

# AR16

**CODE: 16CS2010**

**SET-2**

**ADITYA INSTITUTE OF TECHNOLOGY AND MANAGEMENT, TEKKALI  
(AUTONOMOUS)**

**II B.Tech II Semester Supplementary Examinations, May,2025**

**Principles of Programming Languages  
(COMMON TO CSE & IT)**

**Time: 3 Hours**

**Max Marks: 70**

Answer ONE Question from each Unit

All Questions Carry Equal Marks

All parts of the Question must be answered at one place

## UNIT-I

1. a) A concise and understandable description of a programming language is essential to the language's success. Justify the validity of the statement. 7M
- b) Write the recursive procedures for any grammar using recursive descent parser. List out the limitations of it. 7M

**(OR)**

2. a) Explain the Role of Semantic Analyzer 7M
- b) What is Attribute Grammar? Give an example. Explain Evaluation of attributes by a example. 7M

## UNIT-II

3. a) Explain the scope and lifetime of variables. Illustrate when they would coincide and when they don't 7M
- b) What is Semantic Analysis? Role of Semantic Analyzer 7M

**(OR)**

4. a) What is Binding? Explain about the Types of Bindings 7M
- b) What is attribute grammar? Give the syntax directed definition for a desktop calculator 7M

## UNIT-III

5. a) Explain Categories of Arrays and Operations. 7M
- b) Explain in detail various design issues of character string types 7M

**(OR)**

6. a) Explain in detail about expression evaluation with suitable examples. 7M
- b) Explain associative arrays, their structure and operations 7M

## UNIT-IV

7. a) Explain different parameter passing methods with an example 7M
- b) What is exception handling? How exceptions are handled in C++ and JAVA. 7M

**(OR)**

8. a) Explain how subprograms names are passed as parameters 7M
- b) Write a program using try block to detect and throw an exception if the condition "divide-by-zero" occurs. 7M

## UNIT-V

9. a) State the important features of object oriented programming. 7M
- b) With an example, explain the syntax for passing arguments to base class constructors in multiple inheritance. 7M

**(OR)**

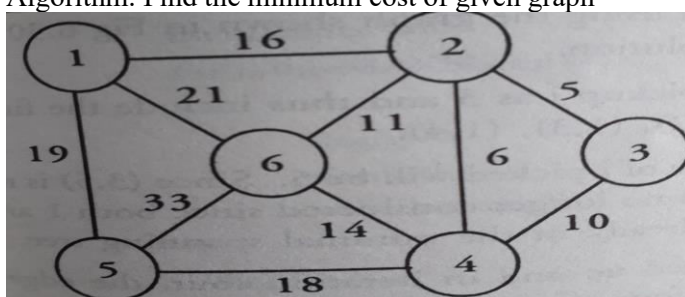
10. a) What is Dynamic Method Binding? Explain with suitable example 7M
- b) What is inheritance explain different types of inheritance with example 7M

Answer ONE Question from each Unit

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		Marks	CO	Blooms Level
<b>UNIT-I</b>				
1.	Define a Data Structure. Explain the types of Data Structures and its operations.	10M	CO1	K2
<b>(OR)</b>				
2.	a) Define an Algorithm. Explain the Characteristics of Algorithm.	6M	CO1	K2
	b) Write an Algorithm for finding largest number for given three numbers.	4M	CO1	K2
<b>UNIT-II</b>				
3.	a) Write an Algorithm for Binary Search and write best case time complexity.	5M	CO2	K2
	b) Using the Binary search Algorithm to find the searching elements are 727 and 275 in the given list {75,151,203,275,318,489,524,591,647,727}	5M	CO2	K3
<b>(OR)</b>				
4.	Write an Algorithm for Quick sort with suitable example.	10M	CO2	K2
<b>UNIT-III</b>				
5.	a) Define a Stack. Write an algorithm for Stack operations.	6M	CO3	K2
	b) To consider the infix expression $A+B*C-D$ , convert from infix expression to postfix expression.	4M	CO3	K3
<b>(OR)</b>				
6.	Write an Algorithm for conversion of infix to postfix expression with example.	10M	CO3	K2
<b>UNIT-IV</b>				
7.	a) Comparison between Arrays and Linked list	5M	CO4	K2
	b) Write an Algorithm to insert a node to the beginning of a singly linked list?	5M	CO4	K3
<b>(OR)</b>				
8.	a) Define a Doubly linked list. Explain the operations of Doubly linked list.	5M	CO4	K2
	b) Write an Algorithm insert a node to the beginning of a doubly linked list	5M	CO4	K3
<b>UNIT-V</b>				
9.	Write an Algorithms for Binary Tree Traversals In-order ,Pre-order and Post order with example.	10M	CO5	K3
<b>(OR)</b>				
10.	Define a Binary search tree. To construct a Binary Search Tree for a list {N,J,B,L,K,M,R,P} and insert an element Q and delete an element L in binary search tree.	10M	CO5	K3
<b>UNIT-VI</b>				
11.	a) Define of a Graph, Adjacency Matrix and Adjacency List	5M	CO6	K2
	b) Write an Algorithm for Breadth First Search(BSF) with example.	5M	CO6	K2
<b>(OR)</b>				
12.	Explain the procedure for minimum cost spanning tree using Prime's Algorithm. Find the minimum cost of given graph	10M	CO6	K2



Time: 3 Hours

Max Marks: 60

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**UNIT-I**

Marks	CO	Blooms Level
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- |    |   |   |   |   |    |
|----|---|---|---|---|----|
| 1. | a | Explain pointers to function with example.        | 5 | 1 | L2 |
|    | b | Implement the C++ code for the following problem. | 5 | 1 | L3 |

**2-sum problem:**

Given an array of integers nums and an integer target, return indices of the two numbers such that they add up to target.

You may assume that each input would have exactly one solution, and you may not use the same element twice.

You can return the answer in any order.

**Example:**

**Input:** nums = [2,7,11,15], target = 9

**Output:** [0,1]

Because nums[0] + nums[1] == 9, we return [0, 1].

**(OR)**

- |    |   |   |   |   |    |
|----|---|---|---|---|----|
| 2. | a | Explain about new and delete operators in C++ with example. | 5 | 1 | L2 |
|    | b | Build a C++ code for the following problem                  | 5 | 1 | L3 |

**Fruit Into Baskets**

You are visiting a farm that has a single row of fruit trees arranged from left to right. The trees are represented by an integer array fruits where fruits[i] is the type of fruit the ith tree produces. You want to collect as much fruit as possible. However, the owner has some strict rules that you must follow:

- You only have two baskets, and each basket can only hold a single type of fruit. There is no limit on the amount of fruit each basket can hold.
- Starting from any tree of your choice, you must pick exactly one fruit from every tree (including the start tree) while moving to the right. The picked fruits must fit in one of your baskets.
- Once you reach a tree with fruit that cannot fit in your baskets, you must stop.

Given the integer array fruits, return the maximum number of fruits you can pick.

**Example:**

**Input:** fruits = [1,2,3,2,2], **Output:** 4

**Explanation:** We can pick from trees [2,3,2,2].

If we had started at the first tree, we would only pick from trees [1,2]

**UNIT-II**

- |             |  |                                    |    |   |    |
|-------------|--|------------------------------------|----|---|----|
| 3.          |  | Demonstrate Inheritance in C++.    | 10 | 2 | L2 |
| <b>(OR)</b> |  |                                    |    |   |    |
| 4.          |  | Discuss exception handling in C++. | 10 | 2 | L6 |

### UNIT-III

5. a Explain Characteristics of an algorithm. 5 3 L5  
b Find the time complexity for the recursive function given below. 5 3 L3

```
void test(int n)
{
    if(n>1){
        test(n/2);
        for(i=0; i<n; i++)
            cout << i;
    }
}
```

(OR)

6. a How can we measure the efficiency of an algorithm. Explain. 5 3 L1  
b Find the time complexity for the recursive function given below. 5 3 L3

```
void test(int n)
{
    if(n>0){
        test(n-1);
        for(i=1; i<n; i=i+1)
            cout << i;
    }
}
```

### UNIT-IV

7. Discuss about stack and queue STL containers in C++ and their functions with examples. 10 4 L6

(OR)

8. Discuss about Set STL container, types of sets and their functions with example. 10 4 L6

### UNIT-V

9. Discuss Recursion. Write a C++ solution to generate all permutations of characters in a given string. 10 5 L2,L3

(OR)

10. Explain about Backtracking. Discuss N-queen problem and give a C++ solution for it. 10 5 L2,L3

### UNIT-VI

11. a Demonstrate Extended Euclidean algorithm 5 6 L2  
b Write a C++ solution for Factorial Trailing Zeroes. 5 6 L3

**Statement:** Given an integer n, return the number of trailing zeroes in n!.

**Input:** n = 5, **Output:** 1

**Explanation:** 5! = 120, one trailing zero.

(OR)

12. a Demonstrate the approach of Sieve of Eratosthenes. 5 6 L2  
b Write a C++ solution to Check If It Is a Good Array. 5 6 L3

**Statement:** Given an array nums of positive integers. Your task is to select some subset of nums, multiply each element by an integer and add all these numbers. The array is said to be good if you can obtain a sum of 1 from the array by any possible subset and multiplicand. Return True if the array is good otherwise return False.

**Input:** nums = [12,5,7,23], **Output:** true

**Explanation:** Pick numbers 5 and 7.

$5*3 + 7*(-2) = 1$

**Time: 3 Hours****Max Marks: 60**

Answer ONE Question from each Unit

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	<u><b>UNIT-I</b></u>	Marks	CO	Blooms Level
1. Define an Operator and Explain operators in CPP. (OR)		10	1	L1
2. What are input and output statements in CPP. Explain built functions.		10	1	L2
	<u><b>UNIT-II</b></u>			
3. Explain OOP principles in detail. (OR)		10	2	L3
4. What are the keywords in Exception Handling? Explain.		10	2	L2
	<u><b>UNIT-III</b></u>			
5. Define space complexity. Explain with an example program. (OR)		10	3	L1
6. Explain Big-oh, Omega, Theta notations clearly with example program.		10	3	L3
	<u><b>UNIT-IV</b></u>			
7. Define stack? Explain all operations for stack with example program. (OR)		10	4	L2
8. What is priority queue? Describe in detail.		10	4	L1
	<u><b>UNIT-V</b></u>			
9. What are the different types of operators in SQL? Explain with queries. (OR)		10	5	L1
10. Write queries using order by and group by. Explain in detail.		10	5	L2
	<u><b>UNIT-VI</b></u>			
11. Explain about different types of joins with suitable examples? (OR)		10	6	L2
12. What is the difference between a sub query and a correlated sub query? Explain with suitable queries.		10	6	L4

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		Marks	CO	Blooms Level
<b><u>UNIT-I</u></b>				
1.	Determine g.c.d of 275 and 200, and express it in the form of $m.275+n.200$ .	10	CO1	L3
<b>(OR)</b>				
2.	Prove that $3^{2n+2} - 8n - 9$ is divisible by 64	10	CO1	L3
<b><u>UNIT-II</u></b>				
3.	Show that $10^n + 3.4^{n+2} + 5 \equiv 0 \pmod{9}$	10	CO2	L3
<b>(OR)</b>				
4.	Solve the congruence $17x \equiv 9 \pmod{276}$	10	CO2	L3
<b><u>UNIT-III</u></b>				
5.	Show that $4(29!)+5! \equiv 0 \pmod{31}$ . Find $4^{532} \pmod{11}$ by Fermat theorem.	10	CO3	L3
<b>(OR)</b>				
6.	Solve $x \equiv 2 \pmod{3}, x \equiv 4 \pmod{5}, x \equiv 5 \pmod{7}$ , using Chinese remainder theorem	10	CO3	L3
<b><u>UNIT-IV</u></b>				
7.	Determine the number of divisors and sum divisors of 1800	10	CO4	L3
<b>(OR)</b>				
8.	Determine $\phi(96), \phi(720), \phi(1200), \phi(3600)$ Determine $\mu(11), \mu(15), \mu(17), \mu(20)$	10	CO4	L3
<b><u>UNIT-V</u></b>				
9.	Find NRP & $\bar{N}RP$ when $p=7, 17, 19$	10	CO5	L3
<b>(OR)</b>				
10.	Determine whether 85 is quadratic residue of 223 or not	10	CO5	L3
<b><u>UNIT-VI</u></b>				
11.	Using Caesar cipher method, To decrypt the message "wklvkvkrzzhghflskhu" by using transformation $p \equiv c - 3 \pmod{26}$	10	CO6	L3
<b>(OR)</b>				
12.	To encrypt the plaintext message "MILLENNIUM" using the key "YTWOK"	10	CO6	L3

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Max Marks: 60

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		Marks	CO	Blooms Level
<b><u>UNIT-I</u></b>				
1.	Explain about the Conventional Building Materials?	10	01	02
<b>(OR)</b>				
2.	Explain the Objectives, merits and demerits of Concrete?	10	01	02
<b><u>UNIT-II</u></b>				
a.	Illustrate the following:	05	02	02
3.	a) Set-back or Building line b) Floor Space Index or Floor area ratio			
b.	Classify the Buildings as per National Building Code (NBC)?	05	02	02
<b>(OR)</b>				
a.	Explain the objectives of building bye-laws and summarize their principles?	05	02	02
4.	b. Explain the open space requirements which are essential to satisfy the lighting and ventilation requirement of a building?	05	02	02
<b><u>UNIT-III</u></b>				
5.	What is meant by superstructure and explain the following terms: i) Plinth ii) Plinth Beam iii) Damp Proof Course	10	03	02
<b>(OR)</b>				
a.	Illustrate the following beams with a neat sketch	06	03	02
6.	i. Reinforced Concrete Beam ii. Steel Beam iii. Cantilever Beam			
b.	Determine the estimation of peak discharge for the residential colonies	04	03	05
<b><u>UNIT-IV</u></b>				
a.	Explain the following points related to planning of school (public) building?	06	04	02
7.	i) Aspect ii) Prospect and iii) Grouping			
b.	Explain the requirements and minimum standards for group B– Educational Buildings	04	04	02
<b>(OR)</b>				
8.	Draw the line plan of a hospital with the given site measurement 15mx10m?	10	04	03
<b><u>UNIT-V</u></b>				
a.	Draw the sun path diagram and Summarize the CBRI	06	05	02
9.	recommendations for obtaining optimum orientation of a building?			
b.	Illustrate the English and Flemish brick bonds with a neat sketch?	04	05	02
<b>(OR)</b>				
10.	What do you mean by orientation of building and Explain the criteria for orientation of residential building with reference to climate zones of India?	10	05	02
<b><u>UNIT-VI</u></b>				
11.	Draw the line diagram of plan and elevation for single room residential building with suitable dimensions?	10	06	03
<b>(OR)</b>				
12.	Draw the single room office building section and elevation with suitable dimensions?	10	06	03