## BMATH FIRST YEAR, FUNDAMENTALS OF COMPUTING AND PROGRAMMING MIDERM EXAMINATION

Date: Friday, 13th September, 2024 | Time: 10 am - 12 noon

## Part 1

Please answer all the questions. Each question carries 2 marks.

1. What would be the output of the following program.

```
#include <stdio.h>
int f(int a)
{
    int b = 0;
    while (a != 0)
    {
        b = b * 10 + a \% 10;
        a = a / 10;
    }
    return b;
}
int main()
ſ
    int n = f(28567);
    printf("%d\n", n);
}
```

2. What does the following program do? Please explain in a single sentence.

```
#include <stdio.h>
int main (void)
{
    int n = 0;
    while (getchar() != EOF)
    {
        ++n;
    }
    printf("%d\n", n);
}
```

3. What will be the output of the following program.

```
#include <stdio.h>
int f(int a, int b)
{
    if (a == 0)
        return 0;
    else
        return b + f(a-1, b);
}
int main()
{
    int n = f(1234, 5);
    printf("%d\n", n);
}
```

4. What will be the output of the following program.

```
#include <stdio.h>
void swap(int x, int y)
{
    int tmp = x;
    x = y;
    y = tmp;
}
int main()
{
    int x = 10;
    int y = 20;
    swap(x, y);
    printf("%d %d\n", x, y);
}
```

5. What will be the output of the following program.

```
#include <stdio.h>
int main()
{
    int values[] = {1, 2, 3, 4, 5};
    int i;
    int sum = 0;
    for (i=0; i<5; i++)
    {
        sum += values[i];
        printf("%d\n", sum);
    }
}</pre>
```

## Part 2

Please solve any two of the following three questions. Each question carries 5 marks.

 If we list all the natural numbers below 10 that are multiples of or 3 or 5, we get 3, 5, 6 and 9. Sum of these multiples is 23.

Write a program to compute the sum of all multiples of  $3 \text{ or } 5 \text{ below } 1000.^1$ 

(5 marks)

7. The sum of sequence of terms in the following series converges to  $\frac{\pi}{8}$  very slowly.

 $\frac{1}{1.3} + \frac{1}{5.7} + \frac{1}{9.11} + \dots$ 

For example, we take the first 3 terms:

 $\frac{1}{1.3} + \frac{1}{5.7} + \frac{1}{9.11} = \frac{1}{3} + \frac{1}{35} + \frac{1}{99} = 0.372005772005772$ 

If we multiply that with 8, we'll get 2.976, which is quite far from  $\pi$ , but it gets closer as we add more and more terms.

Write a program to compute the value of  $\pi$  using 10000 terms in the above sequence.

(5 marks)

<sup>&</sup>lt;sup>1</sup>This problem is adopted from the Problem 1 of Project Euler. https://projecteuler.net/problem=1

- 8. Write a function get\_prime that takes a positive integer n as argument and returns the  $n^{th}$  prime number. For example:
  - get\_prime(1) returns 2
  - get\_prime(2) returns 3
  - get\_prime(3) returns 5
  - get\_prime(4) returns 7

(5 marks)