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. strlength()
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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