ಭಾರತೀಯ ಮಾಹಿತಿ ತಂತ್ರಜ್ಞಾನ ಸಂಸ್ಥೆ ರಾಯಚೂರು
भारतीय सूचना प्रौद्योगिकी संस्थान रायचूर
Indian Institute of Information Technology Raichur

Lab - 3

Introduction to Programming (ID110)
Date: November 6, 2024
Topics: Recursion

Time: 1.5 Hr | CSE'24, Semester - I | Max marks: 10

Instructions:

- The lab session consists of **three programming questions**, of which the **first** question is **mandatory**. From **second and third** question, **only one** needs to be solved. Consider the given options for question solving carefully.
- External materials (e.g., notes, books) and electronic devices (e.g., mobile phones, smart watch, bluetooth) are **strictly prohibited**. Only a **blank sheet of paper** and a **pen** may be used for rough work.
- Internet usage is **not allowed** under any circumstances. Any violations will lead to **serious academic consequences**, including potential disqualification from the lab.
- Any form of **plagiarism or academic dishonesty** will be treated with the utmost seriousness and may result in severe penalties, including a zero for the lab or further disciplinary actions.
- Code must be written from scratch during the session. Pre-written code snippets or solutions will not be accepted. Use meaningful variable names and add appropriate comments where necessary.
- Upon completion, **two code files** named after **roll no.** (e.g., "CS24B1001-Lab3-p1.c" and either one of "CS24B1001-Lab3-p2.c" and "CS24B1001-Lab3-p3.c") must be sub- mitted on **Google Classroom**. Not following the naming convention will lead to **minus marking**. The submission will only be accepted if done in the presence of TA.

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1. Write a C Program to calculate the sum of the sequential numbers up to n^{th} term. using recursive function where n is a whole number. The sequence is defined as the following:

   3 *0th expression*, 12 *1st expression*, 33 *2nd expression*, 72 *3rd expression*, 135 *4th expression*, . . .

   Note: For mathematical operations <*math.h*> can be used as per requirement.

   (**Hint** : use *Mathematical Induction* to find the n^{th} expression.)

   Input Format:

   - An integer n representing the positive integer including zero.

   Output Format:

   - An integer S representing the **sum of the integers** of the sequential numbers up to n^{th} term.

Examples:

- **Input:**

  3

  Output:

  120

- **Input:**

  10

  Output:

  1353

- **Input:**

  0

  Output:

  3

(5 marks)

2. Write a C Program to calculate the Greatest Common Divisor (GCD) and Least Common Multiple (LCM) of two natural numbers using recursive function. Add a short explanation of the base cases you considered in comments.

   (*Bonus*: **+2** if you find the GCD and LCM of an array of natural numbers.)

   Input Format:

   - An integer *n* representing the first natural number.
   - An integer *m* representing the second natural number.

   Output Format:

   - Print the GCD and LCM separated by space.

   Examples:

   - **Input:**

     12
     10

     Output:

     2 60

- **Input:**

  7

  6

  Output:

  1 42

- *Only for bonus question:*

  Input:

  4

  48 60 72 84

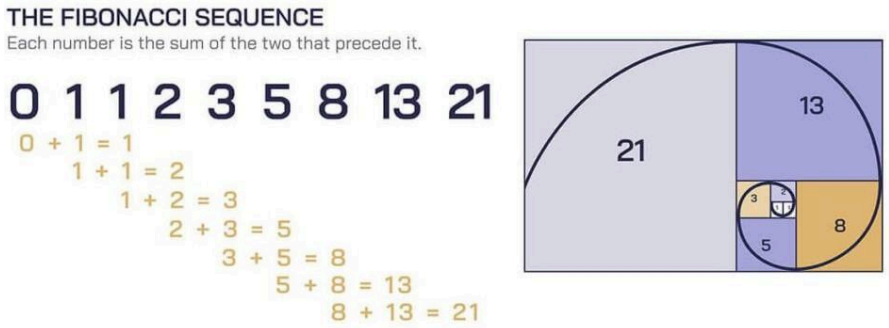
  Output:

  12 5040

(5 marks)

OR

3. Write a C Program to calculate the sum of the first *n* Fibonacci numbers using a re- cursive function. Consider *0* as the first Fibonacci number. Add a short explanation of the base cases you considered in comments.
   (*Bonus*: **+2** if you use function to add the Fibonacci Numbers)



Input Format:

- A natural number *n* representing the total Fibonacci numbers to add.

Output Format:

- A natural number *S* representing the sum of first *n* Fibonacci numbers.

Examples:

- **Input:**

  5

  Output:

  7

- **Input:**

  1

  Output:

  0

- **Input:**

  10

  Output:

  88

(5 marks)

All the Best!