## INDIAN INSTITUTE OF TECHNOLOGY MADRAS, CHENNAI-600036.

Advertisement No. IITM/R/4/2024 dated 11.03.2024

### Syllabus & Scheme of Examination

**Post: Technical Officer**                    **Stream: Computer Science Engineering**

### LEVEL-1 Multiple Choice Question Test                    (100 Marks)

**PART – A**                                                     **(30 Marks)**

1. *Quantitative aptitude:* Number systems, simplification, decimals, fractions, LCM, HCF, ratio & proportion, percentage, log and trigonometric functions, solutions of simple equations (linear and quadratic), basic statistics – mean and standard deviation, profit & loss, discount, simple & compound interest, mensuration, time & work, time & distance, tables & graphs.

2. *Logical reasoning aptitude:* Analogies, similarities, differences, space visualization, analysis, judgment, decision making, visual memory, discrimination, observation, relationship concepts, arithmetical reasoning, verbal and figure classification

3. *Computer-related aptitude:* Hardware, software, operating systems, basic operations in MS Office® - Word, Excel, PowerPoint

4. *Language aptitude:* Comprehension, vocabulary, and basic grammar in English.

5. *General awareness aptitude:* Current events, general knowledge, Indian history, Indian constitution, basic geography.

**PART – B**                                                     **(70 Marks)**

1. **Programming in C**

**Data Types and Operations:** Data types, constants, variables; Arithmetic operators and expressions; Basic input/output statements; Relational, logical, increment and decrement operators; Bitwise assignment and conditional operators.

**Arrays and Strings:** Array declaration and initialization; Multi-dimensional arrays; Strings and character arrays; String library functions

**Statements:** Assignment statements; Selection statements: if-else, switch; Loop statements: for statement, while statement; Break and Continue.

**Functions:** Definition, Call, Arguments; Argument passing methods:  Call by value, Call byreference; Recursion, Call stack, Header files

**Text files:**  Open, read, write, close;

2. **Data Structures**

**Basic data structures:** Arrays, Linked lists, Doubly linked lists, Circular linked lists, Operations on Queue, Operations on Stack.

**Search techniques:** Linear search, Binary search.

**Sorting techniques:** Bubble sort, Insertion sort, Merge sort, Quick sort.

### 3. Computer Organization

**Functional Components of Computer:** CPU, Memory Unit, Input/Output Unit, Buses.

**Physical Memory Unit:** Basic Memory Cells – SRAM and DRAM, Main Memory Unit, Cache Memory Unit – Mapping Methods, Cache Memory Hierarchy.

**Memory Management Unit:** Virtual Memory Concept – Demand Paging, Page Table Structure, Page Table Entry, Translation Look-Aside Buffer.

**Input/Output Unit:** I/O Control Mechanisms – Program controlled I/O, Interrupt controlled I/O, DMA controlled I/O; Peripheral devices – Keyboard, Display and Hard disk; Peripheral interfaces – PCI, SCSI

### 4. Linux Operating System

**Commands:** Creation of user accounts, Directory Management Commands, File Management Commands, General Purpose Commands, Filters, Communication Commands - Check the Process Status; Process Management Commands, Search Patterns.

**Text Editor:** File operations (New, Open, Close, Save, Save and Exit, Print) – Text Editing operations (Inserting, deleting, finding, replacing, copying and moving).

**Shell Scripts:** Use of shell scripts, Numerical operations, Looping, Swapping Technique, String operations, Using Command line arguments, Date Functions, Relational operations, Logical operations, Boolean operations, Basic arithmetic operations, Case statement, Search Directory orFile

### 5.  Web Design and Programming

**HTML:** Introduction - Basic Tags of HTML - HTML Tag - TITLE Tag – BODY Tag - Formatting of Text: Headers - Formatting Tags: BOLD, ITALICS, UNDERLINE, PARAGRAPH, TT, STRIKETHROUGH, EM, BR and HR tags - PRE Tag - FONT Tag – Special Characters - Working with Images - META Tag.

**Frames:**  Frameset – FRAME Tag – Frame inside other frames – NOFRAMES Tag.

**Forms:** FORM and INPUT Tag – Textbox - Radio Button – Checkbox – SELECT Tag and Pull Down Lists: Hidden - Submit and Reset; Some Special Tags: COLGROUP - THREAD, TBODY, TFOOT - _blank, _self, _parent, _top – IFRAME – LABEL - Attribute for <SELECT> - TEXTAREA.

**CSS:** Introduction – Features – Style Sheet basics - Working with CSS files – Syntax - Types of Style Sheets - Inline Styles - Embedded Styles - External or Linked Styles - What is CSS3? Animation – Borders – Backgrounds – Fonts –Multiple columns – Text effects.

**Formatting Text and Fonts:** Font Families Font Size Kerning, Leading and Indenting - Formatting Colors and Backgrounds: The Color Attribute - The Background Attribute - Background Colors and Images. Exploring CSS Class and ID Attributes: Defining the CSS Class Attribute – Defining the CSS ID Attribute - Dynamic effects with CSS - Lists- Tables – Forms - Simple Examples using above properties.

**PHP:** PHP Structure and Syntax - Integrating HTML with PHP - Syntax and Variables - Constants and Variables - Passing Variables between Pages – if Statements - if and else – switch case - forloop – for each loop.

**Includes:** Includes and Functions for Efficient Code - Strings – Arrays and Array Functions - Sessions and Cookies – Sample Programs - Alternates to Incrementing/Decrementing Values.

### 6.  System Administration

**Introduction:** System Administration - Importance of System Administration Life Cycle – Role of System Administrator – Workstation – Server – Services – Data center

**Virtualization:** Types of Virtualization: Hardware Virtualization - operating system Virtualization - Server Virtualization - Storage Virtualization. - Virtualization Benefits - Virtualization Security Hardware Virtualization Technology – Windows Hyper Visors (HyperV) - How to Use Hyper-V Virtualization Technology - Virtualization Tools

**File System Management:** Windows File and Directory Layout – NTFS – FAT - Disk Partitions –Defragmentation – Registry - Linux File and Directory Layout – EXT4– FreeBSD – EXT3 – VFAT –Disk Partitions

**Account Management:** User management in Windows- creating and managing local users and groups – User and group management in Linux - related commands - superuser - relevant files

**Memory Management:** Windows Memory Architecture and Management – Linux Memory Architecture and Management

**Windows Administration:** Processes - Windows boot process – system process – process identifier - user mode process – kernel mode process - managing start-up process; Windows Services: Active Directory – Domain – Tree – Forests - Groups – Objects – Task Scheduler; Windows Performance: Understanding Physical and Virtual memory – Paging File – Task Manager - Performance Monitor – Resource Monitor; Windows Security: Windows Defender – Firewall – Firewall Inbound/Outbound rules – Group Policy – Windows Services; Maintenance: WSUS (Windows Server Update Service) – Windows Backup & Recovery mechanisms – Windows Error Reporting (WER)

**Linux/Unix Administration:** Boot process overview – Daemons – Boot Loaders GRUB –– start-upscripts – process life cycle – process monitoring; Access Control: File system access control – process ownership – management of root account – user management – ACL; Software Management: Package management tools – rpm – dpkg – apt – yum.

### 7. Computer Networks and Network Services

**Introduction to Computer Networking Concepts:** Layered Network Protocol Architecture

**Physical Layer:** Basics of communications; Physical media types and their important bandwidth and bit-error-rate characteristics; Wired and Wireless media including copper cables, optical fiber and wireless.

**Network Services:** Domain Name System - Dynamic Host Configuration - Authentication servers -Directory services - e-Mail - File sharing - Instant messaging - Online game - Printing - File server -Voice over IP - Video on demand - Video telephony - World Wide Web -Simple Network Management - Time service

**Networking requisites and tools:** Pre-requisites to connect the computers to access the shared resources – Exchange server configuration - Network monitoring tools.

### 8. Computer Hardware and Servicing

**Motherboard components:** Processor sockets/slots – Memory sockets – Chipsets – Cache– BIOS – Clock generator – RTC – Super I/O Controller – Power connector – Battery –Keyboard/Mouse Connectors – Jumpers – Ports and Headers – Pin Connectors -Motherboard Form factor - Hardware, Software and Firmware. Chipsets: Chipset basics - North / South Bridge architecture and Hub architecture.

**Memory:** Primary and Secondary Memory - Memory speed – Access time - Wait states. Main Memory – types - Memory errors.

**Hard Disk:** Construction – Working Principle – File Systems – Formatting and Troubleshooting.

**Removable Storage and Special Devices:** DVD-ROM – Recordable DVD - Rewritable DVD. Blu-ray: Introduction - Blu-ray Disc Parameters – Recording and Playback Principles. Special drives: External drives, Memory stick, USB flash drive, Solid state drive.

**Keyboard and Mouse:** Keyboard: Interfacing and Signals (USB, Wireless), Types of keys, Keyboard Matrix, Key bouncing, Types of keyboard (Simple, Mechanical). Mouse: Optical mouse operation – Optical mouse cleaning – Troubleshooting flowchart for a mouse.

**Printers and Scanners:** Types of printers – Dot Matrix, Inkjet, Laser, Thermal, MFP printer (Multi-Function Printer) - Operation and Troubleshooting. Scanner: Scanner mechanism, working principle – Types of Scanners (Barcode, Handheld, Flatbed) – Preventive maintenance and Troubleshooting.

**Displays and Graphic Cards:** Displays: LCD Principles – Plasma Displays – TFT Displays - LED Displays. Graphic Cards: Video capture card.

**SMPS:** Basic Principles and Operations – O/P Voltage – Cable color code – Connectors and Power Good – Common Failures

**BIOS:** BIOS functions – Cold and Warm booting – BIOS error codes – BIOS interrupts – BIOS advanced setup. Upgrading BIOS, Flash BIOS-setup.


## LEVEL – 2 Professional Competence Test

- **The Professional Competence Test will be a Descriptive Test and/or Laboratory based Test** for testing Professional Competence on the topics mentioned under Part-B for Level-1Test.

## LEVEL – 3 Personal Interview

- Syllabus as mentioned for Professional Competence Test.
- The Interview/personality test shall be conducted in such a manner that the candidate's suitability for the post is tested, among other things, through academic qualifications, experience, general awareness/knowledge, communication and problem-solving skills, and overall personality, etc.

## Scheme of Examination:

| Level | Type of Test | Time | No. of Questions – Max. Marks | Weightage for the final result |
|-------|--------------|------|-------------------------------|-------------------------------|
| Level -1 | Multiple Choice Question Test | Time: 120 Minutes | 100 Objective Questions – 100 Marks | 40 % |
| Level–2 | Professional Competence Test | Time: 90 minutes approximately | Descriptive / Practical Test | 30 % |
| Level-3 | Personal Interview | | 40 Marks | 30% |

- A minimum of 7X candidates shall be shortlisted (for X number of posts advertised) for the Level-2 Professional Competence Test based on their performance in the Level-1 Multiple Choice Question Test.

- A minimum of 3X candidates shall be called for Personal Interviews based on their performance in Level-1 and Level-2 Tests.

**NOTE:**
a) The medium of examination will be ENGLISH
b) The questions will generally be on the minimum qualification level.
c) There shall be no negative marking for wrong answers.
d) **The Level-1 Multiple Choice Question Test is tentatively scheduled to be held on 07th February 2025 at TCS iON Centres in Chennai.**

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