Question Paper

MANIPAL ACADEMY OF HIGHER EDUCATION

B.Tech First Semester Sessional Examination September 2024

PROBLEM SOLVING USING COMPUTERS [CSE 1071]

Marks: 30 **Duration: 90 mins.**

MCQ

Answer all the questions. Section Duration: 20 mins

1) **What is the output of the following C program?**

```
#include <stdio.h>
int main()
    {
      int a=5, b=7;
      float n=3.5, m=2.1;
      printf("a+b=%d\nn-m=%.3f", a+b, n-m);
      return 0;
    }
```

(1)

a+b=12.000 n-m=1.4 | a+b=12.000 n-m=1.400 | a+b=12 n-m=1.400 | a+b=12 n-m=1.400

2) **What is the output of the following C program?**

```
#include < stdio.h>
int main()
{
int y, a=2, b=20, c=4;
y = a*(3/(4-b/(c*2)));
printf("%d",y);
```

(1)

```
return 0;
}
```

0 1 2 -2

3) **What is the output of the following C program?** (1)

```
#include< stdio.h>
int main()
{
float x = 4.6;
double y = 4.6;
if(x == y) printf("Equal");
else if(x > y) printf("x > y");
else if(x < y) printf("x < y");
else printf("x not equal to y");
return 0;
}
```

Equal x < y x > y x not equal to y

4) **What is the output of the following C program?** (1)

```
#include < stdio.h>
int main()
{
int x=15;
int count = 0;
while (x > 0)
{
x = (x & (x - 1));
count++;
}
printf("%d", count);
return 0;
```

```
}
```

1 2 3 4

5) **What is the output of the following C Program?** (1)

```
#include< stdio.h>

int main()

{

int arr[ ] = {1, 2, 3, 4, 5, 6};

int i, sum = 0;

int size = sizeof(arr) / sizeof(arr[0]);

for (i = 0; i < size; i += 2)

sum += arr[i];

printf("%d", sum);

return 0;

}
```

18 12 9 16

DESCRIPTIVE

Answer all the questions.

6) Differentiate among machine level, assembly level and high level languages. (3)

7) Write an algorithm and flowchart to find whether the number is even or odd. (3)

8) What is a ternary operator in C? With proper syntax, explain the ternary (conditional) operator. Write a complete C program to check whether the given year is a leap year using the ternary operator. (4)

9) Write a C program to calculate income tax based on the tax slabs for individuals. The program should prompt the user to input their annual income and display the total tax payable according to the following tax slabs. The income tax calculation is as follows: (3)

1. For income up to Rs. 2,50,000: No tax
2. For income Rs. 2,50,001 to Rs. 5,00,000: 5% on the income exceeding Rs. 2,50,000
3. For income Rs. 5,00,001 to Rs. 10,00,000: 20% on the income exceeding Rs. 5,00,000
4. For income above Rs. 10,00,000: 30% on the income exceeding Rs. 10,00,000

Also, include an additional 4% health and education cess on the calculated tax.

Expected sample output:

Enter your annual income: Rs. 7,50,000

Income Tax: Rs. 62,500
Health and Education Cess: Rs. 2,500
Total Tax Payable: Rs. 65,000

10) (A) It is required to write a C program to guess a **secret number** that is defined as an integer constant within the C program. (Let the **secret number** be 5).
Conditions to be satisfied by the program:

- Let the **secret number** take values between 1 and 10.
- The program should use a loop to continuously allow the user to enter a **guess number**.
- If the **guess number** is greater than the **secret number**, it should display 'Greater than secret number'.
- If the **guess number** is lesser than the **secret number**, it should display 'Lesser than secret number'.
- If the **guess number** is equal to the **secret number**, it should display 'Congratulations, You have guessed it right' (3)
- The program should exit only when the user enters a value of -1.

Suggest which loop construct of C would you select to solve the above problem? Justify your selection. **(DO NOT write the program or algorithm or flowchart)**

(B) With the help of a suitable example, explain the **exit-controlled loop**.

11) Write a C program to:
(i) read the elements of a 1D array **'arr'** from the user
(ii) copy all even numbers from the array **'arr'** to another 1D array named **'even'** and all odd numbers from array **'arr'** to a third 1D array named **'odd'**, and (4)
(iii) print all the resulting arrays.

12) Illustrate the binary search technique to search 80 in a given 1D array ***10, 12, 20, 32, 50, 55, 65, 80, 99***. Show clearly all the required intermediate steps. (Note: Do not write algorithm or program). (2)

13) Imagine you are developing a system for a car service station that needs to manage the car records. Each car record has a unique ID number. Due to an emergency, the system must quickly sort these records by the car ID to prioritize the cars with the lowest IDs first. Write a C program that sorts an array of car IDs using **Selection Sort algorithm**. (3)