

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING
SRM UNIVERSITY-AP, ANDHRA PRADESH, INDIA

Syllabus for Ph.D. Entrance Examination

GENERAL APTITUDE

Verbal aptitude: English grammar - Vocabulary - Reading and comprehension- Narrative sequencing.

Quantitative aptitude: Data interpretation - 2 & 3-Dimensional plots - Maps & tables - Numerical computation & estimation that includes ratios, percentages, powers, exponents & logarithms - Permutations & combinations - Mensuration and geometry - Elementary statistics & probability.

Analytical aptitude: Logic: Deduction & induction analogy - Numerical relations & reasoning.

Spatial aptitude: Transformation of shapes like translation, mirroring, rotation & scaling - Assembling & grouping - Paper folding, cutting, and patterns (2 & 3 dimensions)

COMPUTER SCIENCE CORE SUBJECTS

PROGRAMMING IN C

Data types and operators – Conditional statements (if, if-else, switch) – Looping statements (for, while, do-while) – One-dimensional arrays – Strings and string handling functions – Two-dimensional arrays – Functions and recursion – Pointers and dynamic memory allocation – Structures and unions – File handling

DATA STRUCTURES

Linear and Non-Linear Data Structures – Arrays – Linked Lists and Their Types – Stacks and Applications of Stacks – Queues and Applications of Queues – Binary Trees – Binary Search Trees – Tree Traversal Techniques – AVL Trees – Graph Data Structures – Graph Representations – Graph Traversal Methods.

DESIGN AND ANALYSIS OF ALGORITHMS

Algorithms Basics – Time and Space Complexity Analysis – Asymptotic Notations (Big O, Ω , Θ) – Searching Techniques (Linear and Binary Search) – Sorting Techniques (Insertion Sort, Merge Sort, Quick Sort) – Greedy Algorithms (Basics, Huffman Coding) – Dynamic Programming (Basics, 0/1 Knapsack Problem) – Backtracking (Basics, N-Queen Problem) – Graph Algorithms – Minimum Spanning Trees (Kruskal's and Prim's) – Shortest Path Algorithms (Dijkstra's and Floyd-Warshall).

OPERATING SYSTEMS

Basics of Operating Systems (OS) – Services Provided by OS – Processes and Process States – Schedulers in OS – CPU Scheduling Techniques (First Come First Serve, Shortest Job First, Shortest Remaining Time First, Priority Scheduling, Round Robin) – Thread Management – Deadlocks (Basics, Necessary Conditions, Handling Methods, Banker's Algorithm for Deadlock Avoidance) – Memory Management Basics – Paging and Segmentation – Types of Page Map Tables – Page Replacement Algorithms (First In First Out, Least Recently Used, Optimal) – Demand Paging – Handling Page Faults

COMPUTER NETWORKS

Concept of Layering (OSI and TCP/IP Protocol Stacks) – Basics of Packet, Circuit and Virtual Circuit Switching – Data Link Layer (Framing, Error Detection, Medium Access Control, Ethernet Bridging) – Routing Protocols (Shortest Path, Flooding, Distance Vector, Link-State Routing) – Fragmentation and IP Addressing – IPv4 and CIDR Notation – IP Support Protocols (ARP, DHCP, ICMP, Network Address Translation [NAT]) – Transport Layer (Flow Control, Congestion Control, UDP, TCP, Sockets) – Application Layer Protocols (DNS, SMTP, HTTP, FTP).

SAMPLE QUESTIONS FROM GENERAL APTITUDE

- 1 Choose the sentence that is grammatically correct:
 - A. He don't like to eat apples
 - B. He doesn't likes to eat apples
 - C. He doesn't like to eat apples
 - D. He not like to eat apples

- 2 Choose the word that is closest in meaning to "*alleviate*":
 - A. Intensify
 - B. Relieve
 - C. Complicate
 - D. Exaggerate

- 3 If the scale of a map is 1:50,000, then 2 cm on the map represents:
 - A. 1 km
 - B. 5 km
 - C. 10 km
 - D. 20 km

- 4 If a sum of money amounts to ₹1210 in 2 years at 10% compound interest per annum, the principal is:
 - A. ₹1000
 - B. ₹1100
 - C. ₹1200
 - D. ₹1300

- 5 All teachers are educated. Some educated people are researchers. Therefore:
 - A. All researchers are teachers
 - B. Some teachers are researchers
 - C. Some educated people are teachers
 - D. No teacher is a researcher

- 6 A man is twice as old as his son. Five years ago, the man was three times as old as his son. The son's present age is:
 - A. 5 years
 - B. 10 years

- C. 15 years
- D. 20 years

- 7 If a triangle is reflected (mirrored) across the y-axis, what happens to its x-coordinates?
- A. They remain the same.
 - B. They are multiplied by 2.
 - C. They change sign (positive becomes negative, negative becomes positive).
 - D. They become zero.
- 8 A cube is painted on all 6 faces and then cut into 64 smaller cubes of equal size. How many of these smaller cubes will have exactly 2 painted faces?
- A. 8
 - B. 12
 - C. 24
 - D. 36

SAMPLE QUESTIONS FROM CORE COMPUTER SCIENCE SUBJECTS

- 1 What will be the output of the following C program?
- ```
#include <stdio.h>
int main() {
 int x = 5;
 printf("%d ", x);
 printf("%d ", x++);
 printf("%d ", ++x);
 return 0;
}
```
- A. 5 6 7
  - B. 5 5 7
  - C. 5 6 6
  - D. 5 7 7
- 2 Which function is used to find the length of a string in C?
- A. sizeof()
  - B. strlen()
  - C. length()
  - D. strlen()
3. If the elements 10, 25, 5, 15, 7, 3, 28 are inserted into a Binary Search Tree (BST) in the given order, what will be the height of the resulting BST?
- A. 2
  - B. 4

- C. 6
- D. 8

4. Which of the following is NOT an application of a stack?
- A. Finding the shortest path in a Graph
  - B. Infix to postfix conversion
  - C. Parentheses matching in expressions
  - D. Evaluation of postfix expression

5. The characters and their frequencies in a message are given as follows:  
'A': 25, 'B': 10, 'C': 80, 'D': 5, 'E': 2, 'F': 15.

If Huffman coding is used for compressing the message, which character will be assigned the shortest code (minimum number of bits)?

- A. 'A'
  - B. 'C'
  - C. 'E'
  - D. 'F'
6. What is the time complexity of Insertion Sort in the best case?
- A.  $(n)$
  - B.  $O(n \log n)$
  - C.  $O(n^2)$
  - D.  $O(1)$

7. If there are four processes in a system with their burst times given, what will be the waiting time of process **P3** when Shortest Job First (SJF) Scheduling is used? Assume that all processes arrive at time 0.

| Process ID | Burst Time |
|------------|------------|
| P1         | 12         |
| P2         | 3          |
| P3         | 10         |
| P4         | 5          |

- A. 3
  - B. 10
  - C. 8
  - D. 18
8. Consider the reference string: 1, 2, 3, 4, 1, 2, 5, 1, 2, 3, 4, 5, Assume the memory has 3 frames. How many page faults will occur using the FIFO (First-In First-Out) page replacement algorithm?

- A.** 7
- B.** 8
- C.** 9
- D.** 10

9 Which of the following is not a function of the Data Link Layer?

- A.** Framing
- B.** Error detection
- C.** Medium Access Control (MAC)
- D.** Shortest Path Routing

10 Which protocol is responsible for dynamically assigning IP addresses to hosts in a network?

- A.** ARP
- B.** DHCP
- C.** ICMP
- D.** NAT

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