Fundamentals of Computing Backpaper Examination

Date 30th December 2024

Time 3 hours

Total Marks 100

Part A (20 marks)

This part has five questions. Each part carries 4 marks

Question 1

What is the output of the following program?

```
#include<stdio.h>
int main(void)
{
    int i, j = 1;
    int *ip, *jp = &j;
    ip = jp;
    i = *ip;
    *jp = *ip + i;
    printf("%d %d %d %d\n", i, j, *ip, *jp);
    return 0;
}
```

Question 2

```
#include<stdio.h>
int f(int n)
{
    int i;
    int result = 0;
    for(i = 1; i <= n; i++)
    {
        result += 1;
        return result;
    }
}
int main(void)</pre>
```

```
{
    int n = f(10);
    printf("%d\n", n);
    return 0;
}
```

Question 3

What is the output of the following program?

```
#include<stdio.h>
int main(void)
{
    int x1,x2,y1,y2,z1,z2,i,j;
    x1 = i;
    x2 = i++;
    y1 = j++;
    y2 = j;
    z1 = i++;
    z2 = i;
    printf("%d %d %d\n", x1-x2, y1-y2, z1-z2);
    return 0;
}
```

Question 4

```
What is the output of the following program?
#include<stdio.h>
void nullify(int x)
{
    x = 0;
}
int main(void)
{
    int x = 1;
    nullify(x);
    printf("%d\n", x);
    return 0;
}
```

Question 5

```
#include<stdio.h>
int main(void)
{
```

```
int i,j,x = 0;
for(i = 0; i < 4; i++)
{
    for(j = 0; j < i; j++)
    {
        x+= i+j;
        }
        printf("%d\n", x);
    }
    printf("%d\n", x);
}</pre>
```

Part B (20 marks)

This part has two questions. Each part carries 10 marks

Question 6

```
Write a program countdown.c that takes a positive integer as a
command-line argument and prints all numbers counting down from that
number to 1.
For example:
$gcc countdown.c -o countdown
$./countdown 5
5
4
3
2
1
```

Question 7

Write a function array_reverse that takes an array of integers and size of the array as arguments and reverses the order of elements. The function should be able to take an array of any size. For example consider the following program:

#include<stdio.h>

//your code will come here

```
int main(void)
{
    int a[4] = {1,2,3,4};
    int b[7] = {1,2,3,4,5,6,7};
    int i;
```

```
array reverse(a,4);
    for(i = 0; i < 4; i++)
    {
         printf("%d", a[i]);
    }
    printf("\n");
    array reverse(b,7);
    for(i = 0; i < 7; i++)
    {
         printf("%d", b[i])
    }
    printf("\n");
}
After implementing your program for array reverse, the above program
will output the following:
4 3 2 1
7654321
```

Part C (60 marks)

This part has five questions. Please answer ANY four of them. Each part carries 15 marks.

Question 8

Write a program which asks for two positive integers and calculates their GCD using the Euclidean Algorithm.

Question 9

Write a program which asks for a positive integer and checks whether it is a prime number or not.

Question 10

Write a program which asks for a positive integer n and calculates the nth Fibonacci number F_n . Here $F_1 = F_2 = 1$ and $F_i = F_{i-1} + F_{i-2}$ for all i > 2.

Question 11

The smallest positive integer which is divisible by all the integers from 1 to 10 is 2520. Write a program to find the smallest positive integer which is divisible by all the integers from 1 to 50.

Question 12

The integer 145 has the property that the sum of the factorial of its digits is equal to itself. That is, 1!+4!+5!=145. Write a program to find all such positive integers.