KUMARAGURU
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B.E/B.TECH DEGREE EXAMINATIONS: NOV / DEC 2024

(Regulation 2024)

First Semester

COMMON TO CSE / IT / AI & DS/ ECE / FT

24CSI101: Logical Thinking and Problem Solving

COURSE OUTCOMES

CO1: Understand the basic concepts of hardware, software, operating systems, and the logic behind the functioning of the computing systems.

CO2: Apply logical thinking and reasoning to solve computing problems through the use of tools like algorithms and flowcharts.

CO3: Understand the structured programming paradigms, memory organization, and how the language can be used as a tool to solve problems.

CO4: Develop simple programs using data types, operators, control structures, pointers, and functions as appropriate in real-world applications.

Time: Three Hours   **Maximum Marks: 100**

PART A (4 * 20 = 80 Marks)
Answer all the Questions

1.	a)	Define system software and application software with examples.	2	CO1	[K_1]
	b)	Convert the binary number 110101_2 to its decimal and hexadecimal equivalents.	2	CO1	[K_2]
	c)	**Scenario:** A healthcare organization plans to digitize patient records and medical billing using computing systems. Explain the concept of memory hierarchy in a computer system and discuss its importance in managing patient record databases.	6	CO1	[K_3]
	d)	A hospital stores records of 1000 patients in a memory system with 32 KB of cache memory, 1 GB RAM, and a 500 GB hard drive. If each record occupies 2 KB of memory, calculate how many records can fit into each memory tier and explain how the rest will be handled.	6	CO1	[K_4]

e)	Write an algorithm to compute the total bill for a patient. The bill should include daily room charges (200/day), additional services (e.g., tests or surgeries) and medicine cost as applicable.	4	CO2	[K4]

2.	a)	Define deductive reasoning and provide an example of its use in problem-solving.	2	CO2	[K1]
	b)	Compare algorithms and flowcharts. Discuss their importance in problem-solving with examples.	2	CO2	[K2]
	c)	Develop a flowchart to calculate the simple interest $SI = (P \times R \times T)/100$, where P, R, and T represent the principal, rate, and time, respectively. Use looping concept to repeat for 5 different sets of values of P, R and T.	6	CO2	[K3]
	d)	Write an algorithm to display a menu and get choice from user as 1 or 2. -If user gives choice as 1, find the largest of three numbers A, B, C. - If user gives choice as 2, find area of a square.	6	CO2	[K4]
	e)	Given an array of marks obtained by 5 students in a test [45,78,62,89,53], create a flowchart to calculate the average marks and determine how many students scored above the average.	4	CO2	[K3]
3.	a)	Describe the difference between call by value and call by reference with examples.	2	CO4	[K2]
	b)	Explain the use of storage classes in C with suitable examples.	6	CO4	[K3]
	c)	Write a C program to reverse a string using pointers. Explain the program with a sample input and output.	4	CO4	[K4]
	d)	Write a program in C to perform matrix subtraction for two 3x3 matrices. Compute the resulting matrix for the following data:	8	CO4	[K4]

- Matrix A:

$$\begin{bmatrix} 8 & 5 & 3 \\ 2 & 6 & 1 \\ 4 & 7 & 9 \end{bmatrix}$$

- Matrix B:

$$\begin{bmatrix} 1 & 3 & 5 \\ 7 & 2 & 4 \\ 6 & 8 & 2 \end{bmatrix}$$

4	a)	Define recursion and explain how it differs from iteration with an example.	2	CO4	[K1]
	b)	Explain the concept of pointer arithmetic with a program that demonstrates accessing an array using pointers.	4	CO4	[K3]

c) Write a program in C to find the sum of even numbers and the sum of odd numbers 8 CO3 [K$_4$]
    in an array [12,45,23,78,34,67,89,22]. Compute the output and explain your
    approach.

d) Write a pseudocode to compute the factorial of a number with input validation for 6 CO2 [K$_3$]
    incorrect entries. The program should check for negative numbers or non-integer
    values and display an appropriate message if the input is invalid.

Answer any ONE Question
PART B (20 x 1 = 20 Marks)

5. a) Define functional programming and structured programming. Compare their key 2 CO3 [K$_1$]
        features.

    b) Explain the role of bitwise operators in C with examples. 2 CO3 [K$_2$]

    c) A library wants to maintain information about its books using a structure in C. 8 CO4 [K$_4$]
        Each book has the following details:

        - **Title** (string)
        - **Author** (string)
        - **ISBN** (integer)
        - **Price** (float)

        Write a program that defines a structure Book for this purpose. The program should
        create an array to store information about 3 books, accept details of these books
        from the user, and then display the details of all the books.

    d) A developer wants to calculate the power of a number X^Y using a loop. Write a C 6 CO3 [K$_4$]
        program to compute this and calculate 5^4 using your program.

    e) Compare primitive and derived data types in C with examples. 2 CO3 [K$_2$]

                                            OR

6. a) Describe the difference between pre-processor directives and macros in C. Provide 2 CO3 [K$_1$]
        examples.

    b) Explain how command-line arguments work in C. Write a simple program to 4 CO3 [K$_3$]
        demonstrate their usage.

c) A hospital wants to keep track of patients' information using a structure in C.   8   CO4   [K$_4$]
Each patient record should include:

- Name (string)
- Age (integer)
- Gender (string, e.g., Male/Female)
- Disease (string)

Write a program that defines a structure Patient for this purpose. The program should allow the user to enter details for 2 patients and then display the entered information.

d) Given a Fibonacci sequence, write a program to calculate the sum of the first 10   6   CO3   [K$_3$]
Fibonacci numbers. Compute the output and explain the logic.

CO distribution summary:

	CO1	CO2	CO3	CO4
Marks (%)	16	28	20	36

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