue of size 6. Let Front =2, Rear =4, and Queue : __, L, M, N, __, __ Describe the queue as following operations are performed. 1) Add O 2) Add P 3) Delete 4) Delete 5) Add Q, R, S 6) Delete **(June'16 Old) [LJIET]**	**07**
22.	Write algorithm for inserting and deleting an element in circular queue. **(May'17) [LJIET]**	**07**
23.	Write a program to perform insert and delete routines on a queue. **(Jan'16 Old) [LJIET]**	**07**
24.	Write a C program to implement a circular queue using array with all necessary overflow and underflow checks **(Jan'16) [LJIET] OR** Write a program to implement circular queue using array.**(June'1) [LJIET]**	**07**
25.	Consider an example where the size of the queue is four elements. Initially the queue is empty. It is required to insert symbols 'A','B' and 'C'. delete 'A' and 'B' and insert 'D' and 'E'. Show the trace of the contents of the queue **(May'17) [LJIET]**	**07**
26.	Write a program to implement queue and check for boundary conditions.**(May'18) [LJIET]**	**07**
27.	Write algorithms for Insert and Delete operation in Circular Queue. **(Nov'18) [LJIET]**	**07**
	Topic 5: Queue: Priority Queue, Array Representation of Priority Queue, Double Ended Queue & Application of Queue	
Sr. No	**SHORT QUESTIONS (1 Mark) / MCQ / True-False/Fill in the blanks**	**Marks**

1	Define priority queue. **(June'16)[LJIET]**	**01**
2	Is Queue a priority queue? Justify. **(Jan'16) [LJIET]**	**01**
Sr. No	**DESCRIPTIVE QUESTIONS**	**Marks**
1.	Explain priority queue **(Dec'2010 Old,Jan'17, Nov'18)[LJIET]**	**02**
2.	What are priority queues? Explain its uses. **(Jun'14 OLD) [LJIET]**	**02**
3.	Write Short note: Dequeue. **(Dec'11 Old) [LJIET]** OR Explain double ended queue.**(June'16)[LJIET]**	**02**
4.	Explain various applications of queue **(Jan'16) [LJIET]**	**04**
5.	Write and explain application of queue. **(May'17) [LJIET]**	**03**
6.	How does priority queue work?**OR**Illustrate the working of priority queue with suitable example.**(Nov'2017, June'19)[LJIET]**	**03**
7.	Explain following: (i) DQUEUE (ii) Priority Queue (iii) Circular Queue **(Dec'2009 Old)[LJIET]**	**03 /06**
8.	Write an algorithm to implement ascending priority queue using singular linear linked list which has insert() function such that queue remains ordered list. Also implement remove() function. **(Mar'2010 Old)[LJIET]**	**07**
9.	Differentiate between stack & queue. Also explain priority queue. **(May'12 Old)[LJIET]**	**05**
10.	What is the difference between queue &Dqueue. Explain insertion operation in Dqueue. **(Jan'15 Old)[LJIET]**	**05**
11.	Write a User define C function for inserting an element into circular queue.**(Jan'15) [LJIET]**	**07**
12.	What Is queue ? Write down the drawback of the simple queue. Also write an algorithm for deleting an element from a circular queue.**(Jan'15 New) [LJIET]**	**07**
13.	Describe : (1) Recursion (2) Priority Queue (3) Tower of Hanoi **(June'15 New)[LJIET]**	**07**
14.	What is Difference between queue and Dqueue. Explain Insertion Operation in Dqueue.**(Jan'15 Old) [LJIET]**	**07**
15.	Does a time sharing computer use queue or stack? Explain.**(June'15 Old)[LJIET]**	**07**
16.	Give various applications of stack and queue.**(June'16 Old)[LJIET]**	**07**
17.	What is a priority queue? Discuss the array implementation of priority queue. **(June'16 Old,Jan'2017 Old)[LJIET]**	**06**
18.	Explain priority queue and dequeue. Write an algorithm/program for insert routine in input restricted dequeues. **(Jan'16 Old)[LJIET]**	**07**
19.	What is priority queue? Explain the array representation of priority queue. **(May'17)LJIET]**	**07**
20.	Differentiate between stack & queue. Also explain priority queue with example**(June'17 Old)[LJIET]**	**07**
21.	Explain circular queue, double ended queue and priority queue with examples**(May'18Old) [LJIET]**	**07**
22.	Explain working of doubly ended queue with example. **(Nov'18Old)[LJIET]**	**07**
23.	Differentiate between Stack and Queue. **(Nov'18)[LJIET]**	**04**
	Topic 6: Linked List: Single , Doubly & Circular Linked List	
Sr. No	**SHORT QUESTIONS (1 Mark) / MCQ / True-False/Fill in the blanks**	**Marks**
1.	Write 'C' structure of Singly linked list. **(June'16)[LJIET]**	**01**
2.	Mention one operation for which use of doubly linked list is preferred over the singly linked list. **(Jan'16)[LJIET] , Ans: Deleting a node whose location in given**	**01**
3.	Write an algorithm/steps to traverse a singly linked list **(Jan'16)[LJIET]**	**01**

4.	What is a header node and what is its use? **(Jan'16)[LJIET]**	**01**

5.	What does the following function do for a given Linked List with first node as *head*? **(May'17)[LJIET]**
	void fun1(struct node* head)
	{
	if(head == NULL)
	return;
	fun1(head->next);
	printf("%d ", head->data);
	}
		01

6.	Explain Circular Linked List. **(Jan'17)[LJIET]**	**01**
7.	What is circular link list? **(Dec'2010 Old) [LJIET]**	**01**

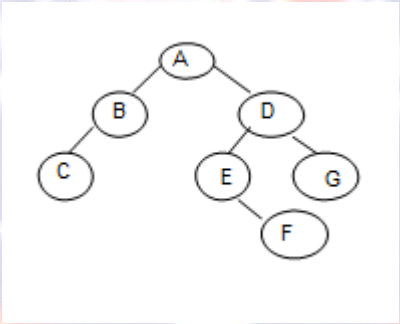
8.	What is the output of following function for start pointing to first node of following linked list? 1->2->3->4->5->6**(Nov'2017 Old)[LJIET]**
	void fun(struct node* start)
	{
	if(start == NULL)
	return;
	printf("%d ", start->data);
	if(start->next != NULL)
	fun(start->next->next);
	printf("%d ", start->data);
	}
		01

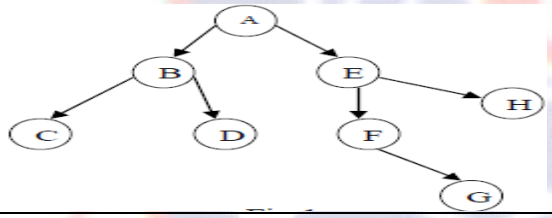
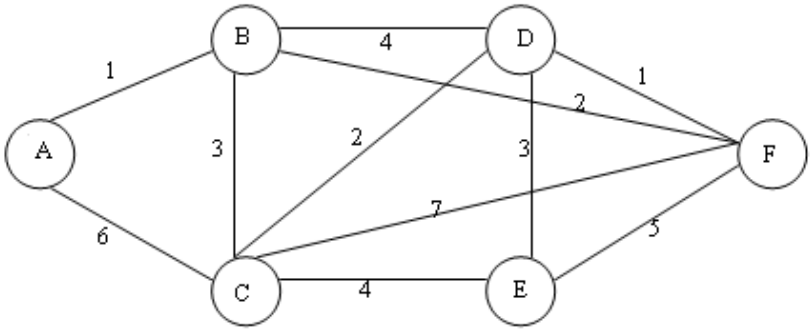
Sr. No	**DESCRIPTIVE QUESTIONS]**	**Marks**
1.	Explain. Why doubly Linked Lists are much more efficient with respect to deletion than singly linked list. **(Jun'15 Old) [LJIET]**	**02**
2.	Write an algorithm to delete an element from a singly linked list. OR Write an algorithm to delete a node from a singly linked list.**(May'2011 Old, June'19) [LJIET]**	**03 /3.5**
3.	What is a header node? Explain its importance.**(May'2018 New) [LJIET]**	**03**
4.	Write an algorithm to insert a node into a linked linear list.**(Nov 2017 OLD)[LJIET]**	**04**
5.	Write an algorithm to insert an element into a singly link list **(Dec'2010 Old)[LJIET]**	**03**
6.	Write an algorithm that will change the INFO field of the kth node to the value given by Y. **(Nov 2017 OLD)[LJIET]**	**04**
7.	Write a short note on doubly link list **(Dec'2010 Old) [LJIET]**	**04**
8.	State the advantages of circular and doubly linked lists over a singly linked list. **(May'2011 Old) [LJIET]**	**3.5**
9.	Write advantages of link list, doubly link list, singly link list & circular link list.- **(Dec'2010 Old) [LJIET]**	**04**
10.	What are the advantages of circular linked list over singly linked list? **(Jun'15 Old)[LJIET]**	**04**
11.	Write an algorithm to delete a node into a linked linear list.**(Nov'2017 OLD)[LJIET]**	**04**
12.	Write a program to count number of nodes in a linked list. **(May'2011 Old) [LJIET] OR** Given a linked list whose typical node consists of an INFO andLINK field. Formulate an algorithm which will count the number of nodes in the list. **(Nov'2017)[LJIET]**	**04/07**
13.	Write an algorithm to count the number of nodes in a singly circularly linked list.**(May'2018)[LJIET]**	**04**
14.	Write difference between singly linked list and doubly linked list. **(May'12 Old) [LJIET]**	**03**
15.	Write 'C' functions to implement DELETE_FIRST_NODE and TRAVERSE operations in doubly linked list **(June'16)[LJIET]**	**03**

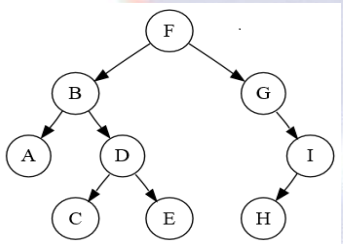
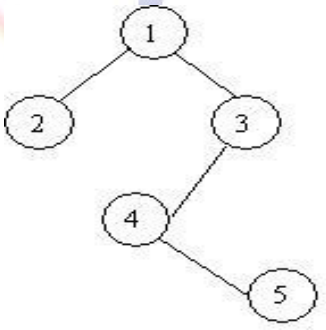
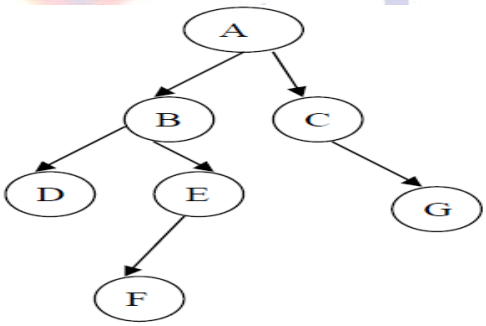
16.	Which type of allocation is called linked allocation? Define singly linked linear list. **(June'15 Old)[LJIET]**	**04**
17.	Write an algorithm for inserting and deleting an element into circular linked list.**(May'12 Old) [LJIET]**	**07**
18.	Write a C function search (l, x) that accepts a pointer l to a list of integers and returns a pointer to a node containing x if it exists and the null pointer otherwise. **) (June'13 Old) [LJIET]**	**07**
19.	Write a program to search an element in a linked list. **(Jan'16 Old)(June'17 Old) [LJIET]**	**07**
20.	Write down advantages of linked list over array and explain it in detail. **(Jan'2015)[LJIET] Or** Discuss advantages and disadvantages of linked list over array. **(Dec'2009 Old,Dec'2011 Old)[LJIET]**	**07**
21.	Write algorithm(s) to perform INSERT_FIRST (to insert a node at the first position) and REVERSE_TRAVERSE (to display the data in nodes in reverse order) operations in doubly linked list.**(Jan'2017)[LJIET]**	**04**
22.	Write 'C' functions to implement INSERT_FIRST (to insert a node at the first position), DELETE_FIRST (to delete a node from the first position), DELETE_LAST (delete a node from the last position) and TRAVERSE (to display the data in nodes) operations in circular linked list.**(Jan'2017)[LJIET]**	**04**
23.	Discuss and compare array and linked list.**(Jan'2017 Old)[LJIET] OR** Differentiate between arrays and linked list**(Jan'2016)[LJIET]**	**07**
24.	Write an algorithm for insert operation at end of Linked List. **(Jan'13 Old)[LJIET]**	**07**
25.	What are the advantages of doubley linked list.Write a C function to find maximum element from doubley linked list**(Jan'13 Old) [LJIET]**	**07**
26.	Write an algorithm to reverse a given single link list. **(Jan'15 Old)[LJIET]**	**05**
27.	Write a 'C' functions to (1) insert a node at beginning in singly linked list. (2) insert an element in circular queue.**(June'15)[LJIET]**	**07**
28.	Write an algorithm to insert a node in an ordered linked list **(Jun'14 OLD)[LJIET]**	**07**
29.	Write an algorithm to delete an element from a doubly link list **(Dec'2010 Old) [LJIET] (OR)** Explain delete operation of doubley linked list **(Jan'2013 Old) [LJIET]** Write an algorithm/program to Delete a node from Doubly Linked List. **(Dec'13 OLD,Jan'15) [LJIET]**	**07**
30.	Write 'C' functions to: (1) insert a node at the end (2) delete a node from the beginning of a doubly linked list.**(June'15)[LJIET]**	**07** **07**
31.	Explain delete operation in doubly link list.**(Jan'15 Old)[LJIET]**	**07**
32.	Write a Program for all (create, insert, delete, display) the operations in a circular linked list. **(May'2011 Old) [LJIET]**(OR) Write algorithm OR code for DELETE and DISPLAY functions of Circular Link List.**(Jan'2017 Old)[LJIET]**	**07**
33.	Write C code for the following operations for a simple link list. ii. Reverse : to reverse the link list ii. Max : to find the largest element from the link list.**(Jan'2017 Old)[LJIET]**	**07**
34.	Write an algorithm to implement following operations in the Singly Linked List(i) Insert the node at end (ii)Delete the node whose value = Y. **(Dec'2011 Old) [LJIET]**	**08**
35.	Write an algorithm/program to "Insert a node at End" operation of Singly Linked List. **(Dec'13 OLD) [LJIET]**	**07**
36.	Briefly explain advantages of doubly link list over singly link list. Write algorithm to insert &**delete (p, &x)** which deletes node pointed by p in doubly link list. **(June'13 Old,Dec'11) [LJIET]**	**07**
37.	Write short notes on following. (i) Priority Queue. (ii)Circular Linked List **(Dec'2011 Old) [LJIET]**	**07**

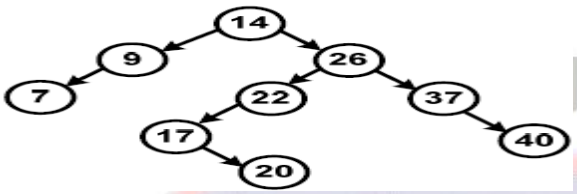
38.	Write an algorithm to insert a new node into orderly doubly linked list. **(May'12 Old) [LJIET]**	**06**
39.	Write an algorithm for inserting a node and deleting a node in doubly linked linear list.**(June'15 Old) [LJIET]**	**07**
40.	Write a 'C' function to Insert a node at the end and Delete the node from the beginning of a doubly linked list. **(June'15)[LJIET]**	**07**
41.	Write C code to insert a node at the end of a doubly link list.**(Jan'17 Old)[LJIET] or** Write a Program to perform all (create, insert, delete, display) the operations in a doubly linked list. **(May'2011 Old)[LJIET]**	**07**
42.	What is the need of doubly linked list? Consider a problem ofinserting a node into a doubly linked linear list to the left of aspecified node whose address is given by variable M. Give details of algorithm.**(Nov'2017)[LJIET]**	**07**
43.	Write insert and remove functions for queue if it is implemented using circular link list. **(June'13 Old)[LJIET]**	**07**
44.	Write an algorithm to merge two simple link lists having initial address L1 and L2 respectively. Also write algorithm to display the list.**(Jan'17 Old)[LJIET]**	**07**
45.	Which type of node is considered as doubly linked linear list? Explain insertion in doubly linked linear list.**(Nov 2017 OLD)[LJIET]**	**07**
46.	Write an algorithm to insert a node before a given node in a singly linked list. Is it advantageous to use a doubly linked list for this operation? Explain.**(June'16 Old) [LJIET]**	**07**
47.	Write advantages and disadvantages of linked list, doubly linked list and circular linked ist with example **(Jan'16 Old) [LJIET]**	**07**
48.	Write a program to insert and delete an element after a given node in a singly linked list.**(Jan'16) [LJIET]**	**07**
49.	Create a doubly circularly linked list and write a function to traverse it **(Jan'16) [LJIET]**	**07**
50.	Write an algorithm to insert and delete a node in Doubly Linked List. **(June'17 Old, Dec'2011 Old) [LJIET]**	**07**
51.	Write a program to implement circularly linked list **(May'18) [LJIET]**	**07**
52.	Write an algorithm or code in 'C' to search, insert, delete and delete element from a linked list**(May'18Old) [LJIET]**	**07**
53.	Write an algorithm or 'C' program to create a doubly linked list and display it in reverse order**(May'18Old) [LJIET]**	**07**
54.	Write a C program that inserts DLL node into doubly linked list.**(Nov'18Old) [LJIET]**	**07**
55.	Write an algorithm for insertion of node at last position in Liner Linked List. **(Nov'18) [LJIET]**	**04**
56.	Write an algorithm for deletion of node in Liner Linked List. **(Nov'18) [LJIET]**	**04**
57.	Write an algorithm for insertion of a node in Doubly Linked List. **(Nov'18) [LJIET]**	**04**
58.	Write an algorithm for deletion of a node in Doubly Linked List. **(Nov'18) [LJIET]**	**04**
	Topic 7: Linked List: Linked implementation of Stack & Linked Implementation of Queue, Application Of Linked List.	
	DESCRIPTIVE QUESTIONS	**Marks**
1.	List the uses of stack, queue and link lists.**(June'14 OLD)[LJIET]**	**02**
2.	Discuss advantage & disadvantages of linked list over array **(Dec'11, Dec'09,June'16 Old) [LJIET]**.	**02**
3.	What are advantage and disadvantages of stack & queue implemented using linked list over array? **(March'2010 Old)[LJIET]**	**04**
4.	Write a function in any programming language to insert an element in an ordered list.**(May'2011 Old)[LJIET]**	**04**
5.	Consider singly linked storage structures, Write an algorithm which performs an insertion at the end of a linked linear list. **(May'17)[LJIET]**	**03**
6.	Consider singly linked storage structures. Write an algorithm which inserts a node into a	**03**

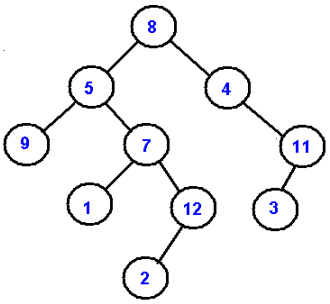
	linked linear list in a stack like manner. **(May'17)[LJIET]**	
7.	Compare Linked-List and Array. (**June'15)[LJIET] Or** Discuss the advantages and disadvantages of linked list over array. **(June'16 Old) [LJIET]**	**03**
8.	List advantages of doubly linked list over singly linked list.**(May' 2018, June'19)[LJIET]**	**03**
9.	Write the implementation procedure of basic primitive operations of the stack using: (i) Linear array (ii) linked list. **(Dec'2009 Old)[LJIET]**	**3.5/3/4**
10.	Write an algorithm to swap two nodes, n and n+1, in a singly linked list**(May' 2018)[LJIET]**	**04**
11.	Write an algorithm to perform each of the following operations on Circular singly linked list using header node. 1. Add node at the end. 2. Add node at beginning 3.delete a node which contain element x. 4. Insert a node containing x after node having address **(Mar'2010 Old)[LJIET]**	**05 / 07**
12.	Write a function to implement insertion of an element in circular queue using link list. **(Dec'2010 Old)[LJIET]**	**07**
13.	Write a program to implement circular queue using array **(June'16)[LJIET]**	**07**
14.	Write a c/c++ program to add two polynomials represented using doubly linear linked list. Also write necessary functions to represent polynomial using doubly linear link list. **(Mar'2010 Old)[LJIET]**	**07**
15.	Write a program in any programming language to concatenate two doubly linked lists. **(Jun'14 OLD) [LJIET]**	**07**
16.	Write the implementation procedure of basic primitive operations of the Queue using: (i) Linear array (ii) linked list.**(Dec'2009 Old)[LJIET]**	**05**
17.	Write a program to implement stack using linked list. **(June'16)[LJIET] or** Write a 'C' program to implement stack using linked list.**(Jan'2017)[LJIET]**	**07**
18.	Write a 'C' program to implement a queue using linked list.**(May'2018 Old)[LJIET]**	**07**
19.	Show linked list representation of polynomial.**(Nov'18 Old)[LJIET]**	**07**
20.	Give an example of linked implementation of stack.**(Nov'18 Old)[LJIET]**	**07**
21.	Write a short note on application of linked lists.**(Nov'18 Old)[LJIET]**	**07**
	UNIT-3 : **NONLINEAR DATA STRUCTURE**	
	Topic 1: Tree-Definitions and concepts, Representation of binary Tree, Binary Tree Traversal(InOrder, PreOrder, PostOrder), Threaded Binary Tree, Binary Search tree	
	MCQS WITH ANSWER	
Sr. No	**SHORT QUESTIONS (1 Mark) / MCQ / True-False/Fill in the blanks**	**Marks**
1.	List the applications of Binary trees.**(June'16)[LJIET]**	**01**
2.	Write 'C' structure of Binary tree. **(June'16)[LJIET]**	**01**
3.	Define: Height of a tree. **(Jan'16)[LJIET]**	**01**
4.	What is the height of a complete binary with n nodes? **(Jan'16)[LJIET]**	**01**
5.	1. Explain: Complete Binary Tree **(Jan'17)[LJIET]**	**01**
6.	What is common in inorder, preorder and postorder traversal? **(Jan'17)[LJIET]**	**01**
7.	In which type of tree, each leaf node is kept at the same distance from root? **(May'17)[LJIET]**	**01**
8.	Which of the traversal technique outputs the data in sorted order in a Binary Search Tree? **(May'17)[LJIET]**	**01**
9.	Explain: Degree of Vertex **(Jan'17)[LJIET]**	**01**
10.	The height of a binary tree is the maximum number of edges in any root to leaf path. Define the maximum number of nodes in a binary tree of height h. **(June'2013 Old)[LJIET]**	**01**

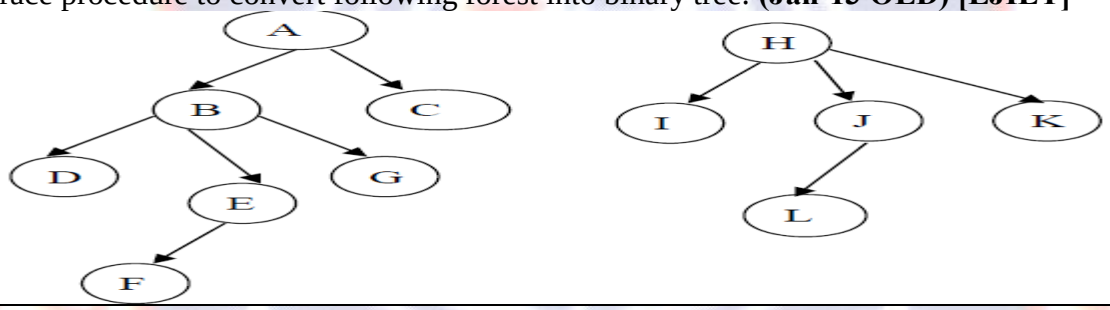
11.	The post order traversal of binary tree is DEBFCA. Find out the pre order traversal. **(Nov'2017 Old)[LJIET]**	**01**
12.	What is a balanced binary tree?**(Nov'2017 Old)[LJIET]**	**01**
Sr. No	**DESCRIPTIVE QUESTIONS**	**Marks**
13.	Define complete binary tree and a full binary tree **(Jun'14 Old) [LJIET]**	**02**
14.	Define following terms related to tree with example. **(March'2010 Old)** (1) Binary tree (2) Binary search tree (3) Strictly binary tree (4) Complete binary tree	**04**
15.	Obtain the expression tree from the following post fix representation ab+cde+**(June'14 old) [LJIET]**	**02**
16.	Define the following: **(May'2011 Old)[LJIET]** 1. Complete Binary Tree 2. Almost Complete Binary Tree	**03**
17.	How many null branches a binary tree possesses?**(Nov'2017)[LJIET]**	**03**
18.	Write an algorithm to traverse a tree in preorder manner. **(Nov'2017 OLD)[LJIET]**	**04**
19.	How lexically ordered binary tree looks like? Explain the process of creating lexically ordered tree.	**04**
20.	Define the inorder, preorder and postorder traversal for following tree. **(June'15 old) [LJIET]** 	**02**
21.	Explain the threaded storage representation for binary tree. **(June'15 old)[LJIET]**	**03**
22.	Give definition of a) Complete binary tree b) Height of tree **(Dec'2010 Old)[LJIET]**	**02**
23.	Write a short note on threaded binary tree**OR**Explain threaded binary trees.**(Dec'13 Old,May'12 Old, Nov'18 Old)[LJIET] OR** Explain Threaded binary trees with suitable examples**. (June'16, June,19)[LJIET]**	**04/07 / 05**
24.	Write a short note on :spanning tree , threaded binary tree **(Jan'15 old)[LJIET]**	**07**
25.	Construct a binary tree from the traversals given below: Inorder: 1 3 4 6 7 8 10 13 14 Preorder: 8 3 1 6 4 7 10 14 13 **(June'16)[LJIET]**	**3.5,4,5**
26.	Define complete binary tree and almost complete binary tree. **(Jan'16)[LJIET]**	**04**
27.	Consider the expression v1*v2-(v3+v4^v5). Show the tree corresponding to the expression. **(May'17)[LJIET]**	**03**
28.	Draw a Binary expression tree for the following and perform preorder traversal: (A $ B $ C) + (D – E * F) **OR**Draw a Binary expression tree for the following and perform preorder traversal: a * (b + c) + (d * e) / f + g * h**(June'16, June'19)[LJIET]**	**03**
29.	Construct a binary tree from the traversals given below: Inorder: 1, 10, 11, 12, 13, 14, 15, 17, 18, 21	**04**

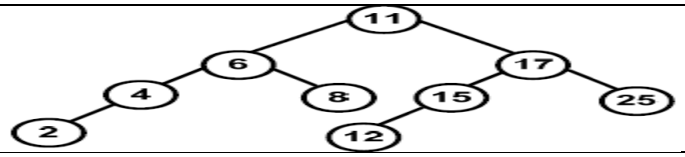
	Postorder: 1, 11, 12, 10, 14, 18, 21, 17, 15, 13 **(Jan'16)[LJIET]**	
30.	What is an ordered tree? What is forest? **(May'17)[LJIET] OR** What is an ordered tree and a forest?**(Nov'2017 Old)[LJIET]**	**04/01**
31.	Given Inorder and Preorder traversal, find Postorder traversal **(May'17)[LJIET]** Inorder traversal = {4, 2, 5, 1, 3, 6} Preorder traversal = {1, 2, 4, 5, 3, 6}	**04**
32.	Construct a binary search tree for the following and perform inorder and postorder traversals:**(Jan'17)[LJIET]** 5 9 4 8 2 1 3 7 6	**04**
33.	Define the following terms: Path, Cycle, Degree of vertex, Sibling, Height, Balanced Tree, Strictly Binary Tree, in degree. **(Dec'13 OLD, Jan'15 Old) [LJIET]**	**04**
34.	Define the following with respect to a graph: 1) Path 2) degree 3) Cycle 4) Spanning tree 5) Directed Graph**OR**Define: i) Cyclic Graph ii) Siblings iii) Strictly Binary Tree **(June'16 Old, June'19)[LJIET]**	**07/03**
35.	Explain Preorder, Inorder and Postorder traversal technique of binary tree with example. **(Dec'2009 Old) [LJIET]**	**07 / 06**
36.	Define threaded binary tree. What are the advantages of threaded binary tree? Give example of threaded binary tree. **(June'2013 Old)[LJIET]**	**05**
37.	Why is Threaded binary tree required? **(Jun'13 Old)**. Draw right in threaded binary tree **(Mar'10 Old) [LJIET]** 	**06 / 05**
38.	Explain Right-in-threaded, left-in-threaded and full-in-threaded binary trees. **(June'15)[LJIET]**	**07**
39.	Define Directed graph, spanning tree and minimum spanning tree. Find minimum spanning tree for the graph shown in Figure 1. **(June'2013 Old)[LJIET]** 	**07**
40.	Explain the structure of threaded binary tree**(Nov'2017) [LJIET]**	**03**
41.	How directed tree can be represented?**(Nov'2017) [LJIET]**	**03**
42.	Construct binary search tree for the following data: **[LJIET]** -- 10,3,15,22,6,45,65,23,78,34,5 Find its inorder, preorder and postorder traversal **(Mar'10 Old)** -- Briefly explain advantages of binary search tree. Construct binary search tree for the following elements --8,3,11,5,9,12,13,4,6,20**(Jun'13 Old)[LJIET]** What is use of binary search tree? Construct sequential order binary tree (binary search tree)	**07**

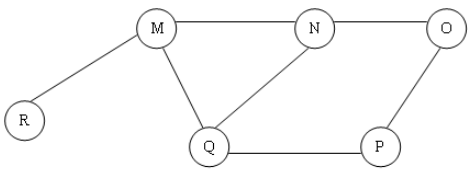
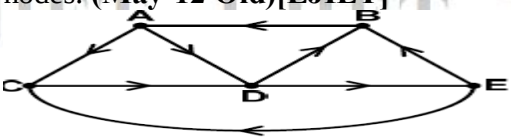
	for following values. 10,15,17,8,7,9,11,12,13,4,14,5**(Jan'13 Old)[LJIET]** -- 68,85,23,,44,80,30,108,26,5,92,60**(Jan'15 Old)** -- 50, 40, 80, 20, 0, 30, 10, 90, 60, 70 Find its inorder, preorder and postorder traversal**(June'15)[LJIET]**	
43.	Create a Binary Search Tree for the following data and do Inorder, Preorder and Postorder traversal of the tree.40, 65,25, 55, 10,70,30,50,15,80,75 **(Dec'13 OLD) [LJIET]**	**07**
44.	The inorder and preorder traversal of a binary tree are: d b e a f c g, a b d e c f g respectively, Construct binary tree and find its postorder traversal. **(Jun'13 Old) [LJIET]**	**07**
45.	Draw a binary expression tree for the following and perform preorder traversal for the same: (A + B $ C) + (D + E * F)**(Jan'17) [LJIET]**	**03**
46.	Give the preorder and Inorder traversal of the tree given in fig .**(June'14 OLD) [LJIET]** 	**07**
47.	Given the following traversals create a binary tree from that. Also give the postorder traversal for the same. preorder = {7,10,4,3,1,2,8,11}, inorder = {4,10,3,1,7,11,8,2} **(June'14 OLD) [LJIET]**	**07**
48.	Define tree. Write an algorithm to do in-order traversal and post-order traversals of Binary Search Tree. **(Dec'13 OLD, Jan'15) [LJIET]**	**07**
49.	Create a binary search tree for the following data : 50 ,25 ,75, 22,40,60,80,90,15,30 **(Dec'2010 Old) [LJIET]**	**07**
50.	Write a recursive 'C' function for in-order, pre-order and post-order traversal of binary search tree. . **(June'15) [LJIET]**	**07**
51.	Give traversal order of given tree into inorder, preorder and postorder fig1. **(Dec'2010 Old)** Fig2**(Jan'13 OLD) [LJIET]** **Fig: 1**  **Fig: 2** 	**07**
52.	Write an algorithm to delete a node from a binary tree. **(May'2011 Old) [LJIET]**<u>**OR**</u> Write an algorithm to delete a node from tree. **(Jan'15) [LJIET]**	**07**
53.	Write a program in any language to create a threaded binary tree. **(May'2011 Old) [LJIET]**	**07**
54.	What is Binary Search Tree? **(Dec'2011 Old)[LJIET]** Advantages of BST? **(June'13 OLD)** Write recursive algorithm/program to implement in-order and pre-order traversal of the Binary Search Tree. **(Dec'2011 Old)[LJIET] Or** Write recursive 'C' functions for (1) in-order (2) pre-order and (3) post-order traversals of binary search tree**(June '15) [LJIET]**	**07**

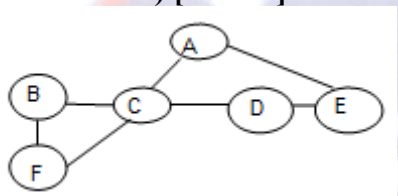
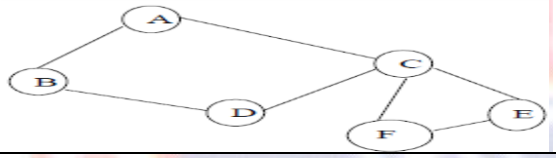
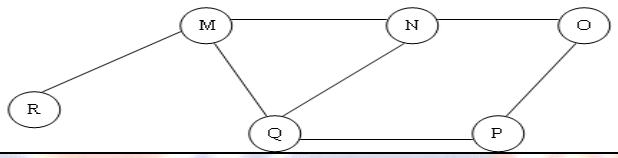
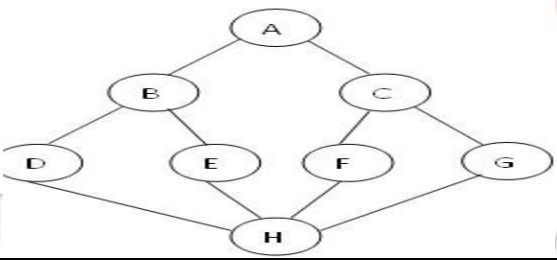
55.	Write a non-recursive algorithm for Preorder traversal of a binary tree. **(May'12 OLD, Jan'2017 Old) [LJIET]**	**06 07**
56.	First insert 10 and then insert 24. After these insertions, delete 37 and then delete 22 from the following binary search tree. Draw the tree after each operation **(May'12 Old) [LJIET]** 	**3.5**
57.	What is a binary search tree? Explain with an example and state its applications. Also explain deletion in a binary search tree. **(June'16 Old)[LJIET]**	**07**
58.	Construct an expression tree for the following expression. A+(B+C*D+E)+F/G. Make a preorder traversal of the resultant tree. **(June'16 Old)[LJIET]**	**05**
59.	A binary tree T has 9 nodes. The inorder and preorder traversals of T give the following sequence of nodes. Inorder: E A C K F H D B G Preorder: F A E K C D H G B Draw the tree T. **(June'16 Old)[LJIET]**	**07**
60.	Create a Binary Search Tree for the following data and do in-order, Preorder and Post-order traversal of the tree. 40, 60, 15, 4, 30, 70, 65, 10, 95, 25, 34 **(Jan'16 Old, Jun'17 Old)[LJIET]**	**07**
61.	Define the following with example : - Strictly binary tree - Complete binary tree **(Jan'16 Old,June'17Old)[LJIET]**	**07**
62.	What is Binary Search Tree? Write recursive algorithm/program to implement in-order traversal of the Binary Search Tree **(Jan'16 Old)[LJIET]**	**07**
63.	What is binary tree traversal? What are the various traversal methods? Explain any two with suitable example. **(Jan'16)[LJIET]**	**07**
64.	What is a binary search tree? Create a binary search tree for inserting the following data. 50, 45, 100, 25, 49, 120, 105, 46, 90, 95 Explain deletion in the above tree. **(Jan'16)[LJIET]**	**07**
65.	Insertion sequence of names is Norma, Roger,John,Bill,Leo,Paul, Ken and Maurice (i) Show the behavior of creating a lexically ordered binary tree. (ii) Insert Kirk. Show the binary tree. (iii)Delete John. Show the binary tree. **(May'17)[LJIET]**	**07**
66.	Discuss Inorder and Postorder traversal of a binary tree.**(Jan'17 Old)[LJIET]**	**07**
67.	Write 'C' functions for: inserting a node, postorder traversal and counting total number of nodes for binary search tree.**(Jan'17)[LJIET]**	**07**
68.	The Preorder traversal of the tree is: 7, 1, 0, 3, 2, 5, 4, 6, 9, 8, 10 The inorder traversal of the tree is : 01,2,3,4,5,6,7,8,9,10 What is the postorder traversal? How a general tree can be converted to binary tree?**(Nov'2017)[LJIET]**	**07**
69.	Perform inorder, postorder and preorder traversals for the following binary tree. What is the peculiarity of the inorder traversal? **(May'2018)[LJIET]**	**07**

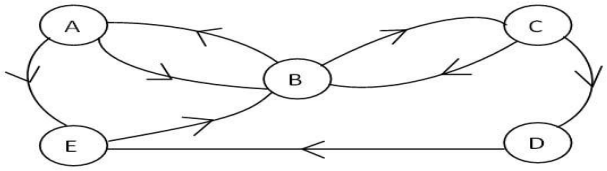
		
70.	What is a threaded binary tree? State how to create a threaded binary tree with Example. **(May'2018 OLd)[LJIET]**	**07**
71.	Given the following data: **57,32,48,45,68,63,75,78,60,30**. Draw a binary search tree for the given data and give inorder, preorder and postorder traversal for the same**(May'2018 Old)[LJIET]**	**07**
72.	Given Inorder and Preorder traversal, find Postorder traversal. Inorder:Y B K C F A G X E D H Z Preorder:G B Y A C K F X D E Z H**(June'19)[LJIET]**	**04**
73.	What is Binary Search Tree? Construct a binary search tree for the following elements 11,6,14,8,12,15,16,7,9,23 **(Nov'18)[LJIET]**	**07**
74.	Create a Binary Search Tree for the following data and do Inorder, Preorder and Postorder traversal of the tree. 45, 70,30, 60, 15,75,35,55,20,85,80 **(Nov'18)[LJIET]**	**07**
	Topic 2: Conversion of General Tree to Binary Tree, Application of Trees-Some Balanced Tree Mechanism, eg. AVL Tree, 2-3 Trees, Height balanced & Weight balanced Tree	**07**
Sr. No	**SHORT QUESTIONS (1 Mark) / MCQ / True-False/Fill in the blanks**	**Marks**
1	Define B-Tree. **(June'16)[LJIET]**	**01**
2	Consider a B-tree in which the maximum number of keys in a node is 5. What is the minimum number of keys in any non-root node? **(June'2013 Old)[LJIET]**	**01**
Sr. No	**DESCRIPTIVE QUESTIONS**	**Marks**
1.	Write short notes on following (i) Height Balanced Tree. (ii) Dequeue**(Dec'11 OLD)[LJIET]**	**06**
2.	Write a short note on Weight balanced tree. **(May'12 OLD) [LJIET]**	**3.5**
3.	In height balanced tree, what is a critical node?**(Nov 2017 Old)[LJIET]**	**03**
4.	Explain insertion operation in the 2-3 tree: (i) if the parent has 2 children and (ii) if the parent has 3 children**.(May'12 OLD) [LJIET]**	**04**
5.	What is 2-3 tree? Write a short note on threaded binary tree **(Dec'2010 Old)[LJIET]**. Or Write a short note on threaded binary tree **(Jan'2013 Old)[LJIET]**	**04/07**
6.	What is meaning of height balanced tree? How rebalancing is done in height balanced tree. **(Dec'2010 Old) [LJIET]**	**4**
7.	Define 2-3 Tree. **(Jan'17)[LJIET]**. Describe characteristics of the 2-3 Tree. **-(June'15 Old)[LJIET]**	**04**
8.	Applications of Trees. **(Dec'2011 Old)[LJIET]**	**04**
9.	Explain AVL trees.**(Jan'17) [LJIET]**	**03**
10.	Write the characteristics of the AVL Tree.**(June'15 Old) [LJIET]**	**03**

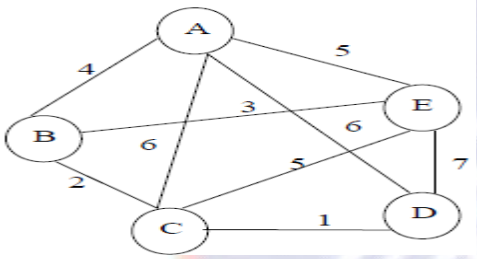
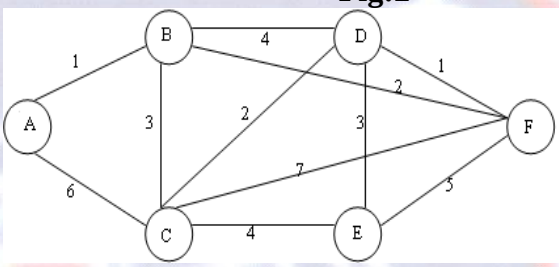
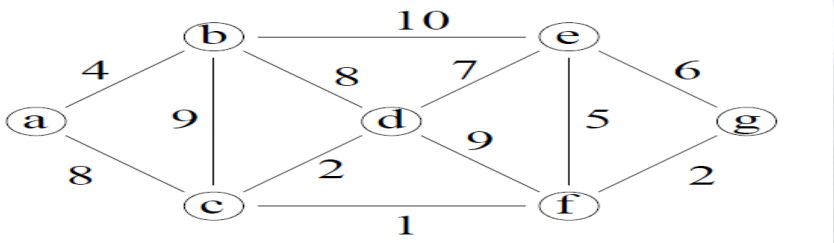
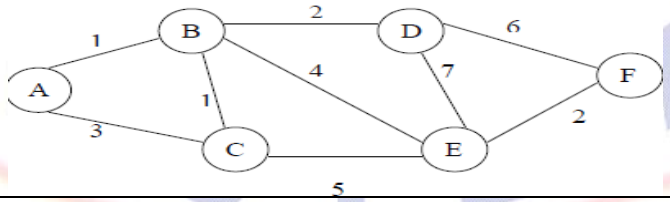
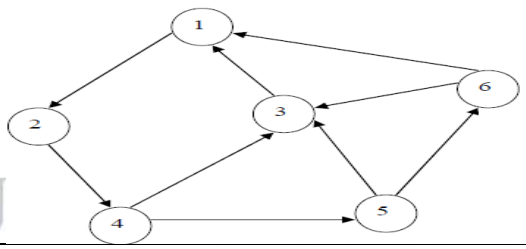
11.	Explain deletion in an AVL tree with a suitable example. **(Jan'15,Jan'16) [LJIET]**	**03**
12.	Mention the properties of a B-Tree **(Jan'16) [LJIET]**	**04**
13.	Insert the following elements in a B-Tree. **(Jan'16) [LJIET]** a, g, f, b, k, c, h, n, j	**03**
14.	Construct the AVL search tree by inserting the following elements in the order of their occurrence. 64, 1, 44, 26, 13, 110, 98, 85 **(Dec'09 OLD)[LJIET]**. **OR** Define AVL tree.Construct AVL tree for following data 10,20,30,40,50,60,70,80 **(June'13 Old) [LJIET]**	**03/07**
15.	Construct a binary search tree from the following traversals:**(Jan'17) [LJIET]** Inorder: 3 4 5 6 7 9 17 20 22 Preorder: 9 4 3 6 5 7 17 22 20	**06**
16.	Draw binary tree for following pre-order and post-order traversals. In-order: CBAEFDG Post-order: CBFEGDA**(Nov'18 Old) [LJIET]**	**03**
17.	Explain AVL tree with the help of an example also show insertion and deletion with the help of an example. **OR** Explain insert and delete operations in AVL trees with suitable examples.**(Jun'14OLD, Jan'15 Old, June '19) [LJIET]**	**04/07**
18.	Trace procedure to convert following forest into binary tree. **(Jan'13 OLD) [LJIET]** 	**07**
19.	Define: (i) Height of the tree (ii) Binary tree (iii)Strictly binary tree (iv) Sibling **(Dec'09 OLD)[LJIET]** (i) Tree (ii) intermediate node and leaf node(iii) Sibling node and adjacent node (iv) path matrix. **(Jan'13 OLD) [LJIET]**	**07 / 08**
20.	Define AVL with its advantages. Construct AVL tree : 42,06,54,62,88,50,22,32,12,33 **(Mar'10 OLD) [LJIET]**	**07**
21.	What are the advantages of Multi way search tree in disc access? Construct B tree of order 5 for the following data 1,7,6,2,11,5,10,13,12,20,16,24,3,4,18,19,14,25. **(Mar'10 OLD) [LJIET]**	**07**
22.	What are the advantages of Multi way search tree over binary search tree? Construct 2-3 tree for the following data 12, 50, 85, 6, 10, 37, 100, 120, 25, 70 **(June'13 Old) [LJIET]**	**07**
23.	Define an AVL tree. Obtain an AVL tree by inserting one integer at a time in the following sequence. 150, 155, 160, 115, 110, 140, 120, 145, 130, 147, 170, 180. Show all the steps. **(May'2011 Old) [LJIET]**	**07**
24.	Create a Binary Search Tree for the following data and do in-order,Preorder and Post-order traversal of the tree.50, 60, 25, 40, 30, 70, 35, 10, 55, 65, 5**(Dec'2011 Old) [LJIET]**	**07**
25.	Create a binary search tree by inserting following nodes in sequence. 68,85,23,38,44,80,30,108,26,5,92,60 . Write inorder, preorder and post order traversal of the above generated Binary search tree. **(Jan'15 Old) [LJIET]**	**06**
26.	Construct a binary search tree for the following sequence. Also do the inorder and postorder traversal for the same 45,56,39,12,34,78,54,67,10,32,89,81**(Jun'14 OLD) [LJIET]**	**07**
27.	Insert 1, 29, 32 and 13 in the following Height balanced tree. For each insertion, draw the balanced tree using AVL rotation. **(May'12 OLD) [LJIET]**	**05**

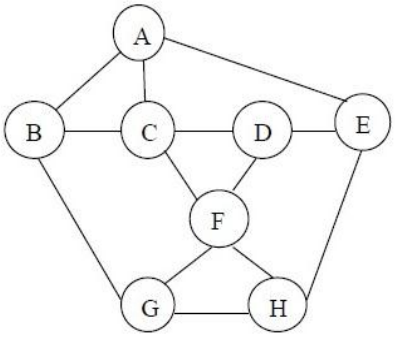
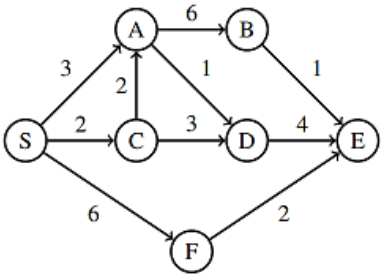
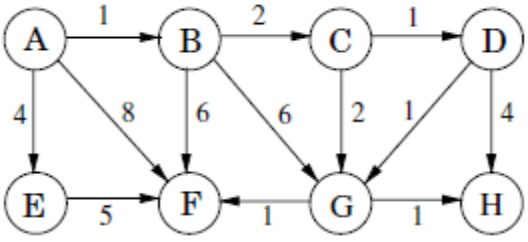
		
28.	List out different traversal way of tree and demonstrate any two with example.**(Jan'15)[LJIET]**	**05**
29.	Explain AVL Tree with example. Also show insertion and deletion with the help of an example. **(Jan'15) [LJIET] OR** Explain insert and delete operations in AVL trees with suitable examples.**(June'16)[LJIET]**	**07**
30.	Write an algorithm to perform traversal of Binary search tree. **(Jan'15 Old) [LJIET]**	**07**
31.	With a suitable example, explain steps for conversion of a general tree into a binary tree **(June'16)[LJIET]**	**07**
32.	Create a B-tree of order 5 by inserting the following data values. D, H, K, Z, B, P, Q, E, A, S, W, T, C, L, N, Y, M **(June'16 Old)[LJIET]**	**07**
33.	What is an AVL tree? Explain the different types of rotations used to create an AVL tree with suitable examples. **(June'16 Old,June'17Old)[LJIET]**	**07**
34.	Define height balanced tree. Construct a height balanced binary tree (AVL tree) for the following data 32,16,44,52,78,40,12,22,02,23 **(Jan'16 Old)[LJIET]**	**07**
35.	What is a binary search tree? Create a binary search tree for the Following data. 14, 10, 17, 12, 10, 11, 20, 12, 18, 25, 20, 8, 22, 11, 23 Explain deleting node 20 in the resultant binary search tree.**(May'18)[LJIET]**	**07**
36.	Insert the following letters into an empty B-tree of order 5: C N G A H E K Q M F W L T Z D P R X Y S**(May'18)[LJIET]**	**07**
37.	What is AVL tree? State the different rotations in AVL tree with examples. **(May'18 Old)[LJIET]**	**07**
38.	Show working of weight balanced trees with example. **(Nov'18 Old)[LJIET]**	**07**
39.	Explain 2-3 trees with example.**(Nov'18 Old)[LJIET]**	**07**
40.	Construct a tree for the given inorder and postorder traversals Inorder DGBAHEICF Postorder GDBHIEFCA **(March'10 Old)[LJIET]**	**07**
41.	Define height of the binary tree. Define height balanced tree with its advantages. Construct a height balanced binary tree (AVL tree) for the following data 42,06,54,62,88,50,22,32,12,33 **(March'10 Old)[LJIET]**	**07**
	Topic 3: Graph- matrix Representation of Graph, Elementary Graph operations(Breadth First Search, Depth First Search)	
Sr. No	**SHORT QUESTIONS (1 Mark) / MCQ / True-False/Fill in the blanks**	**Marks**
1	Define graph. **(June'16)[LJIET]** **Ans:**graph is composed of edges *E* and vertices *V* that link the nodes together. A graph G is often denoted G=(V,E) where V is the set of vertices and E the set of edges.	**01**
2	Explain degree of a vertex in a graph **(June'16)[LJIET]** **Ans:** The **degree** of a vertex in an undirected graph is the number of edges that leave/enter the vertex. The degree of a vertex in a directed graph is the same,but we distinguish between indegree and out-degree. Degree = in-degree + out-degree.	**01**
3	A graph containing only isolated nodes is called a ___. **(May'17)[LJIET]**	**01**

4	List the applications of Graphs. **(June'16)[LJIET]** 1. networks (e.g., of computers or roads) 2. flow charts 3. states of an automaton / program	**01**
5	Give two applications of graphs. **(Jan'16)[LJIET]**	**01**
6	What is a procedure to find out cycle in directed graph?**(Nov'2017 Old)[LJIET]**	**01**
Sr. No	**DESCRIPTIVE QUESTIONS**	**Marks**
1.	Define adjacency matrix. When two diagraphs are considered to be equivalent? **(June'15 Old)[LJIET]**	**04**
2.	How adjacency matrix can be used to represent graph?**(Nov 2017 Old) [LJIET]**	**04**
3.	Explain Depth First Search operation **(May'17)[LJIET]**	**04**
4.	Explain with example breadth first search and depth first search. **(Nov 2017 Old) [LJIET]**	**07**
5.	Give definitions (i) Graph (ii) Adjacent nodes **(May'17)[LJIET]**	**04**
6.	Explain terms: (1) Path (2) Graph **(May'12 Old,June'16)[LJIET]**	**04**
7.	Explain terms: (1) Cycle (2) Complete binary tree , Directed Graph **(May'12 Old, June'16) [LJIET]**	**04**
8.	Define the terms with respect to graph: In-degree, Path, Cycle. **(Dec'2011 Old)[LJIET]**	**04**
9.	Explain Depth First Search in graphs with an example **(June'16)[LJIET]**	**04**
10.	Explain Breadth First Search in graphs with an example **(June'16)[LJIET]**	**04**
11.	List advantages and disadvantages of Breadth First Search and Depth First Search. **(Jan'16)[LJIET]**	**03**
12.	Compare the efficiencies of BFS and DFS .**(May'2011 Old)[LJIET]**	**03**
13.	Explain outdegree and indegree. **(May'17)[LJIET]**	**03**
14.	Discuss following with reference to graphs. (i) Directed graph (ii) Undirected graph (iii) Degree of vertex (iv)Null graph **(Dec'09 OLD)[LJIET]**	**03 / 08**
15.	Define the following terms with respect to a graph: Node, Edge, Path**(May'18)[LJIET]**	**03**
16.	Explain Breadth First Search operation. **(May'17)[LJIET]**	**04**
17.	Discuss different representations of a graph. **(May'18)[LJIET]**	**04**
18.	Explain Depth First Search and Breadth First Search ingraphs with an example. **(Jan'17)[LJIET]**	**07**
19.	The Breadth First Search algorithm has been implemented using the queue data structure. Find breadth first search for the graph shown in Figure 2 with starting node M. **(June'2013 Old)[LJIET]** 	**07**
20.	Obtain the adjacency matrix A for the following graph. Find A_2. Find out degree of E and D nodes. **(May'12 Old)[LJIET]** 	**05**
21.	A communications network is represented by graph. Each noderepresents a communication line and each edge indicate thepresence of interconnection between the lines. Which traversaltechnique can be used to find breakdown in line? Explain**(Nov'2017)[LJIET]**	**04**

22.	Explain matrix and linked list representation of a graph. **(Dec'09OLD) [LJIET]** **(OR)** Explain matrix and linked list representation of a Graph. Also compare BFS and DFS methods of Graph Traversal. orExplain and differentiate BFS and DFS graph traversal method with suitable graph. **(Dec'13 OLD, Jan'15 OLD) [LJIET]**	**05 / 06**
23.	Define the following terms Node ,Sibling ,Path ,Indegree&outdegree of a vertex ,Connected graph **(June'14 OLD) [LJIET]**	**07** **07**
24.	Define the following terms. 1) Graph 2) Tree 3) Multi graph 4) Weighted graph 5) Elementary path 6) Complete Binary tree 7) Descendent node. **(Jan'15)[LJIET]**	**07**
25.	Explain Breadth First Search and Depth first search tree traversal on the following graph. **(June'15 Old) [LJIET]** 	**07**
26.	Find depth-first and breadth first traversals of graph starting at A fig1 **(Mar'10 OLD) [LJIET]**& starting at M fig2 **(June13 OLD) [LJIET]**  	**07**
27.	What is graph? How it can be represented using adjacency matrix, what is path matrix? How path matrix can be found out using adjacency matrix . **(Dec'2010 Old) [LJIET]**	**06**
28.	Explain BFS and DFS with example **(Dec'2010 Old)[LJIET]**. Or Short Note on BFS & DFS**(May'11OLD,Jan'15 , Jan'13OLD) [LJIET]** **(OR)** Write a short on Breadth First Search and Depth First Search in graph. **(May'2012 Old) [LJIET]** Explain DFS and BFS with example. **(Jun'14 OLD)[LJIET] (OR**) Explain with example DFS and BFS traversal of graph.(**Jan'16 Old)[LJIET] OR** Discuss DFS and BFS.**(Jan'2017 Old)[LJIET] OR** Explain BFS and DFS in detail. **(Jan'2015)[LJIET]**	**07**
29.	Compare BFS and DFS traversal methods **(Dec'2011 OLD)[LJIET]** Give both traversal for spanning given below. **(May'2011 OLD) [LJIET]** 	**07**
30.	Define Graph. Write an algorithm to do BFS traversal of a Graph.**(Dec'13OLD) [LJIET]**	**07**
31.	Answer the following for the below given Graph. **(May'2011 OLD) [LJIET]**	**07**

	 1. What is the out degree of node B? 2. Write down a path from node D to node A. 3. Is the graph a multi graph? Give a reason 4. What is the total degree of node A.	
32.	How graph can be represented? Write an algorithm for Breadth First Search Traversal of a Graph. **(Dec'2011 OLD, June'17 OLD)[LJIET]**	**07**
33.	Which are basic traversing techniques of Graph? Write the algorithm of any one of them.**(Dec'09 OLD) [LJIET]**	**08**
34.	What is a graph? Discuss the Adjacency Matrix and Adjacency List representation of graphs with an example.**OR** Discuss different representations of a graph.**(June'16 OLD, June'19) [LJIET]**	**06/ 07**
35.	Show how graph can be represented using example? How path matrix can be found out using adjacency matrix **(Jan'16 OLD) [LJIET]**	**07**
36.	What is a Graph? Explain the adjacency list and adjacency matrix representation of Graph with example.**(May'18 OLD) [LJIET]**	**07**
37.	Discuss BFS and DFS in graph with example. **(May'18 OLD) [LJIET]**	**07**
38.	List out graph traversal techniques & explain anyone using suitable example.**(June'19) [LJIET]**	**04**
39.	Which are the basic traversing techniques of the Graph? Write the algorithm of any one of them. .**(Dec'09 Old) [LJIET]**	**08**
	Topic 4: Spanning Tree, Shortest Path & Minimum Spanning Tree	
Sr. No	**SHORT QUESTIONS (1 Mark) / MCQ / True-False/Fill in the blanks**	**Marks**
1	Explain in brief: Minimum spanning tree**(Jan'2017)[LJIET]**	**01**
Sr. No	**DESCRIPTIVE QUESTIONS**	**Marks**
1.	Write warshall algorithm for graph. **(Dec'2010 Old)[LJIET]**	**02**
2.	Explain the working of the Kruskal's algorithm.**(May'2018) [LJIET]**	
3.	What is a spanning tree? Explain any one method for creating minimum spanning tree.**OR**Define spanning trees and minimal spanning trees. Give any one example to find minimal spanning tree.**(Nov 2017 Old, Nov'18 Old)[LJIET]**	**07**
4.	What is a minimum spanning tree? Explain Kruskal's algorithm for finding a minimum spanning tree. **(Jan'16) [LJIET]**	**04**
5.	With figure, explain following terms:- Depth of a tree, Sibling Nodes, Strictly Binary Tree, Ancestor Nodes, Graph, Minimum Spanning Tree., Degree of Vertex.**(June'15) [LJIET]**	**07**
6.	Write a Kruskal's algorithm for minimum spanning tree and explain with an example. **(Jun'15) [LJIET] or** Write Kruskal's algorithm for minimum spanning tree with an example.**(Jan'2017)[LJIET]**	**07**
7.	Compare and contrast Prim's and Kruskal's algorithm with the help of an example **(June'14 OLD, Jan'15 Old) [LJIET]**	**07**
8.	Short note: spanning tree **(Jan'13 OLD, Jan'15)[LJIET] Or** Write a short note on Spanning	**07/05/02**

	tree**(May'2012 Old)[LJIET]** What is spanning tree? **(Dec'2010 OLD)[LJIET]**	
9.	Short note: MST.& Find MST of the given graph- Fig1-**(Mar10 OLD)**, Fig 2 -**(Jun'13 OLD) [LJIET]** **Fig:1**  **Fig:2**  	**07**
10.	What is a spanning tree? Find the minimum spanning tree for the graph shown in fig. **(Jun'14 OLD) [LJIET]**  	**07**
11.	Apply Dijkstra's algorithm to find shortest path between vertex A and vertex F**(Mar'10 OLD) [LJIET]**  	**07**
12.	Give Ex. & applications of directed & undirected graph-**(Jun'13OLD)**.Find adjacency matrix **(Mar'10 OLD) [LJIET]**  	**07**
13.	Write Prim's algorithm for minimum spanning tree with an example. OR Explain the working of the Prim's algorithm with suitable example. **(June'16, June'19) [LJIET]**	**07**

14.	Consider the following graph: Create a minimum spanning tree using the Kruskal's algorithm. **(June'16 Old) [LJIET]** 	**07**
15.	Apply Djkstra's algorithm for the following graph with Node S as the starting node.**(May'2018) [LJIET]** 	**07**
16.	Apply Djkstra's algorithm on following graph with Node A as the starting node.**(Juen'2019) [LJIET]** 	**07**
17.	Explain spanning tree with example. **(Nov'18)[LJIET]**	**03**
	UNIT– 4: **Hashing & File Structure**	
	Topic 1: Hashing: The Symbol table, Hashing Function, Collision Resolution Technique	

Sr. No	**SHORT QUESTIONS (1 Mark) / MCQ / True-False/Fill in the blanks**	**Marks**
1	What is hash collision? **(June'16)[LJIET] or Explain in brief: Hash Collision (Jan'2017) [LJIET].**	**01**
2	Write two simple hash functions. **(Jan'2016) [LJIET].**	**01**
3	For the division method, H(x)=x mod m + 1. For m=31. What problems arise?**(Nov 2017 OLD)[LJIET]**	**01**

4	For what purpose hashing is performed?**(Nov 2017 OLD)[LJIET]**	**01**
Sr. No	**DESCRIPTIVE QUESTIONS**	**Marks**
1.	List the features of a good hash function-**(Jun'14OLD) [LJIET]**	**02**
2.	Discuss various rehashing techniques.**(Jan'17)[LJIET]**	**02**
3.	What is Hashing? **(Mar'10 OLD, June-15 Old)**Explain various Hashing Functions.- **(Jan'13 OLD, Dec'2009 OLD, June'15 OLD)**. Or What do you mean by hashing? What are various hash function. Explain each one in brief. **(Dec'2010 Old)[LJIET]**Explain hashing for direct files**(Dec'2010 OLD)[LJIET]**	**04 / 05 / 07**
4.	How open addressing can be used for collision resolution? **(May'17)[LJIET]**	**04**
5.	How following hash functions work?**(Nov'2017)[LJIET]** (i) The midsquare method (ii) Digit analysis	**04**
6.	What is hashing? Explain hash collision and any one collision resolution technique.**(May'2018)[LJIET]**	**04**
7.	List the qualities of a good hash function.**(May'2018)[LJIET]**	**03**
8.	Explain two hash functions**(May'2018)[LJIET]**	**04**
9.	What do you mean by Hashing? Explain any FOUR hashing techniques. **(Dec'13 OLD, June'14 OLD, Jan'15 OLD) [LJIET]**	**07**
10.	Explain collision resolution technique.**OR** Explain all the collision resolution techniques.**(Nov'2017 OLD, Nov'18 Old)[LJIET]**	**07**
11.	What are the advantages of Hashing? Discuss problem of collision (hash clash) in Hashing. Discuss collision resolution techniques**(Mar'10 OLD ,Mar'11 OLD) [LJIET]** OR Hash function map several keys into same address called collision. How collision resolution techniques work**?(Nov'2017)[LJIET]**	**07**
12.	Explain: Primary Clustering- Mar12, secondary clustering, rehashing and double hashing. **(May'11 OLD)[LJIET]**	**07**
13.	The integers given are to be inserted in a hash table with 5 locations using chaining to resolve collisions. Construct hash table and use simplest hash function. 1,2,3,4,5,10,21,22,33,34,15,32,31,48,49,50 **(Mar'10 OLD)[LJIET]**	**07**
14.	The keys 12, 18, 13, 2, 3, 23, 5 and 15 are inserted into an initially emptyhash table of length 10 using open addressing with hash function h(k) = k mod 10 and linear probing. What is the resultant hash table? **(June'13 Old)[LJIET]**	**07**
15.	Explain the basic two techniques for Collision-resolution in Hashing with example. Also explain primary clustering. **(Jan'15 Old, May'12 Old) [LJIET]**	**07**
16.	Explain Different hash methods and explain any Three. **(Jan'15)[LJIET]**	**07**
17.	Explain Various collision resolution techniques in hashing. **(June'15) [LJIET]** **(OR)** Discuss various methods to resolve hash collision with suitable examples **(Jan'16) [LJIET]** **(OR)** Explain various Hash collision resolution techniques with examples.**(June'16) [LJIET]** **(OR)** What do you mean by Hashing? Explain various methods for hashing **(Dec'2011 OLD) OR** Explain collision in the context of hashing? Discuss collision resolution techniques**.** .**(June'19) [LJIET]**	**07**
18.	What is collision? Explain two broad classes of collision resolution technique.**(June'15 Old) [LJIET]**	**07**
19.	Define following **(June'2013 Old)[LJIET]** 1. Strictly binary tree 2. Index sequential search	**07**

	3. Hashing	
20.	Discuss importance of hashing. Also discuss one of the method of hashing with an example.**OR**List all the hashing techniques and explain each one of them.**(Jan'17 OLD, Nov'18 Old)[LJIET]**	**07**
21.	What is hashing? Explain the collision resolution techniques. **(June'16 OLD)[LJIET] Or** What is hashing? Explain hash clash and its resolving techniques. **(May'2011 OLD , Nov'18) [LJIET]**	**07**
22.	What is hashing? Briefly explain various methods of hashing **(Jan'16 OLD)[LJIET] OR** What is Hashing? Explain Hashing Functions.**(June'17 Old)[LJIET]**	**07**
23.	Define Hash Clash. Explain Primary Clustering, secondary clustering, rehashing and double hashing **(May'2011 Old, June'17 Old)[LJIET]**	**07**
24.	What is hashing? What are the qualities of a good hash function? Explain any two hash functions in detail **(Jan'16)[LJIET]**	**07**
25.	What is hashing? What is a hashing function? State and explain in brief the collision resolution techniques in hashing.**(May'18 Old)[LJIET]**	**07**
26.	What is hashing? Explain Different Hashing techniques in brief. **(Nov'18)[LJIET]**	**07**
	Topic 2: **File Structure: Concepts of Field, Records & Files, Sequential, Indexed & Relative/Random File Organization. Indexing Structure of indexed files, hashing of direct files, Multi-Key File organization & access Method.**	
Sr. No	**DESCRIPTIVE QUESTIONS**	**Marks**
1.	Write short note on (i) Height Balanced Tree (ii) Indexed-Sequential File **(Jun'14 OLD) (Dec'13 OLD)[LJIET]**	**07**
2.	Explain Sequential & Indexed Sequential File Structures-**(Dec'2009 Old, Mar'12 OLD, Jan'13 OLD)** .Direct sequential access of files **(Mar'10 OLD)[LJIET]**Explain Sequential file organizations and list its advantages and disadvantages.**(June'16,June' 19)[LJIET] or** Explain the structure of sequential file.**(June'15 Old)[LJIET]**	**03.5/ 03**
3.	What is the difference between serial and sequentialprocessing? How a record can be deleted in sequential file?**(Nov'2017)[LJIET]**	**04**
4.	Explain the difference between sequential and indexed file organization.**(Nov'2017 Old)[LJIET]**	**04**
5.	Define File and Record. Explain Indexed-Sequential File. Also discuss the advantages and disadvantages of the same.**(May'11 OLD)[LJIET]**	**07**
6.	Write a short note on Index sequential file organization **(May'12 Old)[LJIET]**	**3.5**
7.	List various fundamental file organization techniques and explain each in brief. **(May'11 OLD,Dec'2010 Old)[LJIET]**	**07**
8.	Explain various multiple key access file organization in brief with advantages and disadvantages of each method. **(Dec'2010 Old, Dec'13 OLD-, Jan'15 Old) [LJIET]**	**07**
9.	List various fundamental file organization techniques and explain each in brief. **(Dec'10 OLD)[LJIET]**	**07**
10.	Explain indexing structure for index files. **(Nov'2017, June'19)[LJIET]**	**03**
11.	Explain the terms: File, Field, Record, Database and Key. **(Dec'2009 Old)[LJIET]**	**07 / 06**
12.	Explain Multikey file organization and access method. -**(June'15 Old)[LJIET] OR** How access of record is performed in multi key fileorganization?**(Nov'2017)[LJIET]**	**04/06**
13.	Explain various multiple key access file organization in brief with advantages and disadvantages of each method. **OR**Explain the multi key file organization and access	**07**

	methods OR Write a short note on multi-key file organization.**(Dec'10 OLD, June'15 OLD, Nov'18 Old)[LJIET]**	
14.	State different File Organizations and discuss the advantages and disadvantages of each of them.**(May'2011 Old, Nov'18) [LJIET]**	**07**
15.	Write short notes on (i) Height Balanced Tree. (ii) Indexed-Sequential Files**(DEC'13 OLD,JUNE'14 OLD)[LJIET]**	**07**
16.	Explain Sequential, Indexed Sequential and Random File Organizations.**(June'15)[LJIET]**	**07**
17.	Explain various multiple key access file organization in brief with advantages and disadvantages of each method. **(Jan'15 OLD) [LJIET]**	**07**
18.	Explain File in terms of fields, records and database. **(Jan'15) [LJIET]**	**07**
19.	What is File Structure? Explain any one File Structure in detail **(Jan'16 Old) [LJIET]**	**07**
20.	Discuss the structure of sequential and indexed file organization. **(Jan'17 Old) [LJIET] or** Explain the structure of indexed sequential files.**(June'15 Old, May'17) [LJIET] OR** What is File Structure? Explain Indexed Sequential File Structure in detail. **(Dec'2011 Old)[LJIET]**	**07**
21.	Write a short note on inverted key file organization **(June'17 Old) [LJIET]**	**07**
22.	Explain structure of sequential file. Explain processing in sequential file. **(May'17)[LJIET]**	**07**
23.	For what purpose external storage devices are used? Explain how storage of records is done on any one storage medium?**(Nov 2017 Old)[LJIET]**	**07**
24.	Write a short note on indexed file organization **(June'17 Old, Nov'18 Old) [LJIET]**	**07**
25.	Explain Sequential, Indexed and Relative/Random File Organization.**(May2018 Old)[LJIET]**	**07**
26.	Explain Sequential Files and Indexed Sequential Files Structures. **(Nov'18, Dec'19 Old)[LJIET]**	**07 / 08**
	UNIT - 5 : **Sorting & Searching**	
	Topic 1: Sorting: Bubble Sort, Selection Sort, Quick Sort, Merge Sort	
Sr. No	**SHORT QUESTIONS (1 Mark) / MCQ / True-False/Fill in the blanks**	**Marks**
	What is the time complexity of Quicksort algorithm in the worst case? **(June'16) [LJIET] Ans = $O(n^2)$**	**01**
1	Consider that n elements are to be sorted. What is the worst case time complexity of Bubble sort?**[LJIET]Ans = $O(n^2)$**	**01**
2	Name two divide and conquer algorithms for sorting. .**(Jan'2016) [LJIET] – Ans: Merge & Quick Sort**	**01**
3	For sorting 1 GB of data with only 100 MB of available main memory. Which sorting technique will be most appropriate? **(May'2017) [LJIET]**	**01**
4	Consider a situation where swap operation is very costly. Which of the sorting algorithms should be preferred so that the number of swap operations are minimized in general? **(May'2017) [LJIET]**	**01**
Sr. No	**DESCRIPTIVE QUESTIONS**	**Marks**
1.	Apply quicksort algorithm to sort the following data. Justify the steps. 42, 29, 74, 11, 65, 58 **(Jan'16)[LJIET]**	**03**
2.	What is the complexity of the quick sort algorithm on sorted data? Justify your answer.**(May'18)[LJIET]**	**03**
3.	Write the algorithm for binary search and find its complexity.**(May'18 New)[LJIET]**	**04**

4.	Appalgorithm for the following data and show the steps. 66, 33, 40, 22, 55, 88, 11, 80, 20, 50, 44, 77, 30**(May'18)[LJIET]**	**04**
5.	Explain the trace of selection sort on following data. 42,23,74,11,65,58,94,36,99,87 **(May'17)[LJIET**]	**07**
6.	Sort the following numbers using (i) Selection sort (ii)Quick sort: 10 50 0 20 30 10**(Jan'17)[LJIET]**	**07**
7.	Explain Bubble Sort with example or Write a 'C' program for Bubble sort.**(Jan'2017) [LJIET]**	**07**
8.	What is sorting? Explain how sorting can be done(any one method)?**(Nov 2017 OLD)[LJIET]**	**07**
9.	Explain Quick Sort with example. Or Write an algorithm for Quick sort.**(Jan'17)[LJIET]**	**07**
10.	Explain the trace of bubble sort on following data. 42,23,74,11,65,58,94,36,99,87 **(Jan'17)[LJIET]**	**07**
11.	Write an algorithm for Binary search method.**(Jan'17)[LJIET] Or** Write an algorithm for binary search method and discuss its efficiency.**(June'15)[LJIET]**	**07**
12.	Write an algorithm for Selection sort method. Explain each step with an example. **(June'16)[LJIET**]	**07**
13.	Write a selection sort algorithm, and discuss its efficiency. **(Jan'15) [LJIET]**	**07**
14.	Write an algorithm for Insertion sort method. Explain each step with an example. **OR**Write an algorithm for insertion sort. **(June'16, June '19)[LJIET**]	**07/ 04**
15.	Write a 'C' function for Selection sort..**(Jan'17)[LJIET]**	**07**
16.	"If no interchanges occurred, then the table must be sorted andno further passes are required." Which sorting method workson this principal? Apply above sorting technique on the following data 5 1 4 2 8 **OR**"If no interchanges occurred, then all the elements must be sorted and no further passes are required." Which sorting technique works on this principal? Apply the same sorting technique on the following data to sort them in ascending order. 11, 15, 13, 14, 2, 8, 10**(Nov 2017, June '19)[LJIET]**	**07**
17.	Apply quick sort on following data:**(Nov 2017)[LJIET]** 42 23 74 11 65 58 94 36 99 87	**07**
18.	Explain the difference between insertion sort and selection sort with an example. What is the time complexity of these algorithms? How?**(May'2018)[LJIET]**	**07**
19.	Write an algorithm for Bubble sort. **(Nov 2018)[LJIET]**	**03**
20.	Write an algorithm for Selection sort. **(Nov 2018)[LJIET]**	**03**
21.	What is Topological sorting? **(Nov 2018)[LJIET]**	**03**
22.	Sort the following numbers in ascending order by applying quick sort. 29 15 11 82 22 17 53 57 4 8..**(Jan'19)[LJIET]**	**07**
	Topic 2: Searching: Sequential Search, Binary Search	
	SHORT QUESTIONS (1 Mark) / MCQ / True-False/Fill in the blanks	
1	Describe the time complexity of Binary search algorithm **(June'16)[LJIET] OR** What is the complexity of binary search algorithm?**(Jan'16)[LJIET]Ans: O(logn)**	**01**
Sr. No	**DESCRIPTIVE QUESTIONS**	**Marks**
1.	Explain Binary search method. **(June'16)[LJIET]**	**04**
2.	Explain Sequential search method. **OR** Explain Sequential search method with suitable example. **(June'16, June'19)[LJIET]**	**04/ 03**
3.	How linear search is performed?**(Nov 2017 OLD)[LJIET]**	**03**
4.	Write a 'C' program for insertion sort. And discuss its efficiency.**(June'15) [LJIET]**	**03**

5.	How binary search technique can be applied to search for aparticular item with a certain key?**(Nov 2017)[LJIET]**	**04**
6.	Write a Binary Search algorithm, and discuss its efficiency.**(June'15) [LJIET]**	**07**
7.	Write down precondition and algorithm of binary search method.**(Jan'15) [LJIET]**	**07**
8.	Explain binary Search method. Write an algorithm for performing the binary search.**(June'15 Old) [LJIET]**	**07**
9.	How binary search is performed??**(Nov 2017 Old)[LJIET]**	**03**
10.	Write the algorithm for binary search.**(June'19) [LJIET]**	**04**
11.	Write an algorithm for Sequential Search. **(Nov'18)[LJIET]**	**04**
12.	Write an algorithm for Binary Search. **(Nov'18)[LJIET]**	**04**