PROGRAMMING FOR PROBLEM SOLVING
(CSEN 1001)

Time Allotted : 3 hrs **Full Marks : 70**

Figures out of the right margin indicate full marks.

Candidates are required to answer Group A and any 5 (five) from Group B to E, taking at least one from each group.

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

Group – A
(Multiple Choice Type Questions)

1. Choose the correct alternative for the following: **10 × 1 = 10**

(i) Which of the following cannot be a member of a structure in C language?
(a) Function (b) Array (c) Another structure (d) Pointer variable

(ii) sizeof(int)returns the length of an integer. In C, sizeofis -
(a) Operator (b) Reserved word/Keyword
(c) Function (d) Both (a) and (b)

(iii) Which of the following is correct as far as the speed of the memory is concerned?
(a) CPU registers > Cache Memory > RAM > Hard disk
(b) CPU registers < Cache Memory < RAM < Hard disk
(c) Speeds of all these types of memory are same
(d) Speed varies depending on the situation

(iv) Macro substitution is done at -
(a) post-compilation stage (b) pre-compilation stage
(c) compilation stage (d) run-time

(v) Left shift operation by 1 bit in C is equivalent to _____.
(a) Division by 2 (b) Multiply by 2
(c) Adding 2 (d) Subtracting 2

(vi) What is actually passed if you pass a structure variable to a function as an argument?
(a) Copy of structure variable
(b) Reference of structure variable
(c) Starting address of structure variable
(d) Starting and ending address of structure variable

(vii) What will be the output of the following C program?

```
#define no 5+3
int main()
{
   int result;
   result=no*no*no;
printf("%d",result);
   return 0;
}
```

(a) 512 (b) 38
(c) Compile time error (d) None of the above

(viii) Suppose that x is a one-dimensional array, then choose the correct answer regarding array from the following:
(a) *(x+i)is same as&x[i] (b) *&x[i]is same as(x+i)
(c) *(x+i)is same asx[i] (d) *(x+i)is same asx[i]+1

(ix) Which of the following four assignments in C is valid after the following declaration?
int A[10], B[20], *C;
(a) A = B (b) B = C (c) A = C (d) C = A

(x) Which of the following is not a valid name of a C variable?
(a) result22 (b) _result22 (c) 22result (d) re2sult2

Group- B

2. (a) Compute the following:
$(67.89)_{10} = (?)_8 = (?)_{16}$
Show all the intermediate steps. [(CO1) (Understand /LOCQ)]

(b) Following is the IEEE-754 32-bit single precision representation of a floating-point number.
Find the decimal value closest to this floating-point number.
00111110011011010000000000000000. [(CO1) (Understand/LOCQ)]

(c) Draw a flowchart to find whether a number given by the user is prime or not. [(CO2)(Apply/IOCQ)]

(2 + 2) + 4 + 4 = 12

3. (a) Given, $(121)_r=(144)_8$. Find the base r. [(CO1) (Analyze/IOCQ)]

(b) Compute the following:
$(111001)_2 - (1001)_2$ using 2's complement method.[(CO1) (Understand/LOCQ)]

(c) What is the advantage of using complement method in binary arithmetic? What are the advantages of using 2's complement over 1's complement? [(CO1)(Understand/LOCQ)]

6 + 2 + (2 + 2) = 12

Group - C

4. (a) Explain the output of the following C programs:

i.
```
int main()
{
    int i = -1, j = -1, k = 0, m = 2, n;
    n = i++ &&j++&& k++ || m++;
    printf("%d %d %d %d %d", i, j, k, m, n);
    return 0;
}
```

ii.
```
int main()
{
    int i;
    for (i = 1; i< 10; i<<=1)
printf(“%d”, i);
    return 0;
}
```

iii.
```
int main()
{
    int x=1, y=1, z=1;
    x += y += z;
    printf(“%d\n”, x < y ? y : x);
    printf(“%d\n”, x < y ? x++ : y++);
    printf(“%d\n”, x) ; printf(“%d\n”, y);
    return 0;
}
```

[(CO2) (Evaluate/HOCQ)]

(b) Express the following if...else statements written in C using ternary operator:

```
if (x + y >= 30)
    value = 30;
else if (x + y >= 25)
    value = 25;
else
    value = 20;
```

[(CO3) (Understand/LOCQ)]

(c) What is the difference between explicit and implicit type casting? Explain with an example. [(CO3) (Remember/LOCQ)]

(2 + 2 + 3) + 3 + 2 = 12

5. (a) State the differences between a ‘while’ loop and a ‘do-while’ loop. Give a suitable example where ‘do-while’loop is preferred over ‘while’ loop.
[(CO6) (Understand/LOCQ)]

(b) Write a C program to take the number of rows to be printed as input and display the following pattern as output. As for example, if the number of rows to be printed is 5 then the output will look like as follows:

```
*   *
** **
*****
** **
*   *
```

[(CO5) (Create/HOCQ)]

(c) Write a C program to find the sum of the following series:

$$1+\frac{x}{1!}+\frac{x^2}{2!}+\frac{x^3}{3!}+..upto\ 50\ terms$$

Note that the value of neither 40! nor x^{40} can be calculated.
[(CO4) (Create/HOCQ)]

(2 + 2) + 4 + 4 = 12

Group - D

6. (a) Show how to enter two integers and print their sum using command line arguments. If the number of integers is less than 2, show appropriate error message. You may take the help of a C program for this.
[(CO5) (Understand/LOCQ)]

(b) Distinguish between following (i) and (ii):
i. int* ip[10] and int (*ip)[10]
ii. int p(char *a) and int *p(char *a). [(CO3) (Understand/LOCQ)]

(c) Write a program in C to delete an element from a particular position in an array where position will be a user input. After deletion, array elements must be in continuous locations. [(CO5) (Create/HOCQ)]

4 + (2 + 2) + 4 = 12

7. (a) Write a recursive function to calculate the sum of all digits of a number entered by the user. Also write the main() to test the function. [(CO5) (Create/HOCQ)]

(b) What are the advantages of using dynamic memory allocation over static memory allocation? Is there any disadvantage of dynamic memory allocation? [(CO6) (Understand/LOCQ)]

(c) If an array is passed to a C function as an argument and some of its elements are modified within the function, are these modifications visible in the calling function of the program? Explain. [(CO3) (Analyse/IOCQ)]

4 + (2 + 2) + 4 = 12

Group - E

8. (a) What is the difference between the file opening modes “r+” and “w+”?
[(CO3) (Remember/LOCQ)]

(b) Define a structure called Point having two float type variables, representing the x-coordinate and y-coordinate of the point.

Write a C function named as 'distance' to calculate the distance between two points using the Point structure defined above. The prototypeof the function is given below:

float distance(Point, Point)

Note: Given two points (x_1, y_1) and (x_2, y_2), the formula to calculate the distance between them is:

distance = $\sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$

Write anotherC function named as 'mid' to find the mid-point between two points using the

Point structure defined above. The prototypeof the function is given below:

Point mid(Point, Point)

Note: Given two points (x_1, y_1) and (x_2, y_2), the mid-point between them is given by:

Coordinates of the mid-point: $\left(\frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2}\right)$

Write a main() function to test the above two functions.[(CO5) (Create/HOCQ)]

2 + 10 = 12

9. (a) Write a program in C to read a data file, to print the size of the file and to print the last 5 characters from the file. Use separate function for different operation. [(CO5) (Create/HOCQ)]

(b) Write a program in C to define a structure named *Customer* with members - *Name* (string), *Account_No*(integer) and *Balance* (float). It should be able to take n many customers' details as input and search for a particular customer by the account number. Write a separate function for searching operation. [(CO5) (Create/HOCQ)]

6 + 6 = 12

Cognition Level	LOCQ	IOCQ	HOCQ
Percentage distribution	38.54%	14.58%	46.88%

Course Outcome (CO):

After the completion of the course students will be able to:

CO1: Understand and remember functions of the different parts of a computer.

CO2: Understand and remember how a high-level language (C programming language, in this course)works, different stages a program goes through.

CO3: Understand and remember syntax and semantics of a high-level language (C programming language,in this course).

CO4: Understand how code can be optimized in high-level languages.

CO5: Apply high-level language to automate the solution to a problem.

CO6: Apply high-level language to implement different solutions for the same problem and analyse whyone solution is better than the other.

*LOCQ: Lower Order Cognitive Question; IOCQ: Intermediate Order Cognitive Question; HOCQ: Higher Order Cognitive Question

Department & Section	Submission Link
BT	https://classroom.google.com/u/1/w/NDA1ODY2MzE1OTM0/tc/NDY3OTg5NDY4NTY0
CE	https://classroom.google.com/c/NDA2MDk3ODY4NTY1/a/NDY3Nzc3OTU4NjYx/details
CHE	https://classroom.google.com/c/NDA2MDk5NTQwMTc3/a/NDY3Nzc5MzM4MTE0/details
CSE (AI&ML)	https://classroom.google.com/c/NDA1MzEwOTQzODYy/a/NDY0MjAwODc4ODYx/details
CSE(DS)	https://classroom.google.com/w/NDA1MTkzMTc0Nzg2/tc/NDc0ODM0Mzk1MzQw
EE	https://classroom.google.com/c/NDA2MDkwMjk4OTI5/a/NDU5ODI0NDM5NDIy/details
ME	https://classroom.google.com/w/NDA1NTg0MzE4NDY1/tc/MjI3ODkwMDQxNjk2
Backlog	CSEN1001 Backlog Students Google Classroom Joining Link https://classroom.google.com/c/NDA1ODY2MzE1OTM0?cjc=aitezyg CSEN1001 Backlog Semester Exam Paper Submission Link https://classroom.google.com/c/NDA1ODY2MzE1OTM0/a/NDY3OTg5NDY4Mjcz/details