राष्ट्रीय प्रौद्योगिकी संस्थान जमशेदपुर
NATIONAL INSTITUTE OF TECHNOLOGY JAMSHEDPUR
(An Institution of National Importance under MoE, Government of India)

Department of Computer Science and Engineering

Semester: Spring Semester 2023-24
Course Title: Introduction to Programming and Data Structure
Full Marks: 30
Semester: B.Tech. 2nd Semester (ME/MME/PIE/ECM)
Course Instructors: **ME** – Dr. Dilip Kumar,
MME – Dr. Alekha Kumar Mishra
PIE/ECM – Dr. Neha Prerna Tigga

Examination: Mid Semester
Course Code: CS1201
Duration: 2 Hrs.

(Answer All Questions)

1) Write an algorithm/flowchart to input an array of integer numbers and sort the elements in ascending order. **[5]**

2) What is the difference between call by value and call by reference in a function. Give one benefit of call by reference. Illustrate both with suitable examples. **[5]**

3) What is a recursive function? Write a C program to define a recursive function to print first *n* Fibonacci numbers. **[5]**

4) **a)** What is the difference in the way data is stored in an array and a pointer? **[1]**

b) Which one executes faster, n++ or n+=1? Please provide an explanation. **[1]**

c) Complete the code given below: **[1]**

```
int main() {
    int decimalNumber=96, octalNumber[100],
    int i = 0;
    // Convert decimal to octal
    while (decimalNumber != 0) {
        _____________________;
        _____________________;
        _____________________;
    }
    // Display octal number
    printf("Octal equivalent: ");
    for (int j = ____; _______; _______) {
        printf("%d", octalNumber[j]);
    }

    return 0;
}
```

d) Write the output of the following code segment. Justify your answer. **[2]**

i)
```
int main() {
  int a=10,b=15,c=20, d=30, e;
  e = a!=b&&!(a<c)||b>d;
  printf("%d", e);
  }
```

ii)
```
#include<stdio.h>
  int main() {
  int a[5] = {1, 2, 3, 4, 5};
  int *ptr = (int *) (&a + 1);
  printf("%d %d\n", *(a + 1),*(ptr - 1));
  printf("%d %d\n", *(a + 3),*(ptr));
  return 0;
  }
```

5) Define a structure name 'Product' to store the following details: Product name, Product code, Quantity in stock, Price per unit. The program should dynamically allocate memory for an array of structures to store information about a variable number of products. It should then allow the user to input data for each product, including its quantity in stock and price per unit. Additionally, the program should calculate the total value of each product in stock (quantity * price per unit). Your program should display the list of products and properly free the dynamically allocated memory before exiting. Provide a sample input and output to demonstrate the functionality of your program. **[5]**

6) Write a C program to print the Pascal's triangle up to *n* rows as below: **[5]**

```
        1
      1   1
    1   2   1
  1   3   3   1
1   4   6   4   1
1  5  10 10  5   1
1 6  15  20 15 6  1
.....
```

NATIONAL INSTITUTE OF TECHNOLOGY JAMSHEDPUR
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Autumn Semester 2024-25 End Examination, Dec-2024

Programme: B. Tech — **Semester:** 1st
Branch: CSE/EE/EC/CE — **Duration:** 3hr
Course: Introduction to Computer Programming and Data Structure — **Code:** CS1101
Max Marks: 50 — **Instructors:** GB/PH/RK/AK

All parts of a question should be answered at one place only.

Answer all the questions.

1. a) What are the different types of constants in C? Give example of each. Write the algorithm for inserting an element at any position in an array. [3+2]

   b) Write a C program to print the sum of diagonal elements of 2-D matrix. Draw the flowchart for switch-case statement in C. [3+2]

2. a) What are the differences between iteration and recursion? Explain with example. Write a C program to swap two numbers taken as input from user using function call by reference. [2+3]

   b) What are the difference between the local and global variables in C? What is a pointer? Why are they used? [2+3]

3. a) Create a structure named Crossword to store the details of the book such as title, author, and price. Write a C program to input details for three books, find the most expensive and the lowest priced books, and display their information. [5]

   b) Write a C program to dynamically allocate memory for an array of integers using malloc (). Initialize the array with values 1 to 5, print the values, and free the allocated memory. What are the difference between calloc (), malloc () and realloc ()? [3+2]

4. a) Consider an array with the elements {5, 1, 3, 2, 4, 6}. Sort the array in ascending order using selection sort. If the array is sorted using both bubble sort and selection sort, which algorithm will require the minimum number of comparisons for sorting? Justify your answer. [3+2]

   b) Given the array [2, 4, 6, 8, 10, 12, 14], how would you find the element 10 using the binary search method? Write the steps involved in the process. What are the limitations of binary search? [3+2]

5. a) Explain, with the help of a diagram, how the information is stored in the memory using a single linked list. [2]

b) What will be the output of the followings: [2+2+2+2]

i)
```
void main() {
    int x = 10, y = 20;
    int *p1, *p2;
    p1 = &x;
    p2 = &y;
    *p1 = *p1 + *p2;
    *p2 = *p1 - *p2;
    *p1 = *p1 - *p2;
    printf("x = %d, y = %d\n", x, y);}
```

ii)
```
int main()
{
    int a= -1, b = -a;
    int x,y;
    x = (a> 0) && (b < 0) || (a< 0) && (b > 0);
    y = (a<= 0) || (b >= 0) && (a>= 0) || (b <= 0);
    printf("%d\n",x = = y);
    return 0;
}
```

iii)
```
int main()
{   int a=20, b=30,*p, s=0;
    p = &a;
    a++;
    (*p)++;
    s = a + b + *p;
    printf("%d\n", s);
    return 0;
}
```

iv)
```
int main ()
{
 int a, b;
 a = b = 4;
 b = a++;
 printf ("%d %d %d %d", a++, --b, ++a, b--);
}
```

72/50

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