भारतीय सूचना प्रौद्योगिकी संस्थान गुवाहाटी
Indian Institute of Information Technology Guwahati
COMPUTER PROGRAMMING LAB (CS110)
ASSIGNMENTS–11

1. Write a macro to test whether a character is a small case letter.

2. Write a macro to find the larger number of two numbers.

3. Print the source filename, date of compilation, time of compilation, function name, and line number using a macro.

4. Create a structure `student` in C to store the following information about a student:

    i. `name`, a string (an array) of 11 characters.
    ii. `roll`, an integer.
    iii. `sex`, a character, 'M' (male), 'F' (female), 'T' (third gender/ other).
    iv. `gpa`, i.e., grade point average, a real (`double`) value.

   Now, perform the following:

    i. Write a function to print an instance of the structure. You must pass an instance of `student` to the function. You must access the member variables using the "." operator.
    ii. Create an instance/ object of `student`. Print the address of the instance. Now, print the address of each of its member variables. Print the structure size using the `sizeof()` operator.
    iii. Use the preprocessor directive
    `#pragma pack(1)`
    before defining the structure. Create an instance/ object of `student`. Print the address of the instance. Now, print the address of each of its member variables. Print the structure size using the `sizeof()` operator.
    iv. Create an array of five `student` objects taking user inputs. Print the details of each student. Print the address of each of the five objects.

v. Write a function to print an instance of the structure. You must pass the pointer of an instance of student to the function. You must use the "->" operator to access the member variables.

5. Realize the following program:

```c
#include <stdio.h>
typedef struct node_t {
    int data;
    struct node_t *next;
} Node_t, *Node;
void f(Node_t *h) {
    h ? printf("%d -> ", h->data), f(h->next) : printf("NULL");
}
void g(Node_t *h) {
    h ? g(h->next), printf(" <- %d", h->data) : printf("NULL");
}
int main() {
    Node_t n4 = {4, 0}, n3 = {3, &n4}, n2 = {2, &n3}, n1 = {1, &n2};
    Node h = &n1;
    f(h);
    printf("\n");
    g(h);
    return 0;
}
```

6. Define a union that contains (i) a char variable, (ii) an int variable, (iii) a float variable, and (iv) a double variable. Now, perform the following:

    i. Create an object of the union. Print the address of each variable.

    ii. Print the size of the union using the sizeof() operator.

    iii. Create an object of the union and initialize it to zero (use "= {0}" during initialization). Assign a value to the char variable and print the other member variables.

    iv. Create an object of the union and initialize it to zero (use "= {0}" during initialization). Assign a value to the int variable and print the other member variables.

    v. Use a pointer to the created object. Access the elements using the "->" operator.

7. Define a structure S that has two member variables: (i) a member of type int and (ii) a member of a nested structure, P. P has two member variables: (i) a member variable of type char, and (ii) a member variable of a nested-union U. U has a member of type char and a member of type float. Create an object of this structure. Scan each of these member variables from the keyboard. Print each of these member variables.