

2021

MATHEMATICS — HONOURS

Paper : SEC-A-1

(C-Programming Language)

Full Marks : 80

*The figures in the margin indicate full marks**Candidates are required to give their answers in their own words as far as practicable.**Notations and symbols have their usual meaning.*

1. Each question below is followed by four possible answers of which exactly one is correct. Choose the correct answer with proper justification. 2×10=20

- (a) In the following statement the value of z is

 $x = 15;$
 $y = 25;$
 $z = (x > y)? x : y;$
(i) $z = 15$ (ii) $z = 20$ (iii) $z = 0$

(iv) None of these.

- (b) The program segment

```
float x=2.5;
```

```
printf ("%f%f" , x==2.5, x < 2.5);
```

```
will print
```

(i) 2.50 0.0

(ii) 2.5 0.00

(iii) 2.50 0.00

(iv) None of these.

- (c) Which one is the correct way to initialize array?

(i) `int n[5] = {20,30,40,50}`(ii) `int num[4] = {20,30,40,50}`(iii) `int n{5} = {20,30,40,50}`(iv) `int n(5) = {20,30,40,50}`

- (d) The output of the following programme is

```
# include <stdio.h>
```

```
main()
```

```
{
```

```
int x = 11;
```

```
x = x+(x++)+(++x)+x;
```

```
printf("%d",x);
```

```
}
```

(i) 46

(ii) 47

(iii) 49

(iv) 51

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(e) How many times the following loop runs?

```
for (n=1; n<100; n++)
```

- (i) 98 (ii) 99 (iii) 100 (iv) never

(f) Which of the following statements is true for variable names in C?

- (i) They can contain alphanumeric characters as well as special characters.
- (ii) It is not an error to declare a variable to be one of the key words.
- (iii) Variable names cannot start with a digit.
- (iv) Variable can be of any length.

(g) Which of the following is a valid C expression?

- (i) `int my_num = 100,000;`
- (ii) `int my_num = 100000;`
- (iii) `int my num = 10000;`
- (iv) `int $ my_num = 100000;`

(h) `scanf()` is a predefined function in which of the following header files?

- (i) `stdlib.h` (ii) `ctype.h` (iii) `stdio.h` (iv) `string.h`

(i) What will happen if the following C code is executed?

```
#include <stdio.h>
int main()
{
    int main = 3;
    printf("%d",main);
    return 0;
}
```

- (i) It will cause a compile time error
- (ii) It will cause a run-time error
- (iii) It will run without any error and print 3
- (iv) It will experience infinite looping

(j) What is the difference between the following two C codes?

```
(I) #include <stdio.h> //Program 1
int main()
{
    int d, a = 1, b = 2;
    a = a++ + ++b;
    printf ("%d%d%d", d, a, b);
}
```

```
(II) #include <stdio.h> //Program 2
int main()
{
    int d, a = 1, b = 2;
    d=a++ + ++b;
    printf ("%d%d%d", d, a, b);
}
```

- (i) The values of a, b, d are same in both the case.
- (ii) The values of a, b, d are different;
- (iii) Program 1 has syntax error, Program 2 has not.
- (iv) Program 2 has syntax error, Program 1 has not.

2. Answer **any one** question:

- (a) (i) How can you use *break* and *continue* statements in for loop? Give suitable example to justify your answer.
- (ii) Write a C-program to test whether a number is prime or not. (2+3)+5
- (b) (i) Write the benefits of using functions in C. Distinguish between the user-defined function and standard build-in functions.
- (ii) Write a C-program to find the functional values for five given values of x , where

$$f(x) = x^2 + \sin(x), \quad 0 \leq x < 2.$$

$$= 2 \cos(x) - 1, \quad 2 \leq x \leq 4$$
 and input values of x are 0.2, 1.8, 2.0, 2.5, 3.5 (2+3)+5

3. Answer **any one** question:

- (a) (i) Explain conditional operator using suitable example. What are the limitations of conditional operator?
- (ii) Write an algorithm to find factorial of a given number. Hence write the corresponding C-program. [(2+2)+(3+3)]
- (b) (i) Write down the syntax of for loop in C and draw the corresponding flow diagram.
- (ii) Write a C program to print $a = 10, 11, 12, 13, 14, 15, 16, 17, 18, 19$ using for loop. 2+2+6

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4. Answer *any one* question:

- (a) (i) Write a C-program to find the arithmetic mean of n real numbers.
 (ii) Write a C-program to find the sum of the series:

$$1 + \frac{x}{1} + \frac{x^2}{2} + \dots + \dots \text{ correct to 3 decimal places at } x = 0.5. \quad 5+5$$

- (b) (i) What is Mixed-mode Arithmetic? Explain with an example.
 (ii) Using Integer Arithmetic write a C-program to convert the given number of days into months and days and print the result. 2+2+6

5. Answer *any one* question:

- (a) (i) What do you mean by one dimensional array? Give an example.
 (ii) Using array write a C-program to sort a given set of numbers in descending order. 2+2+6
- (b) (i) Discuss the difference between library functions and user defined functions with suitable examples.
 (ii) Write a C-program to compute and print a multiplication table for numbers 1 to 5 as shown below:

	1	2	3	4	5
1	1	2	3	4	5
2	2	4	6	8	10
3	3	6	9	12	15
4	4	8	12	16	20
5	5	10	15	20	25

using two-dimensional array. 5+5

6. Answer *any one* question:

- (a) (i) Write about the following errors in C:
 Syntax error; Run-time error; Logical error.
 (ii) Write an algorithm and draw the flow chart for finding the real roots of $ax^2 + bx + c = 0$. [(2+2+2)+4]
- (b) (i) Write down the syntax of if-else statement and draw the corresponding flow chart.
 (ii) Using if-else statement, write a C program to check whether the entered age is greater than or equal to 18 (years). If this condition meets then display the message, "You are eligible for voting"; however if the condition does not meet then display the message, "You are not eligible for voting". (2+2+6)

7. Answer *any one* question:

- (a) (i) What is local variable and global variable? Explain with suitable example.
 (ii) Distinguish between RAM and ROM.
 (iii) Write a C-program to find the sum of the digits of a number. [3+2+5]

(b) (i) What is meant by 'Nesting of Functions' in C?

(ii) Is the following C-program an example of Nesting of Functions? Explain your answer logically:

```
#include <stdio.h>
int difference(int p, int q)
{
    if(p!=q)
        return (1);
    else
        return (0);
}
float ratio(int x, int y, int z)
{
    if(difference(y,z))
        return((x/(y-z)));
    else
        return (0.0);
}
int main()
{
    int a, b, c;
    float ratio (int a, int b, int c);
    scanf("%d%d%d", & a, & b, & c);
    printf ("%f\n", ratio(a, b, c));
    return 0;
}
```

(iii) What is recursion in C? Explain with an example.

2+5+3
