

Subject: PRF192- PFC

Workshop 05: POINTERS

Objectives:

- Practicing skills at analyzing and implementing the Pointer
- Programs using user-defined functions with multiple Pointer as return parameters.

Program 1 (1 mark)

Please explain the outputs of following codes of program which uses concept of pointer ?

```
1  #include <stdio.h>
2  int main () {
3      int b = 5;
4      int *p, *q;
5      p = &b;
6      q = p;
7      printf("Dia chi cua bien b la: %x\n", &b);
8      printf("Dia chi duoc luu tru trong bien p la: %x, bien q la: %x\n", p, q);
9      printf("Gia tri cua bien con tro *p la: %d, bien con tro *q la: %d\n", *p, *q);
10     return 0;
11 }
12
```

Program 2 (1 mark)

Please explain the outputs of following program which uses the pointer to pointer ?

```
1  #include <stdio.h>
2  int main () {
3      int b = 200;
4      int *p;
5      int **q;
6      p = &b;
7      q = &p;
8      printf("Gia tri cua bien b = %d\n", b);
9      printf("Dia chi cua bien b = %x\n", &b);
10     printf("Dia chi con tro p = %x\n", p);
11     printf("Gia tri bien con tro *p = %d\n", *p );
12     printf("Dia chi con tro q = %x\n", q);
13     printf("Gia tri bien con tro den con tro **q = %d\n", **q);
14     return 0;
15 }
16
```

Program 3 (1 mark)

Please explain the outputs of following codes of program which uses computation among of pointers ?

```

1  #include<stdio.h>
2  int main() {
3      int a = 15, b = 25;
4      int *p1 = &a, *p2 = &b;
5      printf("Truoc khi hoan doi: *p1=%d *p2=%d\n", *p1, *p2);
6      *p1 = *p1 + *p2;
7      *p2 = *p1 - *p2;
8      *p1 = *p1 - *p2;
9      printf("Sau khi hoan doi: *p1=%d *p2=%d", *p1, *p2);
10     return 0;
11 }
12

```

Program 4 (1.5 marks)

Please write a C function which uses **pointers** to swap 2 inputted floats, namely a and b. In which, a and b are pointer parameters of function swap.

Program 5 (1.5 marks)

Please write a C program using dynamic memory allocation (**malloc, calloc, free...**) and **pointers** to find out the biggest real number among 3 inputted real numbers.

Program 6 (1.5 marks)

Please write a C program which uses dynamic memory allocation (**malloc, calloc, free** and **pointers**). The program that will accept two integers and then sum of them, calculate their difference, their multiply, and their division and after that all results are printed out.

Program 7 (2.5 marks)

a) Design and code a C function named **roots** that calculates the roots of a quadratic equation. Your function receives three doubles that hold the coefficients of the quadratic equation and returns through two other double parameters the real roots of the equation. The function returns the number of real roots found as the return value of the function itself. The header for your function looks something like:

```
int roots(double a, double b, double c, double *r1, double *r2)
```

Consider the quadratic equation:

$$f(x) = a * x^2 + b * x + c$$

where **a**, **b** and **c** are constant coefficients. This equation may have up to 2 real roots. The roots are the values of **x** for which

$$a * x^2 + b * x + c = 0$$

The roots are given by the equations

$$x_1 = (- b + \text{sqrt}(D)) / (2 * a)$$

$$x_2 = (- b - \text{sqrt}(D)) / (2 * a)$$

where D is the discriminant

$$D = b^2 - 4 * a * c$$

If **D** is positive-valued, there are 2 real roots. If **D** is zero-valued, there is one real root. If **D** is negative-valued, there are no real roots.

If there is one real root, set **x₁** to its value and leave **x₂** unchanged. If there are no real roots, leave **x₁** and **x₂** unchanged.

b) Write a main C program using dynamic memory allocation (**malloc**, **calloc**, **free**...) to input coefficients a, b, c as doubles and **pointers** to get the 2 roots of quadratic equation which uses the function **roots** above.