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Air University

(Final-Term Examination: Fall 2025)

Subject: Programming Fundamentals	Total Marks: 100
Course Code: CS-111	Date:
Class: BS-ESS	Time:
Semester: I	Duration: **3 Hours**
Section: A	Instructor Name: **Hamza Ayub**
HoD Signature: _____	Instructor Signature: _____

Instructions:

1. Read the questions carefully. Develop the logic and then proceed. As marks will be awarded on correct logic.
2. Do not write on the question paper. Everything should be written on your answer books.
3. Rough work should also be done on your answer books.
4. Though the programs are hand written but only the correct syntax will be awarded marks.
5. If you read instructions till here then make a smiley face on answer sheet and get two bonus marks.
6. This examination carries 45% weight towards the final grade.

CLO 1	**Marks: 30**
Question 1(a): Write answers in 2–3 lines each	**(Marks: 10+5)**

i. How do you initialize all elements of an integer array to zero at declaration?

ii. Write three rules of declaring an identifier in C++ program.

iii. Which header file is required for file operations in C++?

iv. Evaluate the expression: 8 - (2 - 4 + 2 * (5 - 1) - 1)

v. What is difference between prefix & postfix operators?

vi. What is standard input, output, and error streams?

vii. How do you obtain the memory address of a variable x?

viii. What is the purpose of the try, catch, and throw keywords?

ix. What is the primary risk of recursion if not implemented carefully?

x. Identify and correct the errors in each of the following statements (assume that the statement using std::cout; is used):

```
if ( c < 7 );
cout << "c is less than 7\n";
if ( c => 7 )
```

```
cout << "c is equal to or greater than 7\n";
```

Question 1(b): State whether the following are True or False

i. Functions help in reusing code.
ii. Syntax errors occur when the program logic is incorrect.
iii. Logical operators include AND, OR, and NOT.
iv. The compiler directly executes the source code line by line.
v. An algorithm is a step-by-step procedure for solving a problem.

Question 2(a): Following is given the pseudocode for a program, **change** it into C++ source code with proper syntax. **(Marks: 6+4+5)**

- Start
- Define function calculatePercentage(totalMarks, obtainedMarks)
- Return (obtainedMarks / totalMarks) * 100
- Declare float variables total, obtained, percent
- Input total and obtained
- Call function and store result in percent
- If percent >= 90 then Display "Grade A"
- Else if percent >= 75 then Display "Grade B"
- Else if percent >= 50 then Display "Grade C"
- Else Display "Fail"
- End

Question 2(b): Write a for statement to add all the numbers divisible by 3 or 5 between 1 and 1000.

Question 2(c): Write a C++ program that generates and prints the Fibonacci series up to n terms, where n is provided by the user.
Requirements:

1. Take Input:
   - Ask the user to enter a positive integer n (number of terms to generate).
2. Generate Fibonacci Series:
   - The Fibonacci series starts with: 0, 1, 1, 2, 3, 5, 8, 13, ...
   - First two terms are 0 and 1.
   - Each subsequent term is the sum of the previous two terms.

CLO 2	Marks: 35

Question 3(a): What is the output of the following program?
 	
`#include <iostream>`
`using namespace std;`
`void func1();`
`void func2();`
`int main()`
`{`
`int num;`
`cout << "Enter 1 or 2: ";`
`cin >> num;`
`cout << endl;`
`cout << "Take ";`
`if (num == 1)`
`func1();`
`else if (num == 2)`
`func2();`
`else`
`cout << "Invalid input. You must enter a 1 or 2" << endl;`
`return 0;`
`}`
`void func1()`
`{`
`cout << "Programming I." <<endl;`
`}`
`void func2()`
`{`
`cout << "Programming II." << endl;`
`}`
 	
1. What is the output if the input is 1?
2. What is the output if the input is 2?
3. What is the output if the input is 3?
4. What is the output if the input is -1?
 	
Question 3(b): Write the definition of a void function that takes as input an integer and outputs two times the number if it is even; otherwise, it outputs five times the number.
	(Marks: 8+7)

Question 4(a): Write a program that reads a file consisting of students' test scores in the range **0–200**. It should then determine the number of students having scores in each of the following ranges: **0–24, 25–49, 50–74, 75–99, 100–124, 125–149, 150–174,** and **175–200**. Output the score ranges and the number of students. (Run your program with the following input data: 76, 89, 150, 135, 200, 76, 12, 100, 150, 28, 178, 189, 167, 200, 175, 150, 87, 99, 129, 149, 176, 200, 87, 35, 157, 189.) **Question 4(b):** Write a program that uses a two-dimensional array to store the highest and lowest temperatures for each month of the year. The program should output the average high, average low, and the highest and lowest temperatures for the year. Your program must consist of the following functions: i. Function **getData**: This function reads and stores data in the two-dimensional array. ii. Function **averageHigh**: This function calculates and returns the average high temperature for the year. iii. Function **averageLow**: This function calculates and returns the average low temperature for the year. iv. Function **indexHighTemp**: This function returns the index of the highest high temperature in the array. v. Function **indexLowTemp**: This function returns the index of the lowest low temperature in the array.	**(Marks: 10+10)**
CLO 3	**Marks: 35**
Question 5(a): Write a program that prompts the user to enter a person's date of birth in numeric form such as 8-27-1980. The program then outputs the date of birth in the form: August 27, 1980. Your program must contain at least two exception **classes**: **invalidDay** and **invalidMonth**. If the user enters an invalid value for day, then the program should throw and catch an **invalidDay** object. Follow similar conventions for the invalid values of month and year. (Note that your program must handle a leap year.) **Question 5(b):** Write a C++ program to perform following pointer operations with a 1D array: **Requirements:** 1. Create an integer array of size 10 and initialize it with values 1 through 10 2. Use a pointer to: o Print all array elements o Calculate and print the sum of all elements o Find and print the maximum element o Reverse the array (in-place)	**(Marks: 10+10)**

Question 6: Write a C++ program that converts a **binary number** (base 2) into its equivalent **decimal representation** (base 10) using **recursion only**. **Requirements:** 1. The program should: o Take a binary number as input from the user (positive integer containing only digits 0 and 1). o Implement the conversion **entirely using recursion** without using loops, exponentiation functions like pow(), or iterative methods. o Display the decimal equivalent as output. 2. The recursive function must: o Process the binary number digit by digit from right to left. o Use the formula: (last_digit * 2^position) + decimal_value_of_remaining_number o Position starts at 0 for the rightmost digit. o Base case: When the binary number becomes 0, return 0. 3. Handle edge cases properly: o Binary input 0 → Decimal 0 o Binary input 1 → Decimal 1 o Invalid input (containing digits other than 0 or 1) should display an error message and exit. 4. Include appropriate comments explaining the recursive logic.	**(Marks: 15)**

**********END**********