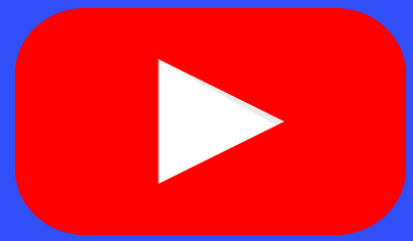


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Syllabus and Reference Links for Section I and II

Syllabus for Section I

- Money, measurement and relations
- Algebra
- Sequences and change
- Sets and Venn Diagrams
- Ratio and Proportion
- Volume and Surface Area
- Square Root and Cube Root
- Time and Work
- Approaching the problem using programmatic thinking techniques such as iteration, symbolic representation, and logical operations

Reference Books/Links for Section I

- Bible to Basic Mathematics by Pragati Agrawal, G.S.Publications
- Tricky Mathematics for General Competitions by R.K. Mishra, Competition Herald

Syllabus for Section II

1. Basic Programming Concepts - 20 Questions

- Variable declaration
- Basic syntax
- Data types and structures
 - String
 - Boolean (true or false)
 - Numbers, which includes integers (whole numbers from 1) and floating-point numbers (decimal-base)
 - Characters (includes single alphabets or numbers)
 - Arrays (a collection of data, usually of the same data type)
- Flow control structures
 - Sequential
 - Selection (conditionals)
 - Iteration (Loops).
- Functional programming
- Object-oriented programming
 - Inheritance
 - Polymorphism

- Abstraction
- Encapsulation
- Debugging

Resources

- <https://www.aimt.edu.in/wp-content/uploads/2016/12/Basic-Programming.pdf>
- <https://www.educative.io/edpresso/what-are-the-basic-fundamental-concepts-of-programming>
- https://chortle.ccsu.edu/java5/Notes/chap09A/ch09_3.html
- <https://www.programiz.com/c-programming/list-all-keywords-c-language>
- <https://www.youtube.com/watch?v=zOjov-2OZ0E>

2. Data Structure Concepts - 10 Questions

- Data structure Introduction
 - Complexity analysis
 - Time complexity
 - Space complexity
 - Bit manipulation
 - Recursion
- Array
 - 1-D arrays
 - Multi-Dimensional arrays
- Linked list
 - Singly linked list
 - Doubly linked list
 - Circular linked list
 - Circular doubly linked list
- Stack
 - Stack implementation by arrays and linked list
- Queue
 - Linear queue
 - circular queue
 - Priority queue
 - Dequeue
 - Array and linked list representation of queue
- Tree

- Binary tree
- Binary search tree
- AVL tree
- B tree
- B+ tree

- Graph
 - Implementation of graph
 - Dfs
 - Bfs
 - Minimum spanning tree

- Searching
 - Linear search
 - Binary search

- Sorting algorithms
 - Bubble sort
 - Insertion sort
 - Selection sort
 - Quick sort
 - Merge sort

Resources

- **Book**
 - Data Structures and Algorithms Made Easy: Data Structures and Algorithmic Puzzles by Narasimha Karumanchi
- **Videos**
 - Introduction of algorithm: <https://youtu.be/S746R8hqNIo>
 - Data Structure: <https://youtube.com/playlist?list=PLBlK6fEycRj9lld8sWIUNwlKfdUoPd1Y>
- **Additional reference**
 - <https://www.javatpoint.com/data-structure-tutorial>
 - <https://www.w3resource.com/java-exercises/basic/index.php>

3. Database Concepts - 15 Questions

- Introduction to Database
- Database-System Applications
- Purpose of Database Systems

- Database Languages
 - Data-Manipulation Language
 - Data-Definition Language
 - Data control language
 - Transaction control language (TCL)

- Introduction to the Relational Model
 - Database Schema
 - Keys
 - Relational Query Languages

- Introduction to SQL
 - Overview of the SQL Query Language
 - SQL Data Definition
 - Basic Structure of SQL Queries
 - Additional Basic Operations
 - Set Operations
 - Null Values
 - Aggregate Functions
 - Nested Subqueries
 - Modification of the Database
 - Join Expressions
 - Views
 - Transactions
 - Integrity Constraints
 - SQL Data Types and Schemas
 - Accessing SQL From a Programming Language
 - Functions and Procedures
 - Triggers

- Database Design
 - The Entity-Relationship Model
 - Constraints
 - Normalization

- Transaction Management
 - Transaction Concept
 - ACID properties

- Overview of NoSQL Database (MongoDB)

Resources

- **Book**
 - DATABASE SYSTEM CONCEPTS by Abraham Silberschatz, Henry F. Korth and S. Sudarshan, Sixth edition

- **DBMS tutorial**
 - <https://www.w3schools.com/sql>
 - <https://www.javatpoint.com/dbms-tutorial>

 - **Mysql official docs**
 - <https://docs.oracle.com/en-us/iaas/mysql-database/doc/getting-started.html>
 - **Mongo Overview**
 - https://www.tutorialspoint.com/mongodb/mongodb_overview.htm

4. Web Development Basics – 15 Questions

- Getting started with the Web
 - Reference :
https://developer.mozilla.org/enUS/docs/Learn/Getting_started_with_the_web

- HTML
 - Multimedia And embedding
 - HTML TablesReference: <https://developer.mozilla.org/en-US/docs/Learn/HTML>

- CSS
 - Styling text
 - CSS layout
 - Box ModelReference: <https://developer.mozilla.org/en-US/docs/Learn/CSS>

- Javascript
 - Client-side web API
 - Asynchronous Javascript
 - Events in Javascripts
 - PromisesReference: <https://developer.mozilla.org/en-US/docs/Learn/JavaScript>

- Web Forms
 - Native form controls
 - Styling forms

- Sending form data

Reference: <https://developer.mozilla.org/en-US/docs/Learn/Forms>

- Server Side website programming
 - First Step

Reference: <https://developer.mozilla.org/en-US/docs/Learn/Server-side>

5. Software Development Life Cycle Basics – 5 Questions

- Software processes
 - <https://www.javatpoint.com/software-processes>
- Software Development Life Cycle
 - <https://www.javatpoint.com/software-engineering-software-development-life-cycle>
- SDLC Models
 - Waterfall model
 - Spiral model
 - V-model
 - Incremental model
 - Agile model - Sprint

Reference : <https://www.javatpoint.com/software-engineering-sdlc-models>

6. Operating System Basics & Networking Basics – 5 Questions

- Introduction
 - What operating system do
 - Types of operating systems
 - Process and Program
- Process Management
 - Process concept
 - Concept of threads
 - Process and thread scheduling
 - Deadlocks
 - Inter-process communication
 - Environment Variables
- Memory management
 - Main memory and Registers
 - Logical addresses and physical addresses
 - Virtual-Memory Management

Reference : <http://web.cse.ohio-state.edu/~soundarajan.1/courses/3430/silberschatz8thedition.pdf>
<https://jameskle.com/writes/operating-systems>

Networking Basics

- TCP and UDP
 - Differences between TCP and UDP protocolsReference:
<https://www.geeksforgeeks.org/differences-between-tcp-and-udp/>

 - IP addressing
 - IPv4 and IPv6 addressReference:
<https://www.ibm.com/docs/en/ts3500-tape-library?topic=functionality-ipv4-ipv6-address-formats>

 - Difference between private and public IP addresses
- Reference:
-
- <https://www.geeksforgeeks.org/difference-between-private-and-public-ip-addresses/>
-
- Static IP vs. Dynamic IP
- Reference:
-
- <https://www.educative.io/blog/static-ip-vs-dynamic-ip>
-
- HTTP
- Reference:
-
- <https://developer.mozilla.org/en-US/docs/Web/HTTP/Overview>
-
- HTTP methods
- Reference:
-
- <https://www.javatpoint.com/http-methods>
-
- HTTPS
- <https://www.cloudflare.com/learning/ssl/what-is-https/>
-
- DNS
- <https://www.cloudflare.com/en-in/learning/dns/what-is-dns/>

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