# User Defined Data Type

**1-** C Program to store information (name, roll and marks) for a student using structure and display it.

**2-** C Program to add two distances (inch-feet) using structure and display the result.

**3-** C function to add two complex numbers by passing two structures to a function and display the results.

**4-** C Function to calculate the difference between two time periods using structures.

**5-** C Function to store information (name, id and grade) for 10 students in array of structures using pointers and another function to print all the structures using pointers.

**6-** Create Union type called **family_name** it shall have two members **first_name** and **last_name**. The two members are array of characters with same size 30. Try to write string in the first member **first_name** then print the second member **last_name** plus print the size of the union.

**7-** Create enum type called **fan_level** it shall have three values **Level1**, **Level2** and **Level3**. This enum shall be used to control the level of the fan.

# Linked List

**8-** Write a C function that insert linked list node at any position. The function takes the data of the node and the node position as inputs.

For example if we have a linked list contains the following data nodes: 11 3 10 50 23 5 60

If you asked the function to insert a new node has data equals to 15 at position 3 the linked list should be: 11 3 10 15 50 23 5 60

**9-** Write a C Function that returns the data of the middle node in a linked list and in case the linked list contains only one node return the data inside this node.

**10-** Write a C function that returns the data inside the 5th element from the end of linked list and in case the linked list contains only one node return the data inside this node.

**11-** Write a C function that returns the sum of all the nodes in linked list.

**12-** Write a C function that returns the maximum data value in the linked list.

# Embedded C Concept

**13-** Write a C Macro **GET_BIT** to read certain bit in a register or variable. The Macro inputs are the register or variable and the bit number.

**14-** Write a C Macro to calculate the sum of an array.

**15-** Given an integer number we want to know the value of the $4_{th}$ least significant bit in num's binary representation, For example if num = 23 we first convert it to its binary representation (10111). When we count the bits from least to most significant, we see that the $4_{th}$ least significant bit is 0.

**16-** Write a C function that counts number of falling edges (i.e change from high to low) that occurs on a digital input pin. You are required to complete the function **FallingEdgCounter()** which called periodically and have one input parameter that contain the last reading for the port pin (e.g 0:Low 1:High) and returns accumulated number of falling edges since the first function call.

**17-** Write a C function that counts number of rising edges(i.e change from low to high) that occurs on a digital input pin. You are required to complete the function **RisingEdgCounter()** which called periodically and have one input parameter that contain the last reading for the port pin (e.g 0:Low 1:High) and returns accumulated number of rising edges since the first function call.

**18-** Write a C function to perform a right circular shift for an unsigned 32 bits integer a given number of times and copy the output to third argument and return 0 if OK and 0xFF if the number of shifts > 32 in this case copy input to output without doing any shifts.

**unsigned char RightCircularShift(unsigned int InputNumber, int NumberOfShifts, unsigned int * pOutput)**

**19-** Write a C function that clears a specified bit in a giver number (bit number starts from 0) and return the new value of the number. If not possible return the same number as it is.

**Example:**

Input Number = 3

Bit Position = 0

Result = 2