Indian Association for the Cultivation of Science
(Deemed to be University under *de novo* Category)
Masters/Integrated Masters-PhD Program/Integrated Bachelors-Masters Program/PhD Course
Mid-Semester Examination-Autumn 2024

Subject: Introduction to Computing ***Subject Code: COM 1101***
Full Marks: 25 ***Time Allotted: 2 h***

Instructions *(please read carefully each point)*

- ★ Write as little as possible without missing out on any details
  - Think carefully before answering
  - There are no marks on being verbose
  - Sometimes, adding an example makes things easier
- ★ If you are making any valid assumption(s) while writing an answer, do remember to mention that information clearly and concisely
- ★ Answering guidelines
  - **Section A**: Just write the answers, no explanations necessary
  - **Section B**: Add 1-2 lines justifying your answer for anything non-trivial
  - **Section C**: Just write the 5 answers per questions, no need to write the entire code
- ★ *Consider all questions are for C language and assume the size of int and float as 4 bytes, char as 1 byte, double as 8 bytes, pointer variables as 8 bytes in this exam; also note the characters are evaluated using their ASCII values A-Z are valued 65-90 and a-z are valued 97-122 respectively*

Section A: (1 mark each) **Answer any seven questions** (7 questions × 1 mark = 7 marks)

1. What will be the output of the following code?

```
int x = 3, y = 4;
x = x++ + --y;
printf("%d", x);
```

6

2. What is the final value of 'result' after this code executes?

```
int a = 10, b = 2, result;
result = a / b * (b + 3) % 2;
```

12

3. Calculate the value of 'count' at the end of the nested loop?

```
int count = 0;
for (int i = 0; i < 4; i++) {
    for (int j = i; j < 4; j++) {
        count++;
    }
}
```

10

4. Predict the output of the following code:

```
int x = 1, y = 10;
while (y > 0) {
    x *= 2;
    y -= 2;
}
printf("%d", x);
```

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5. Evaluate the following expression assuming 'a = 2', 'b = 4', and 'c = 6':

```
int result = (a > b) ? (b > c) ? a : c : b;
```

4

6. Calculate the value of 'sum' after the loop executes:

```
int arr[] = {2, 4, 6, 8, 10};
int sum = 0;
for (int i = 0; i < 5; i++) {
    if (arr[i] % 4 == 0) {
        sum += arr[i];
    }
}
```

12

7. Given an array 'int arr[5] = {10, 20, 30, 40, 50};', what will be the value of '*(arr + 3)'?

40

8. In the following code, what value does '*p' print?

```
int arr[3] = {5, 10, 15};
int *p = arr;
p++;
printf("%d", *p);
```

10

Section B: (2 marks each) **Answer any six questions** (6 questions × 2 marks = 12 marks)

1. Predict the output of the following code:

```
int a = 5, b = 3;
int result = (a * b > 10) && (a / b < 2) ? a + b : a - b;
printf("%d", result);
```

8

2. What will be the value of 'product' after this loop executes?

```
int product = 1;
for (int i = 1; i <= 5; i++) {
    product *= i % 3;
}
```

0

3. Given the following code, what will be the value of 'count' after execution?

```
int count = 0;
for (int i = 1; i <= 5; i++) {
    for (int j = 1; j <= i; j++) {
        if (i % j == 0) {
            count++;
        }
    }
}
```

10

4. Write a function that takes an integer n and returns 1 if n is even and 0 if it is odd. Implement the function and test it with the number 7.

5. Calculate the value of 'sum' and the end of the code:

```
int arr[5] = {1, 2, 3, 4};
int sum = 0;
for (int i = 0; i < 5; i++) {
    sum += (arr[i] % 2 == 0) ? arr[i] * 2 : arr[i];
}
```

16

6. What is the value of 'result' after this conditional operator executes?

```
int a = 15, b = 20;
int result = (a % 3 == 0) ? a / 3 : b / 5;
```

5

7. What is printed by the following code?

```
int a = 7;
int *p = &a;
*p += 5;
printf("%d", a);
```

12

8. Predict the output of the following code:

```
int x = 10, y = 15;
int *p = &x;
p = &y;
printf("%d", *p);
```

15

Section C: (3 marks each) **Answer both questions** (2 questions × 3 marks = 6 marks)

1. Write a C program that takes an integer array of size n and rotates the elements by k positions to the right. For example, if the array is {1, 2, 3, 4, 5} and k = 2, the result should be {4, 5, 1, 2, 3}. Fill in the blanks to complete the program that rotates an integer array by `k` positions to the right:

```
#include <stdio.h>

void rotate(int arr[], int n, int k) {
   int temp[k];

   // Copy last k elements to temp array
   for (int i = 0; i < k; i++) {
      temp[i] = _____;  // (1)
   }

   // Shift the rest of the array elements
   for (int i = n - 1; i >= k; i--) {
      arr[i] = _____;  // (2)
   }

   // Copy back the temp array elements
   for (int i = 0; i < k; i++) {
      arr[_____] = _____;  // (3) & (4)
   }
}

int main() {
   int arr[] = {1, 2, 3, 4, 5};
   int n = sizeof(arr) / sizeof(arr[0]); // calculates number of elements in arr
   int k = 2;

   rotate(_____, n, k);  // (5)

   printf("Rotated Array: ");
   for (int i = 0; _____ ; ) { //(6)
      printf("%d ", arr[i++]);
   }
   return 0;
}
```

2. Write a C program that reads a number n and calculates the sum of the digits of n. If we have n = 9876, the program should calculate the answer to be 9+8+7+6 = 30. Fill in the blanks to complete the program that sums the digits of a number:

```
#include <stdio.h>

int sumOfDigits(int n) {
    int sum = _____; //(1)

    // Continue until n becomes 0
    while (_____) { //(2)
        sum += _____;  // (3)
        n = _____;  // (4)
    }

    return sum;
}

int main() {
    int number, result;
    printf("Enter a number: ");
    scanf("%d", &_____); //(5)

    result = sumOfDigits(_____);  // (6)

    printf("Sum of digits = %d", result);
    return 0;
}
```