Reg. No. .....

Indian Institute of Information Technology, Surat
Department of Computer Science & Engineering
Makeup End Semester Examination 1st Sem, 2025-26
Fundamentals of Computer and C Programming (CS101)

Timing: 10:00 AM - 1:00 PM **Date: 16 Feb 2026** **Max Marks: 100**

Instructions: Attempt all parts of a question at one place. If you do not, later parts may not be graded.

1. State whether the following statements are **true** or **false**. If the statement is false then **write the intended correct statement.** **(5x2=10)**

a. The last element of an array `Arr` of size `10` can be accessed by `Arr[-1]`.

b. The largest integer that can be stored in a `4`-byte int variable is 2^{31}.

c. The `<stdio.h>` header file is required to use `malloc()`.

d. The function `strconcat()` is used to concat two strings.

e. In a nested loop, a `break;` statement inside the inner loop causes the program to immediately exit from the outermost loop.

2. Choose the single correct answer for each of the following questions. **(5x2=10)**

a. What is the correct way to declare a pointer to an integer?
i. `int ptr;` ii. `int *ptr;` iii. `ptr int;` iv. `ptr int*;`

b. What happens if you try to assign a value to an array name (e.g. `arr=10;`)?
i. Changes the first element ii. Changes the array size
iii. Runtime Error iv. Compilation Error (in C)

c. What happens if you forget the break statement inside a switch case?
i. Compilation Error ii. Runtime Error
iii. Program goes into an infinite loop iv. Next case is executed

d. Which of the following is "False" in a conditional statement?
i. `-1` ii. `0` iii. Both, i and ii iv. None of i or ii

e. Which of the following is the correct syntax for an Else-If ladder?
i. `elif (condition)` ii. `elseif (condition)`
iii. `else if (condition)` iv. `else (condition)`

3. For each of the C code snippets below, classify it as compilation error, runtime error, undefined behavior, or correct. Then, **fix and rewrite** the corrected code snippet (if needed) assuming standard context. **(3x5=15)**

a.
```
str wish = "good luck!" //String wish should store "good luck!" (without quotation marks) int *ptr; *ptr = 101; //The value of integer pointed by ptr should be 101
```

b.
```
long double x=23; scanf("%ld", x); //Read a long double from user
```

4. Write the output of the following programs. Assume that the required header files are included. Assume a standard 64-bit Linux environment identical to that in labs. **(3x5=15)**

a.

```c
int calc(int x, int y) {
    if (x <= 0) return y;
    if (y <= 0) return x;
    return calc(x - 2, y - 1) + x;
}

int main() {
    printf("%d", calc(5, 3));
    return 0;
}
```

b.

```c
void mystery(int n) {
    if (n <= 0) return;
    if (n % 2 == 0) {
        mystery(n - 1);
        printf("%d ", n);
    } else {
        printf("%d ", n);
        mystery(n - 2);
    }
}
int main() {
    mystery(4);
    return 0;
}
```

c.

```c
int main() {
    int i = 0;
    while (i < 5) {
        i += 2;
        if (i == 4) {
            continue;
        }
        printf("%d ", i);
    }
    return 0;
}
```

5. Answer the following: **(4x5=20)**

a. Give the function prototype of `malloc()`. Explain **in three lines** its purpose and why the function `free()` should be called after `malloc()`.

b. Show calculation and write the number `-42` as a `4`-byte integer under `2`'s complement notation. **Box your final answer.**

c. Explain the concept of a recursive function **in two lines** and write a recursive function `int sum_of_digits(int n);` that recursively computes the sum of digits of the parameter `n`.

d. Explain the von Neumann architecture **in two lines** and draw a basic diagram.

6. Write complete C programs for **any two** of the following. You should properly indent and add comments in your code. Use appropriate datatypes as necessary. **(2x15=30)**

a. Read a line of text (string) from the user, followed by a single character to be searched for. You may assume the string contains only upper and lower case alphabets and will not exceed `1000` characters. Implement a function with the prototype: `void swap_case(char *str, char c);` that swaps the case of every occurrence of `c` in `str`. The main function should then display the updated string.

b. Read a number `N` and then an array `Arr` of `N` integers from the user. You may assume that `N` and all input integers are positive and at most `1000`. Calculate and print the mean and variance of `Arr`.

c. Implement a `struct Time` with `int` fields hours and minutes. Write a function `add_time` that takes two such `Time` structs and adds them by returning a `struct Time` variable. In the main function, you should call `add_time` function to add `1` hour `30` minutes and `3` hours `40` minutes and print the resulting time.