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ISLAMIC UNIVERSITY OF TECHNOLOGY (IUT)
ORGANISATION OF ISLAMIC COOPERATION (OIC)
Department of Computer Science and Engineering (CSE)

SEMESTER FINAL EXAMINATION
DURATION: 3 HOURS

WINTER SEMESTER, 2022-2023
FULL MARKS: 150

CSE 4373: Computer Programming and Applications

Programmable calculators are not allowed. Do not write anything on the question paper.
Answer all 6 (six) questions. Figures in the right margin indicate full marks of questions whereas corresponding CO and PO are written within parentheses.

1. a) State the names of the basic components of a simple C program and explain their purpose. 6
(CO1)
(PO1)
- b) Consider two 8-bit unsigned integer variables, $a = 50$ and $b = 60$. What will be the output of the following bitwise operations:
 $a \& b, a | b, a \wedge b, a \gg 1, b \gg 1, a \ll 1, b \ll 1, \sim a, \sim b$ 10
(CO1)
(PO1)
- Show the intermediate steps of each of the operations using the binary representation of a and b .
- c) Determine the output of the program shown in Code Snippet 1. 5
(CO1)
(PO1)
- ```

1 #include <stdio.h>
2
3 int main() {
4 int x = 20, y = 5;
5 x+=y;
6 printf("Result of op1: %d\n", x);
7 x-=y;
8 printf("Result of op2: %d\n", x);
9 x*=y;
10 printf("Result of op3: %d\n", x);
11 x/=y;
12 printf("Result of op4: %d\n", x);
13 x%=y;
14 printf("Result of op5: %d", x);
15 return 0;
16 }

```
- Code Snippet 1: C program for Question 1.c)**
- d) Write the syntax of the nested if-else and the switch conditional statements. Write a C program to create a menu driven calculator that performs basic arithmetic operations (add, subtract, multiply, and divide) using switch case. The calculator should accept two integers and an operator as input from the user. It should perform the operation according to the operator. Your program should also check for invalid input. 9  
(CO1)  
(PO1)
2. a) Write the syntax of function prototype, function definition, and function calling when working with a user-defined function in C programming language. Write a C program to find the factorial of a number,  $num$  by calling a function named `getFactorial`. The prototype of the function is: `int getFactorial(int num);` 9  
(CO2)  
(PO1)

- b) Define algorithm and flowchart. Explain the five basic symbols used in a flowchart. Draw a flowchart to represent a while loop. 7  
(CO1)  
(PO1)
- c) Suppose you need to find the sum of  $N$  numbers taken as input from the user. Write the algorithm and corresponding flowchart to represent the solution of this problem. 6  
(CO2)  
(PO1)
- d) Write a C program for the algorithm that you devised in Question 2.c). 6  
(CO3)  
(PO1)

3. a) Why do we need to use loops in programming? How many types of loops do we have in C programming? Write the syntax for each of them. 5  
(CO1)  
(PO1)
- b) What is the use of break and continue statement in C? Determine the output of the program shown in Code Snippet 2. 7  
(CO1)  
(PO1)

```

1 #include <stdio.h>
2
3 int main() {
4 int i, sum=0;
5 for (i = 5; ; ++i) {
6 if(i == 10){
7 continue;
8 }
9 if(i==15){
10 break;
11 }
12 sum += i;
13 }
14 printf("Sum = %d", sum);
15 return 0;
16 }

```

**Code Snippet 2:** C program for Question 3.b)

- c) Explain the six relational and three logical operators in C programming language with code example(s). 9  
(CO1)  
(PO1)
4. a) What is a pointer in C programming language? Write the syntax of declaring a pointer. Explain the relation of pointer and dynamic memory allocation. What is the difference between compile time and run time memory allocation? 8  
(CO1)  
(PO1)
- b) Write a C program to open a file named "CSE4373exam.txt" and write the following contents in the file:  
 Today is 22 December, 2023  
 The date for final exam of CSE4373  
 Also, write the code to read the contents of the same file. 6  
(CO1)  
(PO1)

- c) Consider the memory representation in Figure 1 for the variables in Code Snippet 3 and determine the output of the program:

6  
(CO1)  
(PO1)

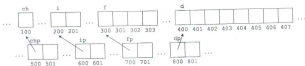


Figure 1: Partial memory representation for Question 4.c)

```

1 #include <stdio.h>
2
3 int main() {
4 char ch = 'a', *chp;
5 int i = 10, *ip;
6 float f = 12.34, *fp;
7 double d = 12.3456, *dp;
8
9 printf("value of ch: %c\n", *chp);
10 printf("value of i: %d\n", *ip);
11 printf("value of f: %f\n", *fp);
12 printf("value of d: %lf\n", *dp);
13
14 printf("Address of chp: %ld, and address of ch: %ld", &chp, chp);
15 printf("Address of ip: %ld, and address of i: %ld", &ip, ip);
16 printf("Address of fp: %ld, and address of f: %ld", &fp, fp);
17 printf("Address of dp: %ld, and address of d: %ld", &dp, dp);
18
19 return 0;
20 }

```

Code Snippet 3: C program for Question 4.c)

5. Suppose you are assigned a task to store information of 10 employees of a company. You need to store three information: employee ID, name of the employee, and salary of the employee.
- What is user-defined datatype? Mention three user-defined datatypes in C. Write the difference between a structure and a union. Write the syntax for creating a structure and a union.
  - Write the C code fragment to create a structure named `employeeInfo` to store the information of the employees described above. Calculate the memory space needed for your created structure.
  - Write a C program to take input of the information about all the employees and print a list containing names of employees with their salary. Also, this program should find out the employee who gets the highest salary.
6. a) What is the use of array in C programming language? What is the difference of array and string? Show three different ways you can initialize the values of a 2D array.
- Write a C program to sort a 10 element integer array in descending order using bubble sort algorithm

6  
(CO1)  
(PO1)

5  
(CO1)  
(PO1)

12  
(CO2)  
(PO1)

6  
(CO1)  
(PO1)

8  
(CO1)  
(PO1)

- c) What is *pass by value* and *pass by reference*? Determine the output of the program shown in Code Snippet 4.

8  
(CO1)  
(PO1)

```
1 void change(int firstVariable, int secondVariable)
2 {
3 int tempVariable;
4 tempVariable = firstVariable;
5 firstVariable = secondVariable;
6 secondVariable = tempVariable;
7 }
8
9 int main(void)
10 {
11 int a = 40, b = 20;
12 printf("before calling the function: value of a: %d , value of
13 b: %d\n", a, b);
14 change(a, b);
15 printf("after calling the function: value of a: %d, value of b:
16 %d\n", a, b");
17 return 0;
18 }
```

**Code Snippet 4:** C program for Question 6.c)

Does the change (int, int) function use *pass by value* or *pass by reference* for argument passing?

- d) Convert the code in Question 6.c) so that it uses the other type of passing of arguments.

6  
(CO1)  
(PO1)