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UNIVERSITI SAINS MALAYSIA

First Semester Examination  
Academic Session 2001/2002

September 2001

**CSI502 – Problem Solving and Programming**

Duration : 3 hours

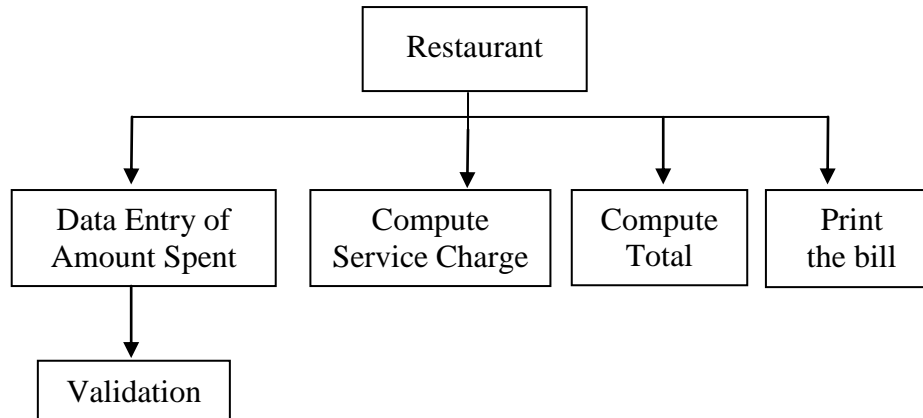
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**INSTRUCTION TO CANDIDATE:**

- Please ensure that this examination paper contains **FOUR** questions in **FIVE** printed pages before you start the examination.
  - Answer **ALL** questions.
  - You can choose to answer either in Bahasa Malaysia or English.
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ENGLISH VERSION OF THE QUESTION PAPER

1. (a) Write an algorithm to read three numbers and output them in ascending sequence, for example, input: 12, 9, 10; output: 9, 10, 12. [4/100]
- (b) Explain why modular design is important for program design. [3/100]
- (c) Recently all the petrol stations in Penang implemented the self-service system. Draw a flow chart to show the process of pumping petrol. [6/100]
- (d) Write an algorithm in pseudocode to read a list of names, and display the names in a descending order. [5/100]
- (e) Below is a simple structure chart of a restaurant program. Show the corresponding chart in a modular C program and omit the irrelevant part. In other words, your coding need not be a complete program, but at least show the declaration of each function and the respected function call.



[7/100]

2. (a) A program contains the following declarations and initial assignments:

```
int i =10, j=4;
char ch1= 'b', ch2 = 'y';
float real1 = 122.56; real2 = 33.22;
```

Determine the output of each of the following C statements. Use the values initially assigned to the variables for each statement.

- (i) `printf("%d", 5 + i * 3 % 2 - j * 4);`
- (ii) `printf("%d", ++i * 2 - j--);`
- (iii) `printf("%c", (ch1 < ch2) ? ch1 + 1: ch2 -1);`
- (iv) `printf("%14.0f", real1);`
- (v) `printf("%d", abs(real1) * 2 + ceil(real2));`

[5/100]

- (b) Change the for loop below to do-while loop.

```
#define PRICE 50

int i, item, total=0;

for (i =0; i < 5; i++) {
    scanf("%d", &item);
    if (item == 99) break;
    total = total + item * PRICE;
}
```

[7/100]

- (c) Correct the C programs below:

```
char name[30]
int 6num[3];
double interest/rate;

scanf("%s", &name);
print("%s", name);
```

[5/100]

- (d) What is the difference between a function call by value and a function call by reference? Illustrate your answer by giving an example in C.

[8/100]

3. (a) What are the basic steps in the software development method?

[6/100]

- (b) Study the codes below carefully. What will be printed when the following codes are executed?

```
int m[4][3] = {{2, 4, 6}, {1, 3, 5}, {3, 9, 27}, {8, 16, 24}};
int k[3][4];
```

```
for (i=0; i < 4; i++) {
    for (j=0; j < 3; j++) {
        switch (i) {
            case 0 :
                k[j][i] = m[i][j] - 1;
                break;
            case 1 :
                k[j][i] = m[i][j] + 3;
                break;
            case 2 :
                k[j][i] = m[i][j] / 3;
                break;
            case 3 :
                k[j][i] = m[i][j]++;
                break;
        } /* end switch */
    }
}
```

```
for (i=0; i < 3; i++) {
    printf("\n");
    for (j=0; j<4; j++) {
        printf("%d ", k[i][j]);
    }
}
```

[7/100]

- (c) Write your own function in C to compute the average for an array of integers. The last element of the array has a value 0.

The prototype of the function: double average(int numbers[]);

[7/100]

- (d) For a non-programmer who doesn't have the access to the source code of a program, what is the testing technique should he use to verify the program?

[5/100]

4. (a) Write a structure in C for a customer to keep the information as below:  
customer id, name, and amount spent.

[6/100]

- (b) Write a C program to do the operations that are addition, minus, multiply and divide for any two real numbers.

Example input/output of the program:

1. Addition
2. Minus
3. Multiply
4. Divide

Please key in your choice:

1

Please key in any two real numbers:

10.5      2.5

The result:  $10.5 + 2.5 = 13.0$

[12/100]

- (c) Write a selection statement to determine a leap year that can be divided by 4 but cannot be divided by 100. However, if it can be divided by 400, we also consider it as a leap year.

[7/100]