

45th BCS Written CSE - 971

Written Question Solution

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To get more suggestion

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[English Version]

[N.B. The figures in the right margin indicate full marks.]

Part I

(Answer all of the following questions)

Marks—25×4=100

- Marks
1. (a) Define problem solving technique. Write the differences between structured programming and object-oriented programming. 5
(b) How can we initialize 1-D array? How can we pass the array to a function in C. 5
(c) Write a C program to sum all digits of a 5-digit number. Draw the flowchart of this program. 10
(d) What is assembly language? Write its features. Write a program in assembly language to add and multiply two numbers. 5
 2. (a) Write the decimal, octal and binary form of the number $(E)_{16}$. Write the next four numbers in the following hexadecimal sequences : 5
6FC, 6FE, —, —, —, —
(b) What is Boolean function? How can we simplify the following Boolean function? 5
 $F = A'B'C + A'BC + AB'$
(c) Write the 2's complement of $(+55)_{10}$. Show the differences between clocked J-K flip-flop and clocked D-flip-flop. 5
(d) Determine the truth table of $(A \oplus B) \vee (\neg A) \vee (\neg C)$. 5
(e) Draw the logic circuit of two input multiplexer. Compare between multiplexer and demultiplexer. 5
 3. (a) What are differences between Breadth first search (BFS) and Depth first search (DFS)? For what sort of problems it is better to use BFS than DFS? 5
(b) Write the advantages and disadvantages of using linked list instead of using array. 5
(c) Define time complexity of an algorithm. Mention in brief-why is the worst-case complexity of Quicksort $O(n^2)$. 5
(d) Is it possible to apply Binary search in a sorted linked list? Justify your answer with proper example. 5
(e) Suppose that in-order and preorder traversal of a binary tree are dbaefg and abdecfg respectively. What will be the post-order traversal of the Binary tree? 5
 4. (a) Draw a block diagram of Intel 8086 microprocessor. Write the features of 8086 microprocessor. 5
(b) What is the meaning of the following program status word for 8086? 5

S	Z	AC	P	CY
0	0	1	1	0

(c) Why is memory segmentation needed in 8086 microprocessor? What is the technique to generate 20-bit physical address in a 16-bit microprocessor? 5
(d) Why does addressing mode require in microprocessor? Describe immediate addressing mode and indexed addressing mode with examples for the 8086 microprocessor. 6
(e) Define interrupt with example. If the processor speed is 1.8 GHz, find the corresponding time period. 4

[Please turn over

Part II

(Answer all of the following questions)

Marks—25×4=100

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|----|--|-------|
| | | Marks |
| 5. | (a) Write the Mergesort algorithm to sort n elements using divide and conquer strategy. | 5 |
| | (b) Define feasible solution and optimal solution. Write the greedy algorithm to generate the single-source shortest path of a graph. | 6 |
| | (c) Consider a sum of subset problem $n = 4$, $w = (w_1, w_2, w_3, w_4) = (11, 13, 24, 6)$ and $m = 30$. Find all possible subsets of w that sum to m . Draw the possible solution space tree of this problem and indicate the answer nodes. | 6 |
| | (d) Define the following terms with example :
Backtracking, NP, NP-Hard, and NP-complete problem. | 4 |
| | (e) Define deadlock in operating system. Draw a proper diagram to show a deadlock situation and discuss in brief. | 4 |
| 6. | (a) What is normalization? Discuss BCNF with an example. | 5 |
| | (b) Define functional dependency. Write Armstrong's axioms property of it. | 5 |
| | (c) Describe the inconsistency state from the following transaction (if any). | 5 |

T_1	T_2
read (A) $A := A - 5$ Write (A) read (B) $B := B + 50$ Write (B) commit	read (A) $temp := A * 0.12$ $A := A - temp$ Write (A) Write (B) $B := B + temp$ Write (B) commit

- | | | |
|----|---|---|
| | (a) Write the responsibilities of a software engineer to design a software. | 5 |
| | (e) What is software testing? Write the differences between following terms? | 5 |
| | (i) Blackbox testing and whitebox testing | 5 |
| | (ii) Verification and Validation. | 5 |
| 7. | (a) Define HTTP and DNS. Suppose that mygov.bd is a domain name. How does this DNS work? | 5 |
| | (b) TCP and UDP are the example of transport layer protocol. What are the differences between these two protocols? | 3 |
| | (c) Discuss circuit switching and packet switching techniques with appropriate diagram. | 7 |
| | (d) Define topologies in a network. Design a LAN for setting up a computer lab using BUS topology. | 5 |
| | (e) What are the differences among virus, worms and trojan horse? | 5 |
| 8. | (a) What are the types of Agent in AI and write their tasks. | 5 |
| | (b) Discuss adversarial search in AI with an example. | 5 |
| | (c) What is overfitting in machine learning? How can we avoid overfitting in machine learning? | 5 |
| | (d) Define supervised learning, unsupervised learning, and reinforcement learning. What are the purposes of using them? | 5 |
| | (e) What is multiplexing in data communication? Write the differences between TDM and FDM. | 5 |

A **Problem-Solving Technique** is a structured approach or method used to identify, analyze, and resolve problems effectively. These techniques provide a framework to understand the root cause of a problem, explore possible solutions, and implement the best one to achieve a desired outcome. Problem-solving techniques can be applied across various disciplines, including business, technology, education, and personal development.

Common Problem-Solving Techniques

1. **Brainstorming**
 - Generate as many ideas as possible without criticism or filtering.
 - Encourages creativity and out-of-the-box thinking.
2. **Root Cause Analysis (RCA)**
 - Focuses on identifying the fundamental reason behind a problem.
 - Common tools: 5 *Whys*, Fishbone Diagram (Ishikawa).
3. **SWOT Analysis**
 - Evaluates Strengths, Weaknesses, Opportunities, and Threats related to a problem or decision.
4. **Mind Mapping**
 - Uses visual diagrams to explore connections between different elements of a problem.
 - Helps in organizing and prioritizing ideas.
5. **PDCA Cycle (Plan-Do-Check-Act)**
 - A continuous improvement model to test solutions and refine them iteratively.
6. **Decision Matrix (Weighted Criteria Analysis)**
 - Compares multiple solutions against a set of weighted criteria.
 - Helps in selecting the most viable option.
7. **Hypothesis Testing**
 - Proposes possible solutions based on assumptions and tests them to validate their effectiveness.
8. **Design Thinking**
 - Focuses on understanding user needs, ideating solutions, and prototyping rapidly.
 - Emphasizes empathy, creativity, and iterative feedback.
9. **Pareto Analysis (80/20 Rule)**
 - Identifies the most significant causes contributing to a problem (the 20% causing 80% of the issues).
10. **Six Thinking Hats**
 - Encourages looking at a problem from multiple perspectives: factual, emotional, creative, judgmental, optimistic, and control.
11. **Lean Problem-Solving**
 - Minimizes waste and focuses on maximizing value.

- Uses tools like Value Stream Mapping and Kaizen.

Each technique is chosen based on the context and complexity of the problem at hand, and sometimes a combination of techniques is used to achieve the best results.