Subject Code: BCS-12

Roll No. 2 0 2 0 0 2 1 0 2 3

B. Tech.
ODD SEMESTER
MINOR TEST 2021 - 2022

Subject Name: Principles of Data Structures through C/C++

Time: 2 Hrs. Max. Marks: 20

Note: Answer all questions.

Q.1 Attempt any Three parts of the following. Q. 1(a) is compulsory. 4

(a). Consider the data shown below which gives the different flights of an airline. Discuss different ways of storing the data as to decrease the time in executing the followings:

	City
1	Gorakhpur
2	Lucknow
3	Delhi
4	Hyderabad
5	Mumbai

	Number	Origin	Destination
1	701	2	3
2	702	3	2
3	705	5	3
4	708	3	4
5	711	2	5
6	712	5	2
7	713	5	1
8	715	1	4
9	717	5	4
10	718	4	5

I. Find the origin and destination of a flight given the flight number.
II. Given city A and city B, find whether there is a flight from A to B, if there is, find its flight number.

Suppose an airline serves in n cities with s flights. Discuss the drawbacks of storing the data suggested by you for I & II.

(b). Give the formula to compute the address of a 3-D array in row major order. Given an array arr[1:9, -4:1, 5:10] with base value 400 and size of each element is 2 Bytes in memory find the address of element arr[5][-1][8] with the help of row-major order? 2

(c). Write a C/C++ function to delete an element from the queue. 2

(d) Define the following types of Queues with an example. 2

I. DeQueue
II. Priority Queue
III. Circular Queue

Q.2 Attempt any Two parts of the following. Q. 2(a) is compulsory.

(a). Write a C/C++ function to compute the value of an expression written in postfix notation. 4
Compute the value of below postfix notation using above algorithm.

12 7 3 - / 2 1 5 + * +

(b). Write a C/C++ function to implement stack using queues. 2

(c). Write a C/C++ function for Towers of Hanoi problem so that it uses one recursive call instead of two. 2

Q.3 Attempt any Two parts of the following. Q. 3(a) is compulsory.

(a). Write a C/C++ function to perform following operations on linked list. 4

I. To print the elements of linked list in reverse order.
II. To find n^{th} element from end of linked list.

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Printed Pages: 3

BCS-12

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B. Tech.

ODD SEMESTER

MAJOR EXAMINATION 2021 - 2022

PRINCIPLE OF DATA STRUCTURE THROUGH C/C++

Time: 3 Hrs. **Max. Marks: 50**

Note: Attempt all questions. Each question carries equal marks.

1. Attempt any five parts of the following: **(5× 2 = 10)**

(a) Find out the transformation function to store the below sparse matrix into a linear array.

5	-3					
1	4	3				
	9	-3	6			
		2	4	-7		
			3	-1	0	
				6	-5	8
					3	-1

(b) Write a function in C/C++ to find all pairs of elements of an array whose sum is 25.

(c) Consider the following arithmetic expression written in postfix notation and evaluate it.

12, 7, 3, -, /, 2, 1, 5, +, *, +

(d) Let M and N be integers and suppose $Q(M, N)$ is recursively defined by

$$Q(M,N) = \begin{cases} 1 & if\ M = 0\ or\ M \geq N \geq 1 \\ Q(M-1,N) + Q(M-1,N-1) & Otherwise \end{cases}$$

Write a C/C++ function to implement above recursive function.

(e) Write a C/C++ function to add an element at the beginning of a singly linked list.

(f) What are the various advantages and disadvantages of linked list over array?

(g) Write a C/C++ function to enqueue an element into a queue.

2. Attempt any two parts of the following: **(2× 5 = 10)**

(a) Write a C/C++ function to implement following.

I. To print only leaf nodes of a binary tree.

I. To create a duplicate tree of the original binary tree.

(b) Suppose the following sequences list the nodes of a binary tree T in Pre-order and In-order respectively.

Pre-Order : G, B, Q, A, C, K, F, P, D, E, R, H

In-Order : Q, B, K, C, F, A, G, P, E, D, H, R

Draw the corresponding binary tree with respect to the above traversals.

(c) Write a C/C++ function to insert an element into a binary search tree. Also, draw a binary search tree by inserting the following element into an empty binary search tree.

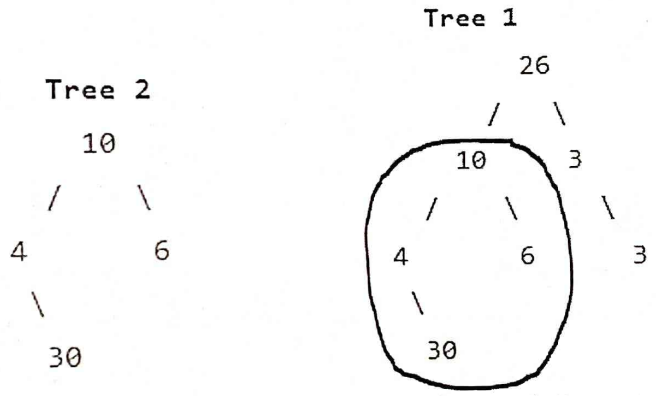
50, 33, 44, 22, 77, 35, 60, 40

3. Attempt any two parts of the following: **(2× 5 = 10)**

(a) What is B-Tree? Draw a B-Tree of order 3 by inserting the following elements into an empty B-Tree.

91, 24, 6, 7, 11, 8, 21, 4, 5, 16, 19, 20, 76

(b) Write a function in C/C++ to check whether a tree T is a sub-tree of larger tree Q. For example, in the below figure, Tree-2 is a sub-tree of Tree-1.



(c) What is AVL Tree? Write C/C++ function to implement left rotation. Draw an AVL tree by inserting the following elements into an empty AVL tree.

50 , 20 , 60 , 10 , 8 , 15 , 32 , 46 , 12 , 48, 11, 6, 7

4. Attempt any two parts of the following: **(2× 5 = 10)**

(a) You are given an array A[1...n] representing a min-heap and an integer k. You have to design an algorithm to output all the keys in the array that are less than k. For example, if k = 6 and the array A is as shown below, then your algorithm should output the keys 3 and 5.

Array index	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Key	3	10	5	13	17	6	11	15	16	21	18	9	8	23

Give pseudocode for your algorithm and discuss running time. Let m be the number of keys in A that are smaller than k. The running time of your algorithm should be O(m).

(b) Write a C/C++ function to sort numbers in ascending order using Quicksort.

(c) What is hashing? Explain hash functions and collision resolution strategies with an example.

5. Attempt any two parts of the following: **(2× 5 = 10)**

(a) Given a graph with V vertices. Write a C/C++ function to find the number of provinces in the graph. A province is a group of directly or indirectly connected cities and no other cities outside of the group. For example, the graph in Figure-1 has two provinces while the graph in Figure-2 has only one province.

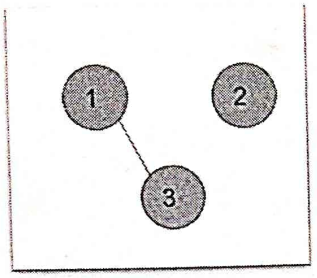


Figure-1

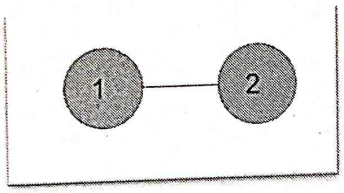
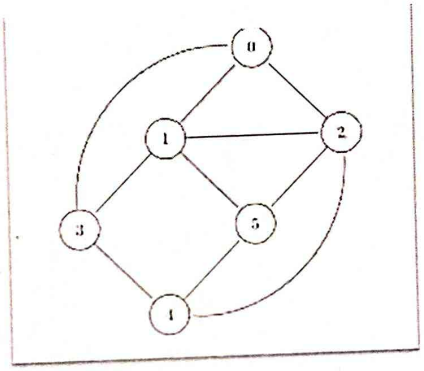
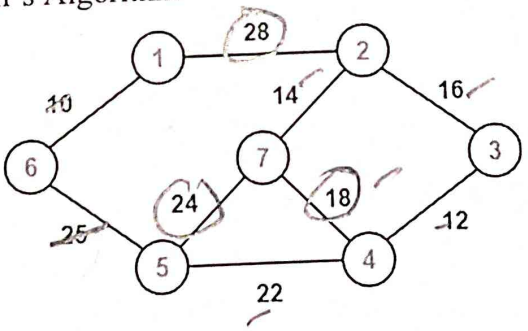


Figure-2

(b) Write a C/C++ function for the Depth First Search algorithm used to traverse a graph. Print the depth-first search traversal of the below graph. Start the traversal from node 0.



(c) What is a minimum spanning tree? Construct the minimum spanning tree for the given graph using Prim's Algorithm-



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B. Tech.

ODD SEMESTER

MAJOR EXAMINATION 2021 - 2022

DIGITAL CIRCUITS AND LOGIC DESIGN

Time: 3 Hrs. **Max. Marks: 50**

Note: Attempt all questions. Each question carries equal marks.

1. Attempt any four parts of the following: **(5× 2 = 10)**

(a) Represent the decimal number 225 in binary, hexadecimal, BCD, and Excess-3 code.

(b) Hamming code 101101101 is received at receiver end with even parity. Correct it if there are any errors.

(c) Find the complement of F = x + yz , then show that F. F' = 0 and F + F' = 1 .

(d) Simplify the Boolean function F(A,B,C,D) = ∑(4,6,7,15) by using 4-variable K-map.

(e) Implement the function F(A,B,C) = ∑ (1,2,4,5) with a multiplexer.

(f) Design a full adder by using a multiplexer.

(g) Implement a full subtractor by using two half-subtractors.

2. Attempt any two parts of the following: **(2× 5 = 10)**

(a) A JN Flip-flop has two inputs, J and N. Input J behaves like the J input of a JK flip-flop and input N behaves like the complement of the K input of a JK flip-flop. (that is , N = K')

(i) Tabulate the characteristic table of the flip-flop.

(ii) Tabulate the excitation table of the flip-flop.

(iii) Show that by connecting the two inputs together, one obtains a D-flip flop.

(b) Design a 4-bit binary synchronous counter with D flip-flops.

(c) Design a synchronous BCD counter with JK flip-flops

3. Attempt any two parts of the following: **(2× 5 = 10)**

(a) What is a T flip flop? How a T flip flop can be obtained by converting a JK flip flop? Explain.

(b) Discuss about the different types of triggering in the case of flip-flops.

(c) Convert a D flip-flop to a JK flip-flop by including input gates to the D-flip flop. The gates needed for the input of the D flip-flop can be determined by means of sequential circuit design procedures. The sequential circuit to be considered will have one D flip-flop and two inputs J and K.

4. **Attempt any two parts of the following:** **(2× 5 = 10)**

(a) Differentiate between static and dynamic RAM based on different parameters.

(b) Design a shift register with parallel load that operates according to the following function table.

Shift	Load	Register Operation
0	0	No Change
0	1	Load Parallel data
1	X	Shift Right

(c) The content of a 4 bit register is initially 1101. The register is shifted six times to the right with the serial input being 101101. What is the content of the register after each shift?

5. **Attempt any two parts of the following:** **(2× 5 = 10)**

(a) Discuss in brief about different types of ROMs.

(b) What is meant by fundamental mode of operation? Discuss about different types of hazards in asynchronous sequential circuits by giving suitable examples.

(c) The following memory units are specified by the number of words times the number of bits per word. How many address lines and input-output data lines are needed in each case?

(i) $2K \times 16$

(ii) $64\ K \times 8$

(iii) $2K \times 16$

(iv) $16\ M \times 32$

ODD SEMESTER
MINOR TEST 2021-2022
Discrete Mathematics

16/30

Time:2 Hrs. Max. Marks:30

Note: Answer all questions

1. Attempt any Three parts of the following. Q.1(a) is compulsory.

(a) Prove that
(i) $B - A \subseteq A'$ (ii) $A - B = A \cup B' = B' - A'$
(iii) $A' - B' = B - A$ (iv) $A \subseteq B$ then $B' \subseteq A'$ 4

(b) Let $A = \{2, 4, 6\}$ and $B = \{1, 4, 5, 6\}$ then find out the relation from A to B defined by "is less than or equal to". Find out the domain and range of the relation. 3

(c) Define Algebraic structure. Let $(\{a, b\}, *)$ be semi group where $a * a = b$ show that
(i) $a * b = b * a$ (ii) $b * b = b$ 3

(d) Define semigroup. Prove that $(A, +)$ is a semi-group where A be the set of all positive even integers and $+$ be ordinary addition operation. 3

2. Attempt any Three parts of the following, Q.2(a) is compulsory.

(a) Define symmetric difference of sets. If A, B, C be sets, then prove
$A - (B \cup C) = (A - B) \cap (A - C)$ 4

(b) Prove that the union of countable family of countable sets is countable. 3

(c) (i) Prove that

Power set (AUB)=power set(A)∩power set(B)

(ii) Show that for any two sets A and B.

A-(A∩B) =A-B 3

(d) Let A= {1, 2, 3} and relation (R) is ≤ on A. Determine its inverse. 3

3. Attempt any Three parts of the following. Q.3(a) is compulsory.

(a) Define monoid, Group, and abelian group. 4

(b) Show that the set I of all integers (positive or negative including zero), i.e.,

I= (...-3, -2, -1, 0, 1, 2...)

Is an infinite abelian group with respect to the operation of addition of integers. 3

(c) Define Subgroup. If H_1 and H_2 are two subgroups of a group G, then $H_1 \cap H_2$ is also a subgroup of G. 3

(d) Define cyclic group. Show that every cyclic group is an abelian group. 3

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B.Tech
(SEM III) ODD SEMESTER
Minor Test 2021-2022
Subject Name : Digital Circuits and Logic Design

Time : 2 hr

Max Marks:30

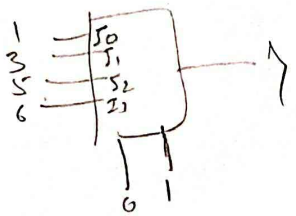
Note : Attempt all questions .

Q1. Attempt any three parts of the following. Q. 1(a) is compulsory.
(a) Express the function f(x,y,z) = xy' + yz' with only one complement operation and one or more AND/OR operations. Draw the logic circuit implementing the expression obtained using a single NOT gate and one or more AND/OR gates. (4)
(b) Explain in brief about the parity bit method of error detection. (3)
(c) What are prime implicants? Explain by taking a suitable example. (3)
(d) Simplify the following Boolean function F, together with the don't care condition d and then express the simplified function in sum-of-min terms form.

$F(x,y,z) = \sum (2,3,4,6,7)$
$d(x,y,z) = \sum (0,1,5)$ (3)

Q2. Attempt any three parts of the following. Q. 2(a) is compulsory.
(a)Reduce the following Boolean expressions to the indicated number of literals.
(i) A'C' + ABC + AC' to three literals.
(ii) (A' + C)(A' + C')(A + B + C'D) to four literals (4)
(b) Obtain the truth table of the function F (x,y,z,w) = y'z + wxy' and express it in the sum of minterms and product of maxterms form. (3)
(c) Convert the following to the other canonical form. (3)
(i) $F(x,y,z) = \sum (4,5,7)$ (ii) $F(A,B,C,D) = \prod (0,1,12)$
(d) Convert the decimal number 205 to binary, octal and hexadecimal. (3)

Q3. Attempt any three parts of the following. Q. 3(a) is compulsory.
(a) Design a BCD to excess-3 code converter. (4)
(b) Explain about decoders in brief? Construct a 4 × 16 decoder using two 3 × 8 decoders. (3)
(c) Implement the function $F(A, B,C) = \sum (1,3,5,6)$ with a 4-to-1 multiplexer.(3)
(d) Explain about Half adder and Full adder in brief. Design a full adder with the help of two half adders. (3)



BCS-13

ROLL NO 2020021023

BTECH
(SEM III)ODD SEMESTER
MINOR TEST (EXAMINATION) 2021-2022

INTERNET & JAVA PROGRAMMING

14/20

Time: 2Hrs. Max.Marks:20

Note: Answer all questions.

Q1. Attempt any three parts of the following.Q.1 (a) is Compulsory.

(a)How classes are inherited? Write a program to illustrate multilevel inheritance. 4

(b)Explain Sending and receiving files using email. 2

(c)Differentiate between method overloading and method overriding. Give example for each. 2

(d)Write a program in Java to create first 100 Fibonacci numbers. 2

Q2. Attempt any two parts of the following Q.2 (a) is compulsory.

(a)What are the various services offered by internet? 4

(b)What is Video and voice conferencing? Explain the various hardware and software used for voice and video conferencing. 2

(c)Discuss various primitive data types supported by Java 2

Q3. Attempt any two parts of the following Q.3 (a) is compulsory.

(a)What are Packages? How will you import a package in Java? Give Example. 4

(b) What is WWW.Explain in detail? 2

...with an example Program. 2

(BCS-13)

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B. TECH (CSE)

(SEM III) ODD SEMESTER

MAJOR EXAMINATION 2021-2022

INTERNET & JAVA PROGRAMMING

Time: 3 Hours **Max. Marks: 50**

Note: Attempt all questions. Each question carry equal marks.

Q.1 Attempt any five parts of the following: **(5×2=10)**

(a) Compare and contrast different technologies available for Internet access.

(b) Explain with an example how exceptions are handled in Java programming using multiple catch blocks.

(c) Discuss role of event listeners in event handling. List five Java event listeners.

(d) Illustrate runtime polymorphism in Java by using interface reference variable.

(e) Explain the various methods supported by the Graphics class with an example of each.

(f) Describe the various primitive data types available in Java. Also specify memory requirements of each.

(g) Create an applet that receives three numeric values as input from the user and then displays the largest of these on the screen.

Q.2 Attempt any two parts of the following: **(2×5=10)**

(a) Describe various layout managers available in Java Swing. Write a simple Java Swing program to create a J Button with ActionListener.

(b) Write a program using Swing components to multiply two numbers. Use text fields for input and output. Your program should display the result when the user presses a button.

(c) Briefly explain various AWT controls available in Java.

Q.3 Attempt any two parts of the following: **(2×5=10)**

(a) Discuss JDBC. Explain packages available in JDBC API.

(b) Describe use of JDBC drivers. Explain each with an example.

(c) What is Driver Manager in JDBC? How SQL queries are executed in JDBC.

Q.4 Attempt any two parts of the following: **(2×5=10)**

(a) Discuss Java Bean. Also mention its benefits.

(b) Describe the steps to be followed in creating a new Java Bean with an example.

(c) Explain how Java Bean is implemented in a JSP page with an example.

Q.5 Attempt any two parts of the following: **(2×5=10)**

(a) Describe the phases of Servlet life cycle with a diagram. Which exception is thrown if the Servlet is not initialised properly?

(b) Differentiate between Generic Servlet and Http Servlet. Write a program in Java to create a Servlet that prints the contents of HTML.

(c) Describe Servlet architecture with a block diagram and explain its working. Also discuss service () method of a Servlet.