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
$$f(x) = x^2 + \sin(x), \ 0 \leq x < 2.$$
$$= 2\cos(x) - 1, \ 2 \leq x \leq 4$$
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:

$$1+\frac{x}{\lfloor 1}+\frac{x^2}{\lfloor 2}+\cdots+\cdots \text{ correct to 3 decimal places at } x = 0 \cdot 5.$$
                                  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:

```c
#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

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