

PROGRAMMING FOR PROBLEM SOLVING (CSE1001)

Time Allotted : 2½ hrs

Full Marks : 60

Figures out of the right margin indicate full marks.

*Candidates are required to answer Group A and
any 4 (four) from Group B to E, taking one from each group.*

Candidates are required to give answer in their own words as far as practicable.

Group – A

1. Answer any twelve:

12 × 1 = 12

Choose the correct alternative for the following

- (i) The smallest 4-digit number in any base b is
 (a) 1111 (b) 1110
 (c) 1000 (d) Cannot be determined based on the given information
- (ii) The octal representation of (AB34.F9)₁₆ is:
 (a) (125464.762)₈ (b) (135464.763)₈
 (c) (124464.762)₈ (d) (126454.762)₈
- (iii) What will be the output of the following C code snippet?

```
int i;
for (i=1; i<=5;i++)
{
    switch(i/2)
    {
        case 1: printf("Heritage "); i++; break;
        case 2: printf("Institute "); i++; break;
        case 3: printf("of "); i++; break;
        default: printf("Technology "); i++; break;
    }
}
```

 (a) Heritage Heritage Institute (b) Heritage Heritage Institute Institute
 (c) Technology Heritage Institute (d) Technology Heritage Heritage Institute Institute
- (iv) What will be the output of the following C code snippet?

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

 (a) Hello5 (b) 5Hello
 (c) Hello (d) Compilation error occurs
- (v) What will be the output of the following C code snippet?

```
int a = 5, b = 2;
float c = a / b;
printf("%.2f", c);
```

 (a) 2.50 (b) 2.00 (c) 2.5 (d) Compilation error occurs
- (vi) Consider the following macro definition with arguments:

```
#define CUBE(x) (x*x*x)
```

 Which of the following would be the correct expansion of the following statement written in C?

```
volume = CUBE(a+b);
```

 (a) volume = (a+b * a+b * a+b); (b) volume = ((a+b) * (a+b) * (a+b));
 (c) Both (a) and (b) (d) None of the above
- (vii) The default return type of the calloc() function is
 (a) int (b) int* (c) void (d) void*
- (viii) What should you write in place of ? in the following C statement to print the text HELLO on the screen?

```
fprintf( ? , "HELLO");
```

 (a) in (b) out (c) stdin (d) stdout
- (ix) If the following command is executed in the Linux terminal to run a C program:

```
./a.out "John Smith" 25 Park Avenue
```

 The value of the command line variable argc in the corresponding C program will be:
 (a) 4 (b) 5 (c) 6 (d) Garbage value

- (x) What does the following code snippet perform?

```
fseek(fp, 0, SEEK_END);
printf("%d", ftell(fp));
```

(a) Moves the file pointer to the end of the file
(b) Both of the above
(c) Counts the number of characters in the file
(d) None of the above

Fill in the blanks with the correct word

- (xi) _____ is an example of primary memory.
(xii) The bitwise operator in C used to toggle a bit is _____.
(xiii) The C function _____ is used to allocate memory for an array and initializes all elements to zero.
(xiv) The C library function _____ is used to copy one string to another.
(xv) An example of an exit-controlled loop in C is _____.

Group - B

2. (a) Convert the decimal number $(145.625)_{10}$ to IEEE-754 32-bit single precision format. [[C01](Understand/IOCQ)]
(b) Compute $(101101101)_2 - (110111)_2$ using 2's complement method. [[C01](Understand/LOCQ)]
(c) How does the compilation process work for C programs? Explain briefly. [[C02](Remember/LOCQ)]

5 + 3 + 4 = 12

3. (a) Perform the following number system conversions (show all steps):
(i) $(101101.101)_2 = (?)_{10}$ (ii) $(325.4)_8 = (?)_4$
(iii) $(7B3.A)_{16} = (?)_8$ [[C01](Apply/IOCQ)]
(b) Draw a flowchart to find the sum of the following series up to n^{th} term where values of x and n are to be provided as input.

$$S = x - \frac{x^2}{3!} + \frac{x^3}{5!} - \dots \text{up to } n^{\text{th}} \text{ term}$$

Note: Do not use a function for calculating exponent (i.e., x^i) or factorial (i!). x may be considered to be a real number and n an integer. [[C03](Apply/IOCQ)]

$(2 \times 3) + 6 = 12$

Group - C

4. (a) Justify the following statement: "the range of signed char (1 byte) is -128 to +127". [[C03](Understand/IOCQ)]
(b) Explain the output or error of the following snippets of code:

(i)

```
int main()
{
    int a=7,b=5,c,d;
    c = b++ + ++a;
    d = ++b + ++a;
    printf("\n %d %d %d %d ",a,b,c,d);
    return 0;
}
```

(ii)

```
int main()
{
    unsigned int x = -1;
    printf("%u", x);
    return 0;
}
```

(iii)

```
int main()
{
    char i = -1;
    while(i)
    {
        printf("%d\n",i);
        --i;
    }
    return 0;
}
```

[[C05](Analyse/IOCQ)]

- (c) Write a C program to print the following pattern (shown here for 6 rows) where the number of rows in the pattern is a user input:

```

      1
     0 1
    0 1 0
   1 0 1 0
  1 0 1 0 1
 0 1 0 1 0 1

```

[[C05](Apply/IOCQ)]

$$2 + (2 + 2 + 2) + 4 = 12$$

5. (a) Write a C program to print the following pattern (shown here for 5 rows). The user should input the number of rows. If the entered number is not an odd number, the program should prompt the user to enter it again. The user is allowed up to three attempts to provide a valid odd number. If all three attempts fail, the program should terminate.

```

  *
 * * *
* * * * *
 * * *
  *

```

[[C05](Apply/IOCQ)]

- (b) What will be the output of the following C code? Explain your answer.

```

#include <stdio.h>
int main()
{
    char ch = 250;
    printf("%d\n", ch);
    return 0;
}

```

[[C04, C05](Apply/IOCQ)]

$$8 + (1 + 3) = 12$$

Group - D

6. (a) Write the output of the following program with justification.

```

#include "stdio.h"
#define scanf "Hello World"
int main() {
    printf(scanf);
    return 0;
}

```

[[C04](Analyse/IOCQ)]

- (b) Explain the difference between the following declarations:

(i) `const int *p;` (ii) `int *const p;`

[[C04](Remember/LOCQ)]

- (c) Write a program to accept a single line of text as a command line argument and print the number of vowels, consonants and spaces present in the line.

[[C05, C06](Apply/IOCQ)]

$$2 + (2 + 2) + 6 = 12$$

7. (a) What is the output of the following C program?

```

#include <stdio.h>
#include <string.h>
int main() {
    char *arr[] = {"ant", "bat", "cat", "dog", "egg", "fly"};
    char *word1 = (arr + 1)[2];
    char *word2 = *(arr + 2);
    int k = strcmp(word1, word2);
    printf("%s %s %s", word1, word2, arr[k]);
    return 0;
}

```

[[C04, C06](Apply/IOCQ)]

- (b) Write a C function with the prototype given below:

`char* fun(char *);`

It will take one word as input and encrypt it by shifting each alphabet to two alphabets ahead. Assume that all alphabets are in uppercase and that the letter A follows Z in a cyclic manner. Numbers and special characters remain unchanged. For example:

Group - E

8.

(a)

How can you check whether a file exists by using the fopen() function?

[[C05, C06](Understand/LOCQ)]

(b)

Write a C program that merges the contents of two text files into a new file. Then print the number of lines of the merged file. The names of all 3 files should be supplied by the user.

[[C04, C05, C06](Apply/HOCQ)].

(c)

What is meant by self-referential structure? Explain with an example.

[[C02](Remember/LOCQ)]
- 3 + 7 + 2 = 12**
9.

(a)

Create a structure *employee* having *name*, *address*, *salary*, and *age* as member elements. Dynamically create an array of **n** objects of the structure to store the employee information. The user should enter the value of n. Then display the names of the employees having age between 40 and 50 and living in Kolkata.

[[C03, C05](Apply/HOCQ)]

(b)

Suppose a file named "Number.txt" contains a list of integers. Write a program to extract only the prime numbers from that file and write them into a new file called "Prime.txt".

[[[C03, C05](Apply/IOCQ)]]
- 6 + 6 = 12**

Cognition Level	LOCQ	IOCQ	HOCQ
Percentage distribution	16.67	69.79	13.54