Syllabus for the Post of TGT- Computer Science

Computer Systems and Organisation

- **Basic Computer Organisation:** Introduction to computer system, hardware, software, input device, output device, CPU, memory (primary, cache and secondary), units of memory (Bit, Byte, KB, MB, GB, TB, PB), Overview of computer memory systems, including semiconductor main memory and cache memory, Advanced DRAM organization and memory hierarchy
- **Types of software:** system software (operating systems, system utilities, device drivers), programming tools and language translators (assembler, compiler & interpreter), application software
- **Operating system (OS):** functions of operating system, OS user interface
- **Boolean logic:** NOT, AND, OR, NAND, N O R, XOR, truth table, De Morgan's laws and logic circuits
- **Number system:** Binary, Octal, Decimal and Hexadecimal number system and conversion between number systems.
- **Encoding schemes:** ASCII, ISCII and UNICODE (UTF8, UTF32)
- **System Buses:** Components of a computer system, its functions, and Inter connection structures.

  Bus architecture: general bus concept and PCI (Peripheral Component Interconnect). Address, Data, Control buses
- **CPU Structure:** Register organization, Stack organization, Instruction format, Addressing modes, RISC vs. CISC architectures

Application Software

- Word Processor
- Electronic Spreadsheet
- Presentation Tools

Computational Thinking and Programming

- **Introduction to problem solving:** Steps for problem solving (analyzing the problem, developing an algorithm, coding, testing and debugging). Representation of algorithms using flow chart and pseudo code, decomposition
- **Familiarization with the basic of Python programming:** Introduction to Python, features of Python, executing a simple program, execution (interactive mode and script mode), Python character set, Python tokens (keyword, identifier, literal, operator, punctuator), variables, concept of L-value and R-value, use of comments
- **Knowledge of data types:** number (integer, floating point, complex), Boolean, sequence (string, list, tuple), none, mapping (dictionary), mutable and immutable data types
- **Operators:** Arithmetic operators, Relational operators, Logical operators, Assignment operators, Augmented assignment operators, Identity operators (is, is not), Membership operators (in, not in)

- **Expressions, statement, type conversion & input/output:** precedence of operators, expression, evaluation of expression, p y t h o n statement, type conversion (explicit & implicit conversion), accepting data as input from the console and displaying output
- **Errors:** syntax errors, logical errors, runtime errors
- **Flow of control:** introduction, use of indentation, sequential flow, conditional and iterative flow control
- **Conditional statements:** if, if-else, if-elif-else, flowcharts, simple programs: e.g.: absolute value, sort 3 numbers and divisibility of a number, check odd even, verify Positive negative etc.
- **Iterative statements:** for loop , range function, while loop, flowcharts, break and continue statements, nested loops, suggested programs: generating pattern, summation of series, finding the factorial of a positive number etc.
- **Strings:** introduction, indexing, string operations (concatenation, repetition, membership & slicing), traversing a string using loops, built-in functions: len(), capitalize(), title(), lower(), upper(), count(), find(), index(), endswith(), startswith(), isalnum(), isalpha(), isdigit(), islower(), isupper(), isspace(), lstrip(), rstrip(), strip(), replace(), join(), partition(), split()
- **Lists:** introduction, indexing, list operations (concatenation, repetition, membership &slicing),traversing a list using loops, built-in functions: len(), list(), append(), extend(), insert(), count(),index(), remove(), pop(), reverse(), sort(), sorted(), min(), max(), sum(); nested lists,
  Suggested programs: finding the maximum, minimum, mean of numeric values stored in a list; linear search on list of numbers and counting the frequency of elements in a list
- **Tuples**: introduction, indexing, tuple operations (concatenation, repetition, membership & slicing), built-in functions: len(), tuple(), count(), index(), sorted(), min(), max(), sum(); tuple assignment, nested tuple,
  Suggested programs: finding the minimum, maximum, mean of values stored in a tuple; linear search on a tuple of numbers, counting the frequency of elements in a tuple
- **Dictionary:** introduction, accessing items in a dictionary using keys, mutability of dictionary (adding a new item, modifying an existing item), traversing a dictionary, built-in functions: len(), dict(), keys(), values(), items(), get(), update(), del(), clear(), fromkeys(), copy(), pop(), popitem(), setdefault(), max(), min(), count(), sorted(), copy();
  Suggested programs: count the number of times a character appears in a given string using a dictionary, create a dictionary with names of employees, their salary and access them
- **Introduction to Python modules**: Importing module using 'import 'a n d using from statement, importing math module (pie, sqrt, ceil, floor, pow, fabs, sin, cos, tan); random module (random, randint, randrange), statistics module (mean, median, mode)
- **Functions:** types of function (built-in functions, functions defined in module, user defined functions), creating user defined function, arguments and parameters, default parameters, positional parameters, function returning value(s), flow of execution, scope of a variable (global scope, local scope)
- **Introduction to files:** types of files (Text file, Binary file, CSV file), relative and absolute paths
- **Text file:** opening a text file, text file open modes (r, r+, w, w+, a, a+), closing a text file, opening a file using with clause, writing / appending data to a text file using write() and writelines(), reading

from a text file using read(), readline() and readlines(), seek and tell methods, manipulation of data in a text file

- **Binary file:** basic operations on a binary file: open using file open modes (rb, rb+, wb, wb+, ab, ab+), close a binary file, import pickle module, dump () and load () method read, write/create, search, append and update operations in a binary file
- **CSV file:** import csv module, open / close csv file, write into a csv file using csv.writerow() and read from a csv file using csv.reader( )

Society, Law and Ethics

- **Digital Footprints**
- **Digital society and Netizen:** net etiquettes, communication etiquettes, social media etiquettes
- **Data protection:** Intellectual Property Right (copyright, patent, trademark), violation of IPR (plagiarism, copyright infringement, trademark infringement), open source softwares and licensing (Creative Commons, GPL and Apache)
- **Cyber-crime:** definition, hacking, eavesdropping, phishing and fraud emails, ransomware, preventing cyber crime
- **Cyber safety:** safely browsing the web, identity protection, confidentiality, cyber trolls and bullying.
- **Safely accessing web sites:** malware, viruses, trojans, adware
- **E-waste management:** proper disposal of used electronic gadgets
- **IT Act :** Indian Information Technology Act
- **Technology & Society:** Gender and disability issues while teaching and using computers

Computer Networks

- **Evolution of networking:** introduction to computer networks, evolution of networking (ARPANET, NSFNET, INTERNET)
- **Data communication terminologies:** concept of communication, components of data communication (sender, receiver, message, communication media, protocols), measuring capacity of communication media (bandwidth, data t r a n s f e r rate), IP address, switching techniques (Circuit switching, Packet switching)
- **Transmission media:** Wired communication media (Twisted pair cable, Co-axial cable, Fiber- optic cable), Wireless media (Radio waves, Micro waves, Infrared waves)
- **Network devices:** (Modem, Ethernet card, RJ45, Repeater, Hub, Switch, Router, Gateway, WIFI card).
- **Network topologies and Network types:** types of networks (PAN, LAN, MAN, WAN), networking topologies (Bus, Star, Ring, Tree)
- **Network protocol:** HTTP, FTP, PPP, SMTP, TCP/IP, POP3, HTTPS, TELNET, VoIP, wireless/mobile communication protocol such as GSM, GPRS and WLL
- **Introduction to web services:** WWW, Hyper Text Markup Language (HTML), Extensible Markup Language (XML), domain names, URL, website, web browser, web servers, web hosting.

Database Management

- **Database concepts:** introduction to database concepts and its need
- **Relational data model:** relation, attribute, tuple, domain, degree, cardinality, keys (candidate key, primary key, alternate key, foreign key)
- **Structured Query Language :** introduction, Data Definition Language and Data Manipulation Language, data type (char(n), varchar(n), int, float, date), constraints (not null, unique, primary key), create database, use database, show databases, drop database, show tables, create table, describe table, alter table (add and remove an attribute, add and remove primary key), drop table, insert, delete, select, operators (mathematical, relational and logical), aliasing, distinct clause, where clause, in, between, order by, meaning of null, is null, is not null, like, update command, delete command, group by, having clause, joins: Cartesian product on two tables, equi-join, Union and natural join
- **Math functions:** POWER (), ROUND (), MOD ().
- **Text functions:** UCASE()/UPPER(), LCASE()/LOWER(), MID()/SUBSTRING() /SUBSTR(), LENGTH (), LEFT(), RIGHT(), INSTR(), LTRIM(), RTRIM(), TRIM().

- **Date Functions:** NOW(), DATE(), MONTH(), MONTHNAME(), YEAR(), DAY(), DAYNAME ().
- **Aggregate Functions:** MAX(), MIN(), AVG(), SUM(), COUNT(); using COUNT(*).
- **Querying and manipulating data:** using Group by, Having, Order by.

Emerging Trends

- Artificial Intelligence, Machine Learning, Natural Language Processing, Immersive experience (AR, VR), Robotics, Big data and its characteristics, Internet of Things (IoT), Sensors, Smart cities, Cloud Computing and Cloud Services (SaaS, IaaS, PaaS); Grid Computing, Block chain technology.

Artificial Intelligence

- **AI Core Concepts:** AI domains, ethics, project cycle, data literacy, generative AI, modeling, evaluation, stats, CV, NLP, **Automated vs. autonomous systems, Basics of machine learning, Importance of cybersecurity in AI**

Use of AI Tools:

- **ChatGPT** – Text generation, explanations, brainstorming.
- **Gemini (Google)** – AI search and summarization.
- **Claude (Anthropic)** – Writing, summarizing, reasoning tasks.
- **Microsoft Copilot** – Integrated with Word, Excel, PowerPoint for AI assistance. • **Canva AI** – Magic Write, AI design suggestions, image generation

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