Advt No. : CORP/GRP.A/04/2024

Recruitment of Scientist B (Level 10) against Continuing contract vacancies

Online Examination

Domain wise examination shall be conducted at the defined examination centres.

An email is sent to your registered email ID with a link to select the desired examination centre from the available ones.

The details of the examination i.e. duration, date, etc. shall be updated on website in due course of time.

Important Note to the applicants:

- **All the applicants must assess their own eligibility as per the notified criteria in our detailed advertisement.**
- **If you satisfy the criteria then only opt for the further process of exam centre selection.**
- **If you disqualify at any stage of the selection process, no communication / representation in this regard shall be considered later.**
- **No TA /DA shall be payable to the applicants for attending the examination.**

Syllabus for the notified centre wise domains is provided on following pages.

Detailed advertisement (Advt. no. CORP/GRP.A/04/2024) is provided after the syllabus

Syllabus:

I. Pune Centre

A. HPC System Software Development

1. **Operating Systems -** Process Management, Scheduling, Interprocess Communication & Synchronization, Memory Management, I/O subsystem & File Systems, POSIX Thread Programming, POSIX Semaphores, Mutexes, Conditional Variables, Shared Memory
2. **C programming** – Data-Types, Variables, Constants, Operators, Identifiers, Preprocessors , arrays, pointers, basics of Data Structures, Algorithms and Abstract Data Types, Complexity of Algorithms, Linked Lists, Stacks, Queues, Searching and Sorting Algorithms, Hashing, Trees.
3. **Linux programming -** GNU Toolchain, Linux environment and editors, Debugging and Optimization of C programs, file handling, signal handling, shell commands, scripting, static linking & dynamic linking, cross-compilation
4. **Device driver programming -** Linux Kernel Modules and Module Programming, Char Device Drivers, Kernel Internals: Dynamic memory allocations, Handling Delays, Timers, Synchronization, Locking, I/O Memory and Ports, Interrupts, Deferred Executions, Driver Debugging Techniques
5. **Embedded programming -** Programming in Assembly and Embedded C, Microcontrollers, Microprocessors and SoC, RISC vs CISC, Timers/Counters, UART, SPI, PWM, Input & Output, I2C, CAN, LED, LCD, RTC, Bus Standards (USB, PCI), ARM, RISC-V
6. **Network programming -** OSI layer, Socket Programming, IP addressing
7. **Computer Architecture and Organization -** Instruction Set Architecture, Cache design and coherency, Arithmetic Logic Unit, Floating Point Unit, Instruction Set Pipelining, Parallel Processing Architectures, Distributed systems

B. Hardware – System Design

1. Electronics Design Fundamentals:

- Introduction to Electronics: Signals, frequency Spectrum of Signals, Analog and Digital Signals, Linear Wave Shaping Circuits: RC LPF, Integrator, RC HPF, Differentiator. Properties of Semiconductors: Intrinsic, Extrinsic Semiconductors, Current Flow in Semiconductors, Diodes: p-n junction theory, Analysis of Diode circuits, Rectifiers,

- Bipolar junction Transistor (BJTs): Physical Structures & Modes of Operation, Transistor Characteristics, DC analysis, Introduction to Small Signal Analysis, Transistor as an amplifier, The RC coupled amplifier, Introduction to Power Amplifiers, Transistor as switch. Field Effect Transistors (FETs): Physical Structures & Modes of Operation of MOSFETs, MOSFET Characteristics, DC Analysis. Feedback Amplifiers & Oscillators: General Principles, Different types of feedback amplifier. Voltage regulators, Voltage converters, Level Shifters.
- Operational Amplifiers (OP-Amps): Ideal OP-AMP, Inverting Amplifier, Non-Inverting Amplifier. Adder, Subtractor, Integrator, Differentiator.
- Digital Fundamentals: Binary Numbers, Signed-binary numbers, Hexadecimal Number Systems, Logic Gates. Combinational and sequential logic design, Digital Logic families.
- Programmable Logic Devices: PLD, PGA, PLA, PAL, FPGA etc.
- Measuring and Test equipment: Introduction to Electronic Instruments, such as Oscilloscope, Multi-meter, Signal Generators, Logic Analyzer

2. Computer Architecture Fundamentals:

- Introduction to Computer Architecture and Organization. Von Neuman Architecture, Harvard Architecture, Flynn Classification.
- Computer Organisation: General register organization, stack organization, Instruction formats, Data transfer and manipulation, program control. RISC, CISC characteristics. Instruction Set Architecture (ISA). Pipeline and Vector processing: Pipeline structure, speedup, efficiency, throughput and bottlenecks. Arithmetic pipeline and Instruction pipeline.
- Memory Organisation: RAM, ROM, Memory Hierarchy, Organization, Associative memory, Cache memory, and Virtual memory. DDRx memories, flash memories.
- Input-Output Organization: Input-Output Interface, Modes of Transfer, Priority Interrupt, DMA, IOP processor.
- Common Bus Architectures such as PCIe, LVDS, SPI, I2C, USB etc.
- Functionality and operation of common networking devices such as network switches, routers.

3. Embedded System Design:

- Overview of Embedded System: Definition, Design Challenges and Characteristics, Categories and Requirements of Embedded Systems. Embedded Hardware and Software Development environment. Difference between microprocessor, microcontroller and DSP. General capability of microcontroller; microcontrollers in embedded systems. Suitability/selection of a microcontroller based on - Cost, Performance, Power dissipation and architecture- 8-bit, 16-bit, 32-bit. Concepts of system-on-chip.
- Interfacing: I/O interfacing of devices such as LED, LCD, different sensors, ADC, DAC etc.

C. Hardware – VLSI / FGPA Design

1. **Advanced Digital design -** Combinatorial Logic Design, Sequential Logic Design: State machines, Counter Design, Advanced Design Issues: metastability, noise margins, power, fan-out, design rules, skew, timing considerations, Frequency divide Hazards. Asynchronous State Machine: Cycle stealing using latch in synchronous circuits, Interfacing Asynchronous data flow, Asynchronous FIFO design, Asynchronous to Synchronous Circuit Interaction

2. **System Architecture -** System Building Blocks: knowledge of Computer Architecture, Memory Architectures, SPI, I2C, UART, eSPI, USB. FPGA Architecture: Architecture study of some popular FPGA families (Ultra Scale architecture), Architecture of Microcontrollers in FPGA (ARM), The backend tools, Integrating non-HDL modules: Building macros, Knowledge of System on Chip (SOC), Multicore Architecture.

3. **Verilog -** Module components, Data types, Operators, Modeling concepts ,Gate level Modeling, Data Flow Modeling, Behavioral modeling, Task and Functions, Compiler Directives, Specify block and Timing checks, Verification and Writing test benches, UDP, VCD, PLI, FSMD

4. **Simulation and Synthesis -** HDL Flow, The concept of Simulation, Types of simulation, HDL Simulation and Modeling, Simulation Vs Synthesis result, The Synthesis Concept, Synthesis of high level constructs, Timing Analysis of Logic circuits, Clock Skew, Clock Jitter, Combinatorial Logic Synthesis, State machine synthesis, Efficient coding styles, Partitioning for synthesis, Pipelining, Resource sharing, Optimizing arithmetic expressions, FPGA synthesis and implementation

5. **CMOS VLSI -** N-MOS, P-MOS and CMOS, Structure of MOS cells, Threshold Voltage, CMOS Inverter Characteristics, Device sizing, CMOS combinational logic design, Design of Basic gates, transmission gates and Design of complex logic circuit, Latch Up effect, Body Effect, Channel Length Modulation, CMOS as a switch, Noise Margin, Rise and fall times, Power dissipation, Knowledge of CMOS fabrication steps, Sequential CMOS logic.

6. **Fin-FET technology.** Application Specific Integrated Circuit (ASIC) Design Flow: Knowldege of Backend VLSI Design Flow – Libraries, Floor planning, Placement, Routing, Verification, Testing. Specifications and Schematic cell Design, Spice simulation, circuit elements, AC and DC analysis, Transfer Characteristics, Transient responses, Noise analysis of current and voltage, Design Rule, Micron Rules, Lambda rules of the design and design rule check, Fabrication methods of circuit elements, Layout design of different cells, Circuit Extraction, Electrical rule check, Layout Vs. Schematic (LVS), Post-layout Simulation and Parasitic extraction, Different design Issues like Antenna effect, Electro migration effect, Body effect, Inductive and capacitive cross talk and Drain punch through, etc., Design format, Timing analysis, Back annotation and Post layout simulation, DFT Guideline, Test Pattern and Built-in Self Test (BIST), ASIC design implementation.

7. **System Verilog (desirable) -** System Verilog Declaration Spaces, Data types, Arrays , structure, union, Procedural Blocks and Statements, Task and function, Verification using SV, Types of verification, Code coverage, task & functions in System Verilog, OOPs Terminology, Implementation of OOPs Concepts in System Verilog, Randomization, Assertions property, Assertions Time, Functional Coverage, FSMD methodologies and working principles, Verilog Regions

8. **Verification (UVM) -** Transaction, Test bench & its component, UVM class, UVM reporting, Device Under Test (DUT) and its connection with environment, Scoreboards, coverage, predictors, monitors, Hierarchy in UVM, Factory Overrides, Interfaces in UVM, Configuration, sequences Multiple Sequences configuration, UVM register Model, RM & its use in verification, RM integration, TLM (Transaction Level Modelling)

9. **Linux Shell scripting, Python (Desirable) -** Linux Commands, Linux File System, Vi editor, The Shell, Shell Programming, Basics of TCL scripting, Python - Operator and Expressions, Numbers, Strings, Lists, tuples, dictionary, standard I/O operations, functions, regex, OOPS concepts

D. System Administrator

1. **Basic Linux Concepts and Linux Operating System Fundamentals:** Download, Install and Configurations of Linux Operating System, System Access and File System
2. **Linux System Administration**
3. **Linux File Editors Vi (or Vim) and Nano:** Advantages, Differences, functionality and useability
4. **User accounts and Group management:** Creating and managing user/group accounts, setting up user permissions and access control, and monitoring activity**.**
5. **Users and Sudo access :** Managing the custom permissions for users and Sudoers
6. **Linux Directory Service** - Account Authentication

7. **Linux Commands:** System utility, Processes and schedules, System Monitoring, OS Maintenance, System logs monitor, Changing System Hostname, Finding System Information, Recover root Password, Environment variables
8. **Shell Scripting:** Linux Kernel, what is a Shell, Types of Shells, Basic Shell scripts
9. **Networking:** Networking Servers and System Updates, enabling internet in Linux VM, Network Components, Network files, NIC Information, NIC or port bonding, Download files with URLs, curl and ping commands, File transfer commands, System updates and repositories, System Upgrade/Patch Management, Create Local Repository from CD/DVD, Advance Package Management, Rollback Patches and Updates, SSH and Telnet, DNS, Hostname and IP Lookup, NTP, Apache Web Server, Central Logger, OpenLDAP
10. **Securing Linux Machine** (OS Hardening)
11. **Disk Management and Run Levels:** System run levels, Linux Boot Process, Message of the Day, Storage, Disk partition(Add Disk and Create Standard Partition, Logical Volume Management (LVM), LVM Configuration during Installation, Add Disk and Create LVM Partition, extend disk using LVM, Adding swap space, RAID, File System Check.
12. **System Backup** (dd Command)
13. **Network File System (NFS**)

II. Bengaluru Centre

A. HPC Software

1. Exposure to x86_64 instruction set, addressing modes, and performance characteristics of x86_64 processors. Understanding the ARMv8/v9 architecture, its features, and its suitability for HPC. Knowledge of the RISC-V instruction set architecture, its modular design, and its potential for HPC.
2. **BIOS/UEFI Firmware - Coreboot, EDKII** Understanding of BIOS/UEFI Concepts, UEFI Specifications, Device Tree, Trusted Platform Module, Building and Porting Coreboot, UEFI Driver Development and its stages.
3. **Operating System and Concepts - Linux** Understanding Linux kernel architecture, file systems, processes, and memory management. Shell scripts for automating tasks for HPC. Configuring and managing Linux systems for HPC environments.
4. **Programming Languages - C, C++, Fortran, Python** Proficiency in C, C++, Fortran and Python programming, data structures, algorithms.

5. **Compilers and Toolchain - GCC, LLVM, GNU Toolchain**
   Using GCC for compiling C, C++, and Fortran programs, and compiler optimizations. Understanding the LLVM compiler infrastructure, its modular design, and its use in development and optimization of compilers. Compiler for GPGPU (NVIDIA/AMD etc.) and AI accelerators (TVM/XLA/Glow etc.). Using the GNU toolchain for profiling, linking, binary analysis and debugging.
6. **Parallel Programming Models - MPI, OpenMP, Hybrid Programming (MPI + OpenMP), CUDA, OpenACC, OpenCL, SyCL**
   MPI concepts, MPI Data types, point-to-point communication, collective operations, and various MPI implementations. OpenMP directives, shared memory parallelism, and its use in multi-core systems and devices. Combining MPI and OpenMP for parallelizing applications with both shared and distributed memory approach.
   CUDA programming, GPU architecture, kernel functions, memory usage and optimization. OpenACC directives for offloading computations to GPUs and managing data transfers. OpenCL for cross-platform device programming and heterogeneous computing and its use in HPC. SyCL as a C++-based abstraction for heterogeneous computing.
7. **Performance Analysis and Debugging - GNU Profiler, GNU Debugger, TAU, HPC Toolkit**
   GNU Profiler to measure program execution time, identify performance bottlenecks, and optimize code. Debugging serial and parallel programs using GNU Debugger, setting breakpoints, inspecting variables, and analyzing memory usage. TAU for performance analysis, profiling, and visualization of HPC applications. Analyzing application performance using HPC Toolkit
8. **Libraries and Benchmarks - Linear algebra (BLAS, LAPACK), NAS Parallel Benchmarks, Floating Point Number System**
   Using BLAS and LAPACK for efficient linear algebra operations in HPC applications. Evaluating the performance of HPC systems using the NAS Parallel Benchmarks suite. IEEE 754, POSIT
9. **HPC Resource Management, Scheduler and Runtime**
   SLURM's architecture, job submission and scheduling, resource allocation, and user management. HPC Scheduling Concepts and Algorithm for efficient scheduling across heterogenous computing resources. Runtime for enabling program execution on different hardware devices.

- **Computer and HPC Architecture**
- **Operating system (Linux)**
- **C/ Modern C++ and python,**
- **data structure and algorithms**
- **Compiler design**
- **Parallel Programming models- OpenMP,CUDA and SYCL**
- **Message passing techniques**
- **Programming libraries - math, domain and AI based**
- **Tools and Frameworks for supporting HPC-AI**
- **Databases (sql and nosql)**

B. Cyber Physical Systems - Embedded systems & IoT

a. <u>Embedded systems</u>

1. **Embedded C Programming and Data structure -** Overview of C Programming language, Introduction to GNU Toolchain and GNU Make utility, Linux environment and vi editor, Tokens of C - Keywords, Data-Types, Variables, Constants, Operators, Identifiers, Storage Class Specifiers, Control Flow Statements, Arrays, Multidimensional arrays, Data Input & Output, Strings, Loops, Functions and Recursion, Pointers - Introduction, Pointer Arithmetic, Pointers and Arrays, Pointers and Functions, Pointers and Strings, Structures, Unions, Enum, Typedef, Bit field operators and pointers with structures, Preprocessors, C and Assembly, Files, I/O, Variable number of arguments, Command Line arguments, Error handling, Debugging and Optimization of C programs, Bit operations, Handling portability issues in C, Hardware, Time, Space and Power aware Programming. Algorithms and Abstract Data Types, Complexity of Algorithms, Linked Lists, Stacks, Queues, Searching and Sorting Algorithms, Hashing, Trees.

2. **Microcontroller programming and peripheral interface -** Overview of Microcontrollers, Microprocessors and SoC, RISC vs CISC, Harvard vs Princeton Architectures, Overview of Computer Architecture, Embedded Memories, Timers/Counters, UART, SPI, PWM, WDT, Input Capture, Output Compare Modes, I2C,CAN, LED, Switches, ADC, DAC, LCD, RTC, Bus Standards (USB, PCI), Programming in Assembly and Embedded C.

3. **ARM**: Overview of ARM Architecture and Organization, Introduction to Cortex-M Architecture, Programming Model and Instruction Set Architecture, Alignment and Endianness, Register access, State, Privilege, Stack, System Control Block, Power Modes, Memory Model, NVIC, Exception Handling, Bit- Banding, Peripheral Programming, SVCall, SysTick, PendSv, MPU, DMA, Mixing Assembly and C programs, Introduction to CMSIS & CMSIS Components, Overview of Cortex A & R architectures.

4. **RISC V**: Why RISC-V processor, RISC-V processor overview, ARM vs RISC-V, Modes in RISC-V, Setting up of necessary tools, RISC-V register set and calling convention, Instruction formats and type, Build Process, Practical examples of instructions, Detail description on Control and Status Registers, Exception handling, Examples in assembly for exception handling, Interrupts, Interrupt Entry and Exit procedure. Introduction to C-DAC VEGA processors.

5. **Power Management**: Power supply requirements for embedded systems, Low-power design techniques, Power modes of microcontrollers (sleep, deep sleep), Energy-efficient software design.
6. **Testing and Debugging in Embedded Systems**: Testing methodologies: unit testing, integration testing, system testing, On-chip debugging techniques: JTAG, SWD, Fault- tolerance and error-handling mechanisms, Testing tools: oscilloscopes, logic analyzers, debuggers.

b. IoT

1. **Introduction to IoT**

   Fundamentals of IoT: Introduction, Definitions & Characteristics of IoT, IoT Architectures, Physical & Logical Design of IoT, Enabling Technologies in IoT, IoT frameworks, IoT and M2M.

   Sensors Networks: Definition, Types of Sensors, Types of Actuators, IoT Development Boards: Arduino IDE and Board Types, RaspberriPi Development Kit, RFID principles and components, Wireless Sensor Networks: History and Context, The node, Connecting nodes, Networking Nodes, WSN and IoT.

2. **Networking and Communication Protocols -** Overview of Basic Networking Concepts (TCP/IP, OSI Model), MQTT, CoAP, LoRaWAN and Cellular Technologies in IoT, Bluetooth Low Energy (BLE) Network Topologies for IoT, Wireless Technologies for IoT: WPAN Technologies for IoT: IEEE 802.15.4, Zigbee, HART, NFC, Z-Wave, BLE, BACnet, Modbus. IP Based Protocols for IoT IPv6, 6LowPAN, RPL, REST, AMPQ, CoAP, MQTT. Edge connectivity and protocols

3. **IoT Hardware and Embedded Systems -** Overview of Microcontrollers (Arduino, Raspberry Pi, i.MX8), Types of Sensors and Actuators and Their Applications, Power Management Techniques, Embedded Programming Languages (C/C++, Python), Hardware Interfacing Techniques (GPIO, I2C, SPI), Basics of the Python programming language, Programming on the Raspberry Pi. Python on Raspberry Pi, Python Programming Environment, Python Expressions, Strings, Functions and Function arguments, Lists, List Methods, Control Flow.

4. **Data Management and Processing -** Data Acquisition Techniques from Sensors, Signal Processing Methods Role of Cloud Computing in IoT (AWS IoT, Azure IoT) Concepts of Edge Computing Comparison of Data Storage Solutions (SQL vs. NoSQL) Data Analytics in IoT, IoT Physical Servers and Cloud Offerings: Introduction to Cloud Storage models and communication APIs. Webserver – Web server for IoT, Cloud for IoT, Python web application framework, Designing a RESTful web API, Connecting to APIs. Introduction, Bigdata, Types of data, Characteristics of Big data,Data handling Technologies, Flow of data, Data acquisition, Data Storage, Introduction toHadoop. Introduction to data Analytics, Types of Data analytics, Local Analytics, Cloud analytics and applications.

5. **Security and Privacy in IoT -** Common IoT Security Challenges and Threats, Best Practices for Securing IoT devices, Overview of Encryption Methodologies (TLS, End-to-End Encryption),Privacy Concerns in Data Collection and Compliance Standards ,Security in WSN: Challenges of Security in Wireless Sensor Networks, Security Attacks in Sensor Networks, Protocols and Mechanisms for Security, IEEE 802.15.4 and ZigBee Security.

6. **IoT Applications and Use Cases -** Smart Homes, Smart Cities, and Industrial IoT, Healthcare Applications and Wearable Technologies, Environmental Monitoring and Precision Farming, Transportation and Fleet Management Solutions, Applications of IoT: Home Automation, Smart Cities, Energy, Retail Management,

Logistics, Agriculture, Health and Lifestyle, Industrial IoT, Legal challenges, IoT design Ethics, IoT in Environmental Protection.

7. **Development Frameworks and Tools**
   - Overview of Popular IoT Platforms (AWS IoT, Azure IoT)
   - Development Tools and Environments (PlatformIO, Arduino IDE)
   - APIs for IoT Integration (REST, GraphQL)
   - IoT Simulation Tools (Cooja, IoTIFY)

8. **Testing and Quality Assurance**
   - Testing Strategies for IoT Devices (Unit, Integration, Performance Testing) Importance of Performance Monitoring
   - Reliability Testing Approaches
   - Tools for Testing IoT Applications (API Testing Tools)

9. **Emerging Technologies in IoT -** AI and Machine Learning in IoT, Blockchain Applications in IoT Security Augmented Reality (AR) and Virtual Reality (VR) Digital Twin Technology and its Applications Impact of 5G on IoT Development

C. Hardware – VLSI / FGPA Design

1. Fundamentals of VLSI Design, MOSFET and CMOS based Circuit Design,
2. Analog VLSI Design, CMOS Layout and Design Rules, Memory Design,
3. Design Methodologies, Testing and Verification,
4. Digital VLSI Design and circuits,
5. ASIC Digital and Analog flow, Physical Design flow, Physical Verification flow,
6. Hardware Description Language (VHDL/Verilog/System Verilog etc.),
7. Static Timing Analysis (STA).
8. FPGA based Digital Design, FPGA Architecture and Building Blocks,
9. Design Flow for FPGA, FPGA Synthesis and Optimization, FPGA Implementation and Physical Design,
10. FPGA Prototyping and Debugging,
11. System on Chip (SoC) with FPGA/ASIC,
12. Multi FPGA Design, Bus Interconnects.
13. Arithmetic circuits, Computer Architecture, Cryptography, CPU and GPU Designs.

D. Quantum Computing

1. Quantum Mechanics Fundamentals
2. Mathematical Foundation – Linear Algebra
3. Quantum Information Science
4. Basics of Quantum Computing
5. Quantum Algorithms
6. Quantum Hardware and Architectures
7. Control Electronics and Measurement Hardware
8. Quantum Optics
9. Quantum Programming and Simulation Tools – (Qiskit, Cirq)
10. Quantum Error Correction
11. Post-Quantum Cryptography

III. Delhi

A. Applied AI and Data Analytics

1. Python Programming

- Core Python: Data types, control structures, functions, and file handling.
- Object-Oriented Programming (OOP): Classes, inheritance, and polymorphism.
- Libraries: Familiarity with NumPy, Pandas, Scikit-learn, TensorFlow, PyTorch, and FastAPI.
- Data Visualization: Using Matplotlib, Seaborn, and Plotly for insights.
- Performance Optimization: Profiling and improving code efficiency.
- Sorting and Searching: Merge Sort, Quick Sort, Binary Search.
- Data Structures: Arrays, Linked Lists, Stacks, Queues, Trees, Graphs, and Hash Tables.
- Threading: Basics of Python threading and understanding thread safety.
- Multiprocessing: Parallel execution using the multiprocessing module.
- Concurrency vs. Parallelism: Distinguishing and implementing both approaches.

2. Machine Learning & Deep Learning

- Statistical Learning: Basics of model training, optimization, and evaluation.
- Ensemble Methods: Combining multiple models like Boosting, Bagging, and Random Forest.
- Transfer Learning & Meta-Learning: Techniques to reuse or adapt models for new tasks.
- Deep Learning: Understanding CNNs, RNNs, LSTMs, Transformers (like BERT, GPT).
- NLP & Computer Vision: Working with advanced text and image processing models.
- Generative AI: Using LLMs, Diffusion Models, and Retrieval-Augmented Generation (RAG).

3. MLOps & Data Engineering

- Version Control: Tracking experiments and models with tools like MLflow and DVC.
- CI/CD Pipelines: Automating testing and deployment of ML models.
- Containerization: Deploying models with Docker and Kubernetes.
- Data Engineering: Managing large-scale data using Spark and data lakes.
- Real-Time Processing: Tools like Kafka for streaming and Spark Streaming for live data.
- Feature Engineering: Creating and managing useful data features.

B. Dependable & Secure Computing (Cyber Security)

1. Cyber Security Fundamentals

- Definition and Importance of Cyber Security
- Key Principles: Confidentiality, Integrity, Availability (CIA Triad)
- Types of Cyber Security: Information Security, Application Security, Network Security, Cloud Security
- Security Policies and Frameworks: ISO/IEC 27001, NIST Cybersecurity Framework, CIS Controls

- Risk Management: Identifying Risks and Vulnerabilities, Risk Assessment and Mitigation Strategies
- Incident Response: Phases of Incident Response (Preparation, Detection, Response, Recovery), Post-Incident Review and Reporting

2. Network Security

- Network Security Basics: OSI and TCP/IP Models, Types of Networks (LAN, WAN, VPN)
- Firewalls: Types (Packet Filtering, Stateful, Application), Configuration and Management
- Intrusion Detection and Prevention Systems (IDPS): Signature-Based vs. Anomaly-Based Detection, Implementation and Tuning
- VPN Technologies: VPN Protocols (IPSec, SSL, L2TP), Secure Remote Access Solutions
- Wireless Security: Wi-Fi Security Protocols (WPA2, WPA3), Risks and Mitigation Strategies
- Network Monitoring and Logging: Security Information and Event Management (SIEM), Best Practices for Network Monitoring

3. Application Security

- Secure Software Development Lifecycle (SDLC): Security in Development Phases, DevSecOps Principles
- Common Vulnerabilities: OWASP Top Ten (e.g., SQL Injection, XSS, CSRF), Secure Coding Practices
- Application Security Testing: Static Application Security Testing (SAST), Dynamic Application Security Testing (DAST)
- API Security: Authentication and Authorization Protocols (OAuth, JWT), Securing REST and SOAP APIs
- Mobile Application Security: Threats to Mobile Apps, Secure Coding Guidelines for iOS and Android
- Web Application Firewalls (WAF): Purpose and Implementation, Rules and Policies for WAF

4. Cryptography

- Basic Cryptographic Concepts: Symmetric vs. Asymmetric Encryption, Hash Functions and Digital Signatures
- Cryptographic Algorithms: AES, RSA, ECC, DES, Blowfish
- Key Management: Key Generation, Distribution, and Storage, Public Key Infrastructure (PKI)
- SSL/TLS: How SSL/TLS Works, Implementing HTTPS
- Cryptanalysis: Techniques Used in Cryptanalysis, Common Vulnerabilities in Cryptography

5. Identity and Access Management (IAM)

- IAM Fundamentals: Concepts of Authentication, Authorization, and Accounting (AAA)
- Access Control Models: Role-Based Access Control (RBAC), Attribute-Based Access Control (ABAC)

- Single Sign-On (SSO): Benefits and Implementation Strategies, Protocols (SAML, OAuth, OpenID Connect)
- Multi-Factor Authentication (MFA): Types of MFA, Best Practices for Implementation
- Identity Lifecycle Management: User Provisioning and De-Provisioning, Role Management and Access Reviews
- Privileged Access Management (PAM): Securing Admin Accounts, Implementing the Least Privilege Principle

6. Cloud Security

- Cloud Security Basics: Shared Responsibility Model, Cloud Deployment Models (IaaS, PaaS, SaaS)
- Security Controls in Cloud Environments: Data Encryption and Tokenization, Identity and Access Management in the Cloud
- Compliance and Governance: Relevant Standards (ISO 27017, CSA STAR), Regulatory Compliance (GDPR, HIPAA)
- Incident Response in the Cloud: Cloud-Specific Incident Response Plans, Forensic Investigations in the Cloud
- Security in Cloud Architecture: Secure Application Design in the Cloud, Threat Modeling for Cloud Services

7. Security Operations and Monitoring

- Security Operations Center (SOC): Roles and Responsibilities of a SOC, SOC Tools and Technologies
- Monitoring and Incident Detection: Types of Monitoring (Network, Host, Application), Alerting and Escalation Procedures
- Log Management: Best Practices for Log Collection and Analysis, SIEM Solutions and Usage
- Threat Hunting: Techniques for Proactive Threat Detection, Tools for Threat Hunting
- Incident Response Procedures: Developing and Testing Incident Response Plans, Continuous Improvement of Response Strategies

8. Governance, Risk, and Compliance (GRC)

- Introduction to GRC: Importance of Governance in Cyber Security, Risk Management Principles
- Regulatory Compliance: Key Regulations (GDPR, HIPAA, PCI-DSS), Compliance Frameworks and Standards
- Risk Assessment: Risk Assessment Methodologies, Risk Treatment Strategies
- Security Policies and Procedures: Developing and Enforcing Security Policies, Policy Review and Updates
- Auditing and Reporting: Internal and External Audit Processes, Documentation and Reporting Requirements

9. Security Testing

- Types of Security Testing: Penetration Testing, Vulnerability Assessment, Red Team vs. Blue Team Exercises
- Tools for Security Testing: Common Tools (Nmap, Metasploit, Burp Suite), Integrating Security Testing in CI/CD Pipelines

- Testing Methodologies: OWASP Testing Guide, NIST SP 800-115
- Reporting and Remediation: Vulnerability Reporting Best Practices, Prioritizing Remediation Efforts

10. Cybersecurity Threats and Attack Techniques

- Types of Threats: Malware (Viruses, Trojans, Ransomware), Social Engineering Attacks (Phishing, Spear Phishing)
- Attack Techniques: Advanced Persistent Threats (APTs), Denial of Service (DoS) and Distributed Denial of Service (DDoS)
- Threat Intelligence: Gathering and Analyzing Threat Intelligence, Using Threat Intelligence for Defense
- Incident Response to Attacks: Incident Response Plans for Different Attack Types, Forensics and Post-Attack Analysis

11. Emerging Trends and Technologies in Cyber Security

- Artificial Intelligence and Machine Learning in Cyber Security: Applications of AI in Threat Detection, Challenges and Limitations of AI
- Zero Trust Security Model: Principles of Zero Trust, Implementing Zero Trust Architecture
- Internet of Things (IoT) Security: Risks and Challenges in IoT Security, Best Practices for Securing IoT Devices
- Quantum Computing and Cyber Security: Potential Impact of Quantum Computing on Cryptography, Preparing for Quantum-Resistant Algorithms
- Cybersecurity Frameworks and Standards: Continuous Evolution of Standards, Importance of Adaptability in Cybersecurity Practices

C. Applied Computing (e-Governance)

1. Core Java

- **OOP Principles**: Classes, Objects, Inheritance, Polymorphism, Encapsulation, Abstraction
- **Exception Handling**: Checked vs. Unchecked Exceptions, Custom Exceptions, try-catch-finally, Throws/Throw
- **Collections Framework**: Lists, Sets, Maps, Queues, Iterators, Generics
- **Multithreading & Concurrency**: Threads, Executors, Synchronization, Locks, volatile, atomic
- **JVM Internals**: Memory Management, Garbage Collection, Class Loaders, Bytecode
- **I/O Streams & NIO**: File Handling, Byte & Character Streams, Buffering, Channels
- **Lambda Expressions & Streams API**: Functional Programming, Stream Operations, Parallel Streams
- **JDK 8+ Features**: Optional, Default Methods, Stream API, CompletableFuture

2. Java EE & Spring Framework

- **Servlets & JSP**: Request-Response Cycle, Session Management, JSP Scripting

- **JPA & Hibernate**: ORM Concepts, Annotations, Criteria API, JPQL, Caching, Entity Lifecycle
- **Spring Core**: Dependency Injection, Inversion of Control, Beans, ApplicationContext
- **Spring MVC**: Controllers, Views (JSP/Thymeleaf), Form Handling, Validation, REST API Development
- **Spring Boot**: Auto-Configuration, Profiles, Embedded Servers, Starters, Properties Configuration
- **Spring Data JPA**: Repositories, Query Methods, Transactions, Paging & Sorting
- **Spring Security**: Authentication, Authorization, JWT, OAuth2, Method Security
- **Spring Cloud**: Microservices, Eureka, Ribbon, Feign, Config Server, Circuit Breakers (Hystrix)
- **Web Services**: RESTful Web Services, SOAP, JSON/XML Marshalling

3. Database Management & SQL

- **Relational Databases**: ER Modeling, Normalization (1NF, 2NF, 3NF), ACID Properties, Transactions
- **SQL Queries**: SELECT, INSERT, UPDATE, DELETE, Joins, Subqueries, Aggregations, Group By, Having
- **Indexes & Optimization**: Types of Indexes, Indexing Strategies, Query Optimization, Execution Plans
- **Database Design**: Entity-Relationship Diagrams, Foreign Keys, Primary Keys, Constraints
- **Stored Procedures & Triggers**: Writing Procedures, Functions, Event Triggers, Cursors
- **NoSQL Databases**: Key-Value Stores, Document Stores (e.g., MongoDB), Column Stores (e.g., Cassandra)
- **Data Integrity & Consistency**: Constraints, Transactions, Referential Integrity, Isolation Levels

4. Web Technologies

- **HTML & CSS**: HTML5 Elements, CSS3 Layouts, Flexbox/Grid, Responsive Design, Media Queries
- **JavaScript & ES6+**: Variables (let/const), Arrow Functions, Promises, Async/Await, Modules
- **Front-End Frameworks**: React.js, Angular, Vue.js, Component Lifecycle, State Management
- **AJAX & Fetch API**: Asynchronous Requests, XMLHTTPRequest, Fetch API, Promises
- **RESTful APIs**: API Design, CRUD Operations, HTTP Methods, Headers, Status Codes
- **WebSockets & Real-Time Communication**: WebSocket Protocol, Long Polling, Server-Sent Events
- **CSS Preprocessors**: SASS, LESS, Mixins, Variables, Functions
- **Browser DevTools**: Debugging, Performance Analysis, Network Monitoring, Accessibility Testing

5. **Software Architecture & Design Patterns**

- **Software Architecture Styles**: Monolithic, Microservices, Event-Driven, Layered Architecture
- **Design Patterns**: Singleton, Factory, Builder, Prototype, Strategy, Observer, Decorator, Adapter
- **SOLID Principles**: Single Responsibility, Open/Closed, Liskov Substitution, Interface Segregation, Dependency Inversion
- **Microservices Communication**: REST, RPC, Message Brokers (Kafka, RabbitMQ), gRPC

f. DevOps & CI/CD

- **Version Control Systems**: Git, Branching Strategies, Merge & Rebase, Pull Requests
- **CI/CD Pipelines**: Jenkins, GitLab CI, CircleCI, Automated Builds, Continuous Deployment
- **Containerization**: Docker, Docker Compose, Container Registry, Image Optimization
- **Orchestration**: Kubernetes, Docker Swarm, Helm Charts, Service Mesh (Istio)
- **Monitoring & Logging**: Prometheus, Grafana, ELK Stack (Elasticsearch, Logstash, Kibana), Fluentd
- **Automated Testing in CI/CD**: Unit Tests, Integration Tests, End-to-End Tests, Code Coverage Tools

g. Software Project Management

- **Project Lifecycle Models**: Waterfall, Agile, Scrum, Kanban, Lean Software Development
- **Agile Frameworks**: Sprint Planning, Daily Standups, Retrospectives, Backlog Grooming, Scrum Roles
- **Task Management & Tracking Tools**: Jira, Trello, Asana, GitHub Issues
- **Risk Management**: Risk Identification, Mitigation Strategies, Risk Logs
- **Stakeholder Communication**: Communication Plans, Reporting, Client Interactions

h. Quality Assurance & Testing

- **Unit Testing**: JUnit, Mockito, TestNG, TDD (Test-Driven Development), BDD (Behavior-Driven Development)
- **Integration Testing**: Testing APIs, Databases, Microservices Communication
- **End-to-End Testing**: Selenium, Cypress, Puppeteer, Postman for API Testing
- **Performance Testing**: JMeter, LoadRunner, Stress Testing, Benchmarking, Bottleneck Analysis
- **Security Testing**: Penetration Testing, Vulnerability Scanning, OWASP Testing Guide
- **Automated Testing**: Continuous Testing, Frameworks for Test Automation (Selenium, Appium)
- **Test Coverage & Metrics**: Code Coverage, Test Reports, SonarQube, Static Code Analysis

i. Security & Compliance

- **Web Security Principles**: XSS (Cross-Site Scripting), SQL Injection, CSRF (Cross-Site Request Forgery)

- **Authentication & Authorization**: OAuth2, JWT, SSO (Single Sign-On), Multi-Factor Authentication
- **Data Encryption**: Symmetric/Asymmetric Encryption, TLS/SSL, HTTPS, Hashing Algorithms (SHA, MD5)
- **Compliance Standards**: GDPR, HIPAA, PCI-DSS, ISO/IEC 27001
- **Security Audits & Penetration Testing**: Vulnerability Assessment, Threat Modeling, Red Team/Blue Team Exercises
- **Secure SDLC (Software Development Life Cycle)**: Security in Design, Secure Coding Practices, Security Testing

j. Microservices

- **Microservices Design**: Decomposition Strategies, Bounded Contexts, Independent Deployment
- **Service Discovery**: Eureka, Consul, Zookeeper, Dynamic Service Registration
- **API Gateway**: Zuul, API Gateway Patterns, Rate Limiting, Circuit Breaking
- **Inter-Service Communication**: REST, Message Brokers (Kafka, RabbitMQ), gRPC, Event-Driven Architecture
- **Resilience Patterns**: Circuit Breaker (Hystrix, Resilience4j), Bulkheads, Retry Patterns, Fallback
- **Data Consistency & Transactions**: Saga Pattern, Eventual Consistency, Two-Phase Commit (2PC)
- **Microservices Security**: OAuth2, JWT, Secure Communication between Services
- **Observability in Microservices**: Distributed Tracing (Zipkin, Jaeger), Metrics (Prometheus), Log Aggregation

IV. Hyderabad

A. Enterprise Software Development

1. Algorithms and Data Structures

- Problem Solving & Computational Thinking
- Constructs, Designs, Complexity analysis, OO design, Basic Data Structures

2. Concepts of Operating Systems (OS)

- Operating System concepts with Linux environment
- Shell Programming
- Process Management, Memory Management, Virtual Memory, Deadlock

3. Software Development Methodologies

- Software Development Life Cycles, Models, Tools
- Design and Architectural Engineering - Design approaches, Modularity, Cohesion, Coupling, Layering, Design Models, UML
- DevOps - ecosystem, phases, methodologies, tools, basics of Cloud Native development
- Software testing
- Versioning systems

4. **Database technologies**

- Database Management Systems – Concepts, Types, Data Models, Database Design
- Relational Database Management systems such as PostgreSQL, MySQL, SQL Programming (database queries, functions, triggers, procedures), NoSQL such as MongoDB

5. **Web Programming Technologies**

- Web architecture
- HTML, CSS, JavaScript, JSON, Ajax, Node.js, Express.js, React, Angular
- Responsive Web Design

6. **Web-based Java Programming**

- J2EE, Servlets, Session Management, JSP
- Spring & Spring Boot Frameworks including Microservices Architecture
- RESTful web services
- Web Application Security

7. **Mobile app development**

- Fundamentals of mobile apps – Types, Mobile app ecosystem (Android, iOS), Design & Development process, Programming fundamentals (Variables, Control structures)
- Mobile IDEs & tools, Design elements, Architecture, Components, Testing tools
- Cross platform Mobile app development frameworks
- Mobile app security

B. <u>Hardware - VLSI/FPGA Design</u>

- **Digital Design (RTL design): IP design, ASIC/SoC design, FPGA based design from concept to implementation**
- **Digital Verification: Guide development of test plans, test benches and automated test cases**
- **Knowledge of synthesis, timing closure, and formal verification**
- **Knowledge of Physical design and verification**

Digital Design: Number System, Boolean Algebra and Gates, Combinatorial Logic, Sequential Logic

Computer Architecture: CPU Architecture (ARM, RISC-V etc.), Memory Architectures, system bus (PCI- Express), peripheral bus (USB), and LAN (Ethernet) etc.

VLSI Design Flow: RTL to GDS Implementation: Logic Synthesis, Physical Design; Verification and Testing; Post-GDS Processes

Hardware Modeling: Introduction to Verilog, Functional verification using simulation: testbench, coverage, mechanism of simulation in Verilog

FPGA Prototyping :

Architecture popular FPGA families, Xilinx high end FPGA family, Architecture of Microcontrollers in FPGA (ARM), FPGA tools

RTL Synthesis: Verilog Constructs to Hardware Logic Optimization: Definitions, Two-level logic optimization

Logic Optimization: Multi-level logic optimization, FSM Optimization Formal Verification: Introduction, Formal Engines: BDD, SAT Solver

Static Timing Analysis: Synchronous Behavior, Timing Requirements, Timing Graph, Mechanism, Delay Calculation, Graph-based Analysis, Path-based Analysis, Accounting for Variations
Constraints: Clock, I/O, Timing Exceptions Technology Mapping Timing-driven Optimizations
Design for Test: Basics and Fault Models, Scan Design Methodology, ATPG, BIST
Basic Concepts for Physical Design: IC Fabrication, FEOL, BEOL, Interconnects and Parasitics, Signal Integrity, Antenna Effect, LEF files
Chip Planning: Partitioning, Floorplanning, Power Planning
Placement: Global Placement, Wirelength Estimates, Legalization, Detailed Placement, Timing-driven Placement, Scan Cell Reordering, Spare Cell Placement
Clock Tree Synthesis: Terminologies, Clock Distribution Networks, Clock Network Architectures, Useful Skews Routing: Global and Detailed, Optimizations Physical Verification: Extraction, LVS, ERC, DRC, ECO and Sign-off

C. Cyber Security R&D

1. Basic Concepts
Fundamental aspects of Network, Firmware, Application, and Cryptography Security, Attack Types, Malware Types
Network Security

- **Network Security Basics**: OSI and TCP/IP models, and secure communication protocols etc
- **Common Network Attacks**: Man-in-the-middle, DoS/DDoS, packet sniffing, IP spoofing etc
- **Firewall & Intrusion Detection/Prevention Systems (IDS/IPS), XDR**: Functions and types etc
- **VPN and Wireless Security**: SSL/TLS, IPSec, WPA3, and vulnerabilities in wireless communication.

Firmware Security

- **Firmware Basics**: Firmware architecture, types of firmware, and secure boot processes.
- **Firmware Vulnerabilities**: Buffer overflows, memory corruption, hardware backdoors, supply chain risks.
- **Firmware Integrity Checks**: Techniques for secure firmware updates, encryption, and verification processes.

Application Security and OS Security

- **OWASP Top 10 Vulnerabilities**: Cross-site scripting (XSS), SQL injection, CSRF, etc.
- **API Security**: Authentication, authorization, and best practices for securing APIs etc
- **Mobile Application Security**: Secure storage, encryption, app sandboxing, mobile-specific threats, etc
- **OS Security:** SELinux, AppArmor, Container etc

Cryptography and Security Protocols

- **Encryption Algorithms**: AES, RSA, ECC, and symmetric vs. asymmetric encryption.
- **Hashing Functions**: SHA, MD5, and their security implications.
- **Key Management**: Key generation, distribution, storage, and secure lifecycle management.

- **Digital Signatures and Certificates**: PKI, certificate authorities, and the chain of trust.

Attack Types & Malware Types

- **Malware Types**: Viruses, worms, trojans, ransomware, rootkits, adware, spyware.
- **Common Attack Vectors**: Phishing, spear-phishing, social engineering, insider threats.
- **Advanced Persistent Threats (APT)**: Definition, behavior, and common examples.
- **Botnets and DDoS Attacks**: Concepts, attack methods, and mitigation strategies.

2. Advanced Concepts

Threat Analysis, Malware Analysis, Vulnerability Analysis, Penetration Testing, Secure Coding, Cryptographic Algorithms, Static & Dynamic Analysis

Threat Analysis

- **Threat Modeling**: STRIDE, DREAD, and risk assessment methodologies.
- **Threat Intelligence**: Gathering, sharing, and responding to threat intelligence data.
- **Incident Response**: Phases of incident response and mitigation techniques.

Malware Analysis

- **Static Analysis**: Signature-based detection, file hashes, binary inspection.
- **Dynamic Analysis**: Behavioral analysis, sandboxing, and debugging malicious code.
- **Reverse Engineering Malware**: Tools and techniques for deconstructing malware.

Vulnerability Analysis

- **Common Vulnerabilities**: CVEs, zero-day exploits, memory corruption, race conditions.
- **Exploitation Techniques**: Buffer overflows, privilege escalation, remote code execution.

Penetration Testing

- **Penetration Testing Phases**: Reconnaissance, scanning, exploitation, reporting.
- **Reporting and Remediation**: Vulnerability disclosure, patch management, and reporting procedures.

Secure Coding Practices

- **Secure Coding Principles**: Input validation, error handling, data sanitization.
- **Best Practices**: Use of static analysis tools, code review, secure memory management.
- **Development Security Standards**: Secure SDLC, SAST, and DAST techniques.

Advanced Cryptographic Algorithms

- **Quantum-Safe Cryptography**: Basics of post-quantum algorithms.
- **Elliptic Curve Cryptography (ECC)**: Use cases, strengths, and weaknesses.
- **Blockchain-based Cryptography**: Merkle trees, hash-based cryptography, zero-knowledge proofs.

3. Fundamentals of Emerging Technologies in Cybersecurity

Blockchain Technology for Cybersecurity

- **Blockchain Fundamentals**: Decentralized ledgers, consensus mechanisms (PoW, PoS) etc.
- **Smart Contracts**: Security vulnerabilities, formal verification of contracts.
- **Blockchain Use in Cybersecurity**: Decentralized identity management, supply chain security, data integrity.

AI for Cybersecurity

- **AI Techniques in Cybersecurity**: Machine learning for threat detection, behavior analysis, and anomaly detection.
- **AI-based Security Tools**: AI-driven SIEM, intrusion detection, and malware classification systems.
- **Challenges in AI Security**: Adversarial attacks, AI model poisoning, and defense techniques.

Cybersecurity of AI

- **Securing AI Models**: Protecting against data poisoning, evasion, and inference attacks.
- **Trust and Explainability in AI**: Issues with transparency and accountability in AI-driven systems.
- **AI Bias and Fairness in Security**: Recognizing and mitigating biases in AI security models.

D. Embedded Systems and IoT

1. **C Programming Language**
    a. The C Programming Model and Development Environment
    b. Tool chains, Optimization, Libraries, Debugging Tools,
    c. Data Types and Variables
    d. Storage Classes in C
    e. Statements, Loops
    f. Arrays, Structures, Unions, Pointers, Enums
    g. Bit Operations, Registers, Directives
    h. Data Structures in C – Singly Linked Lists, Doubly Linked Lists, Circular Buffers, Trees, Graphs
2. Microcontroller Architecture and Programming
    a. Microcontroller Architectures – Harvard, Von Neuman, CISC, RISC
    b. Memory Architectures – Flash, RAM, NVRAM, Serial Flash, EEPROM
    c. Analog circuits – ADC, Comparators, DAC,
    d. General Purpose IO
    e. Clocks, Timers, Watchdog, Real Time Clock
    f. Embedded Peripheral Interfacing - Serial peripherals: UART, SPI, I2C, CAN
    g. Interrupts and Nested Interrupts, Interrupt Controllers
3. Operating System Concepts and Linux Programming
    a. Process Management, File Management, Device Management, Scheduling, Memory Management
    b. IPC, Synchronization Techniques, Shared Memory
    c. Interrupts and Interrupt Vectors, Handlers and Service Routines
    d. Device Drivers, Kernel Programming, Device Tree Sources, System Calls
    e. Linux System and Application Programming
    f. Filesystem Types, Virtual File Systems - Proc FS, SysFS, Dev FS,
    g. Libraries – Static and Dynamic Libraries,
    h. Bootloader Concepts
    i. Real Time Operating System Concepts – Schedulers, Priority based Scheduling Algorithms, Determinism, Priority Inversion and Inheritance,
4. Embedded Hardware Design Concepts and Power Supplies

a. Discrete Analog Circuit Design – OpAmps circuits: Amplifiers, Comparators, Integrators, Differentiators, Hysteresis
b. Microcontroller Board Bring Up – Crystal Oscillators, Power Supply Decoupling, Reset Circuits, Analog and Digital Ground Isolations
c. Power Supply Circuits – Linear Regulators, Low Drop Out oscillators, Switched Mode Power Supplies – Buck, Boost, Buck Boost, Isolated, Non-Isolated
d. Input and Output Device Interfacing – Analog Sensors, Serial Peripheral Interfacing, Digital Sensor Interfacing, LCD Interfacing, OLED Interfacing, Memory Chip Interfacing

5. Internet of Things
    a. IoT Communication Topologies – Mesh, Star, Multihop
    b. Wireless IoT Protocols
        i. LPWAN: LoRa, NBIoT, LTE-CAT M1, SigFox,
        ii. Bluetooth and Bluetooth Low Energy
        iii. ZigBee
        iv. WiFi
        v. UWB
        vi. 4G and 5G
    c. Sensors and Types of Sensors – Acoustic Sensors, Climate Sensors, Navigation & Location Sensors, Proximity Sensors,
    d. Actuators and Output Devices
        i. Motors – BLDC, DC, Stepper, Servo
        ii. Displays – LCD, OLED,
        iii. Buzzers,
    e. Battery Chemistries for IoT Use cases
        i. Rechargable Chemistry
        ii. Non-Rechargable Chemistry
        iii. Battery Charging Circuits
    f. Basics of Network Security

Recruitment to the post of Scientist B (Level 10) against Continuing contract vacancies on payscale

Advt. No.: CORP/GRP.A/04/2024

Centre for Development of Advanced Computing (C-DAC), is a Scientific Society of the Ministry of Electronics & Information Technology, Government of India. C-DAC has emerged as a premier R&D organization in ITC&E (Information Technologies, Communication and Electronics) in the country working on strengthening national technological capabilities in the context of global developments in the field and responding to change in the social need in selected areas. C-DAC represents a unique facet, working in close junction with MeitY to realize nation's policy and pragmatic interventions and initiatives in Information Technology. As an institution for high-end Research and Development (R&D), C-DAC has been at the forefront of the Information Technology (IT) revolution, constantly building capacities in emerging/enabling technologies and innovating and leveraging its expertise, caliber, skill sets to develop and deploy IT products and solutions for different sectors of the economy, as per the mandate of its parent, the Ministry of Electronics and Information Technology, Government of India and other stakeholders including funding agencies, collaborators, users and the market-place.

C-DAC's areas of expertise range from R&D work in ICT&E Technologies to Product Development, IP Generation, Technology Transfer and Deployment of Solutions.

Primary Thematic or Thrust Areas addressed by C-DAC are:

- High Performance Computing and Grid & Cloud Computing
- Multilingual Computing & Heritage Computing
- Professional Electronics, VLSI& Embedded Systems
- Software Technologies including FOSS
- Cyber Security & Cyber Forensics
- Health Informatics
- Education & Training

Mission Mode Programmes of C-DAC are:

- Exascale Computing Mission
- Microprocessor and Professional Electronics Mission
- Quantum Computing Mission
- AI and Language Computing Mission
- Internet of Everything (IoE), Dependable and Secure Computing Mission
- GenNext Applied Computing Mission

Online Applications are invited from suitable, qualified, experienced and dynamic professionals of Indian Nationality for various Group 'A' S&T position at Level 10, to be filled by way of Direct Recruitment basis.

Post/Appointment details: The appointment would be against position sanctioned by the Governing council, in continuing contract vacancy, available at C-DAC subject to the applicable provisions of Bye laws and other applicable rules.

Continuing Contract: The Appointment will be on contract basis for a duration of 5 years including the probation period, which shall be renewable based on satisfactory performance review for further periods of five years at a time, till attaining the age of superannuation i.e 60 years.

Details of the positions available at are as follows:

Table-1

Post & Level in the Pay Matrix	Starting Basic Pay (Rs.)	Centre	No. of posts	Applicable Reservation
Scientist B (Level 10)	Rs. 56100/-	Banglore, Delhi Hyderabad, Pune	22	UR – 11, ST – 1, OBC-NCL – 4, EWS – 6 *Parallel Reservation wrt PwD and Ex-servicemen applicable as per rules*

Table – 2

Domains / work area (Single or in combination)

Centre	Domain / work area
Banglore	1. HPC Software 2. Cyber Physical Systems - Embedded systems & IoT 3. Hardware - VLSI Design 4. Quantum Computing
Delhi	1. Applied AI and Data Analytics 2. Applied Computing (e-Governance) 3. Dependable & Secure Computing (Cyber Security)
Hyderabad	1. Enterprise Software Development 2. Cyber Security (R&D) 3. Embedded systems & IoT 4. Hardware - VLSI Design
Pune	1. Hardware System Design 2. Hardware - VLSI / FGPA Design 3. System Administrator 4. HPC System Software Development

JOB DETAILS:

Sr.	Post/ Designation	No. of Posts	Domain(s)	Location	View Details
1	Scientist B (Level 10)	4	Hardware - VLSI Design, Enterprise Software Development, Cyber Security (R&D), Embedded systems & IoT	Hyderabad	View Details & Apply
2	Scientist B (Level 10)	5	Applied AI and Data Analytics, Applied Computing (e-Governance), Dependable & Secure Computing (Cyber Security)	Delhi	View Details & Apply
3	Scientist B (Level 10)	5	Hardware System Design, Hardware - VLSI / FGPA Design, System Administrator, HPC System Software Development	Pune	View Details & Apply
4	Scientist B (Level 10)	8	Quantum Computing, HPC Software, Cyber Physical System - Embedded systems & IoT, Hardware - VLSI Design	Bangalore	View Details & Apply

NOTE

A. C-DAC reserves the right to not to recruit against the posts notified in this notification at its discretion without any notice.
B. The appointment would be against the positions sanctioned for C-DAC by its Governing Council, subject to availability at the time of appointment and may undergo changes pursuant to provisions of Bye laws and other applicable rules.

1. **Educational Qualification:**

a. All the qualifying qualifications should be regular course(s) and must be from UGC recognized Indian University/ UGC recognized Indian Deemed University or AICTE approved courses from Autonomous Indian Institutions/ concerned statutory council (wherever applicable). The courses offered by autonomous institutes should be recognized as equivalent to the relevant courses approved/recognized by Association of Indian Universities (AIU)/UGC/AICTE.
b. Wherever CGPA/OGPA or letter grade in a qualifying degree is awarded, equivalent percentage of marks should be indicated in the application form as per norms adopted by the respective University/Institute. Please also obtain a certificate to this effect from University / Institute, which shall be required at the time of interview.

2. **Experience:**

a. Only those experiences which are relevant and acquired after the passing date of the qualifying qualification will be considered. The decision of C-DAC in this regard will be final and binding.
b. Minimum Essential Post Qualification Experience in State/ Central Government/ Department(s)/Organization(s)/ Undertaking(s) and/or Large Private Sector Organization(s)/ Institution(s)/ Company(ies) of repute/ Public Sector Enterprise/ Large Private Sector Enterprise should be as on the last date of online application. However, Industrial/ Vocational/ Apprentice Training will not be considered as experience.

3. **Reservation:**

a. Reservation shall be applicable as provided in Table 1 above
b. Reservation is subject to changes based on final assessment.
c. Reserved category candidates are required to submit the Category Certificate as may be the case in the format as applicable for appointment to posts under Government of India and shall be required to produce the certificate at the time of interview, if called for, failing which such candidates will not be allowed to attend the interview against reserved posts and will not be allowed to claim the reservation.
d. In case of candidates belonging to OBC category, certificate should specifically contain the clause that the candidate **does not belong to creamy layer section**.
e. The candidates applying under PWD category are required to submit PWD Certificate in the format as applicable for appointment to posts under Government of India. Only such persons would be eligible for reservation in services/posts under PwD category who suffer from not less than 40 percent of disability.
f. Persons with Disabilities can also apply even if no vacancies are specifically reserved for them. Such candidates will be considered for selection for appointment to the post by general standard of merit.
g. Format of certificates required for claiming reservation under SC/ST/OBC/ PwD/ EWSs category are made available along with this notification in the C-DAC's website for candidates convenience & reference. The certificates issued by any one of the following authorities or as per Govt. of India guidelines in the prescribed format shall only be accepted as proof of candidate's claim for reservation under said categories:

(i)District Magistrate/Additional District Magistrate/ Collector/ Deputy Commissioner/ Additional' Deputy Commissioner/ 1st Class Stipendiary Magistrate / Sub-Divisional Magistrate/ Taluka Magistrate/ Executive Magistrate/ Extra Assistant Commissioner (ii) Chief Presidency Magistrate/ Additional Chief Presidency Magistrate/ Presidency Magistrate (iii) Revenue Officer not below the rank of Tehsildar and (iv) Sub-Divisional Officer or the area where the candidate and/or his family normally resides.

4. **Age Limit/Relaxation:**

a. The Upper Age Limit for various posts as given is as on last date of application in case of appointment by Direct Recruitment.
b. Age Relaxations applicable as per the Govt. of India norms. Accordingly, the upper age limit shall be as follows:

Category	UR/EWS	ST	OBC – NCL	PwD
Upper age limit not exceeding (yrs.)	30	35	33	UR/EWS Pwd – 40 ST PwD – 45 OBC-NCL PwD – 43

c. The age relaxation for SC/ST/OBC candidate is applicable for the post reserved for them. However, relaxation in age limit for PWD candidate will be applicable irrespective of the fact whether the post is reserved for them or not, provided the post is identified suitable for them
d. Government employees with three years continuous service in Central Government will be eligible for relaxation in age by 5 years.
e. In case of Ex-servicemen who have put in not less than six months continuous service in the Armed Forces of the Union, they shall be allowed to deduct the period of such service from their actual age, and if the resultant age does not exceed by more than 03 years the maximum age

limit prescribed for the posts/ services for which a candidate seeks appointment, he/ she be deemed to satisfy the conditions regarding the age limit.

f. The cut-off date for ascertaining the age and experience will be the last date of online application.

5. **Mode of Selection:**

a. Selection processes viz. Written Test, Interview; group discussions etc. as deemed fit by the management will be deployed. Management reserves the right to change/ modify the selection process at any time, during the process, at its discretion. The decision of the management will be final and binding.
b. The qualification and experience prescribed are the minimum requirements and possession of the same does not automatically make the candidates entitled to be called for selection processes.
c. There will be an initial screening based on the academic, experience and other parameters given in the on-line application and only those screened-in will be considered for further selection process. The management reserves the right to increase the minimum eligibility criteria/ cut off limits, in the event of the number of applicants are more for any post(s) at its discretion.
d. Candidates will be selected on the basis of their academic credentials, experience profile, performance in the interview and such other selection processes/ parameters, as deemed fit by management.
e. If no candidates are found suitable for a notified position, C-DAC may consider candidates for lower position, however, not for the reason that they possess lower qualification/experience.
f. If no candidates are found suitable for a notified position(s), C-DAC reserves the right to not fill the notified vacancy(s).

6. **Benefits:**

a. Besides initial pay in the Pay Level, Dearness allowance, HRA and Transport allowance appointed candidates shall be entitled for Medical Reimbursement for self and dependent family members (OPD/IPD), Leave Travel Concession, Leave encashment, Children Education Allowance/Hostel Subsidy, Mobile Reimbursement, Newspaper Allowance, Books reimbursement, Professional Membership Reimbursement, CPF, Gratuity etc. as per extant rules of the C-DAC.
b. Candidates presently employed in Government Service/PSU's are entitled to Last Pay protection subject to fulfilment of extant rules.
c. **Superannuation Benefits:** Besides Contributory Provident Fund, Gratuity under Payment of Gratuity Act 1972 or as ammended from time to time.
d. All the above benefits will be governed by the Bye-laws & Staff Rules of C-DAC in force & amended from time to time.

7. **Posting:**

a. The selected candidates may be posted at any of the offices/ project, etc. of C-DAC or deputed to any Department of Government of India/ other Government organizations etc.
b. The selected candidates may be assigned jobs/ functions/ assignments as per the requirements and larger interest of C-DAC within India and abroad.

8. **How to apply:**

a. The candidates are required to apply through ONLINE process only by visiting the website www.cdac.in. The opening date of submission of online application is **2nd Nov 2024** and closing date is **1st Dec 2024** till 18.00 Hrs.
b. Before filling the online application form, Candidates should read '**General Terms and Conditions**' carefully.
c. Candidate should read all the eligibility parameters and ensure that he/she is eligible for the post before starting to apply online.
d. Candidate should have a valid email id and mobile no. which should remain valid & active till the completion of selection process.
e. Candidates can click on the '**Apply**' button provided against each position for which he/she wish to apply.
f. Fill all the details in the application form at the appropriate places.
g. After filling all the details in online application form click on '**Submit**' button.
h. Candidates should scan their passport size photograph in .jpg format (not more than 400 KB) and keep it ready before starting to apply online for uploading.
i. Candidates are required to upload their updated Resume/Curriculum Vitae (PDF only, not more than 1 MB) and brief write up of the project undertaken ((PDF only, not more than 1 MB)) with the online application.
j. The required Application fee is to be paid by the candidates through online payment mode only. It is advised to print and keep the transaction details for own records.
k. A unique application number will be generated by the system, please note this application number for future reference and use. Candidates can take a print of the application form and keep it with them for their own records.
l. No hard copy/printed applications should be sent to C-DAC. Incomplete and defectively filled up forms shall be rejected straightway and no subsequent correspondences will be entertained in this regard.
m. Candidate working in Government/PSUs/Govt. Autonomous bodies should apply online in advance and print of the application form, duly filled, and signed should be forward through proper channel **Corporate HRD, C-DAC, Innovation Park 34, B/1, Panchawati Pashan, Pune – 411008**

n. Those who are not forwarding their application through proper channel are required to produce '**No objection certificate (NOC)**' from their current employer at the time of interview, if called for, failing which they will not be permitted to attend the interview.

9. **Application fee:**

a. A non-refundable application fee of Rs.500/- is payable for applying for the posts through online payment mode using internet banking or debit/credit cards during the online application process at C-DAC website.
b. Fee Exemption is available for candidates belonging to ST, PWD category and Female applicants
c. Candidates may take note that no cheque, DD or cash will be accepted towards payment of application fees.
d. C-DAC will not be responsible in case of incomplete transactions during the online payment process. Only those applications in respect of which fee payment is made shall be taken into consideration.
e. Application fee once paid shall not be refunded under any circumstances.

10. **Important Notes:**

a. Only Indian Nationals are eligible to apply.
b. Candidates those who are applying for multiple posts should submit separate applications and the application fee should be paid separately for each application.
c. In case of any ambiguity/dispute arises on account of interpretation in version other than English, English version will prevail.
d. Candidates are not required to send printout of application or any other documents in hard copy to C-DAC.
e. Only shortlisted candidates who are found apparently eligible based on the online application data and subsequent screening process will be called for participating in the Selection Process only **through email communication to the email id provided in the application form**. The shortlisted applicants have to appear for interview or any other process of selection as devised by C-DAC.
f. Interview Call Letters, other correspondences (if any) etc. will be sent to candidates only as email to the email id provided in their online application. No hard copy will be sent.
g. Mere issue of Interview call letter will not imply acceptance of candidature.
h. Out-station candidates called for interview shall be entitled for reimbursement of travel expenses to the extent of admissibility only from the communication address as mentioned in the application to the venue of Interview, by the shortest route as per C-DAC's rule. Any request for change of address will not be entertained.
i. In case the candidate is called for further Selection Process, he/ she has to bring the downloaded application form with all **ORIGINAL DOCUMENTS** together with ONE **SEPARATE SET OF PHOTO COPY** of all documents duly SELF ATTESTED at the time of further Selection Process, failing which he/ she will not be permitted to appear in the further Selection Process.
j. Candidature of the registered candidate is liable to be rejected at any stage of the recruitment process or after recruitment or joining, if any information provided by the candidate is found to be false or is not found inconformity with eligibility criteria mentioned in the advertisement.
k. Appointment to the above posts will be subject to the candidate being medically fit as per the standards prescribed for the post by C-DAC and verification of character & antecedents and/or documents submitted by the candidate at the time of appointment or any time during the tenure of service. In case it is detected that the documents submitted by the candidate are fake/false or the candidate has a clandestine antecedent/background and has suppressed the said information, then his/her service shall be terminated forthwith.
l. All queries pertaining to recruitment including selection process should be addressed to our Corporate Recruitment Team only through **recruitment@cdac.in**. Kindly note that we have not authorized any agent/ agency for representing C-DAC for anything related to recruitment or its processes.
m. **C-DAC strives to have a workforce which reflects gender balance**
n. C-DAC reserves the right to cancel or introduce any examination/Personal Interview/Other selection process. C-DAC also reserves the right to cancel/ restrict/curtail/enlarge the recruitment process and/or the selection process without any notice and without assigning any reasons.
o. C-DAC reserves the rights to raise the minimum eligibility standards. C-DAC also reserves the right to relax experience in exceptional cases, or in the case of persons already holding analogous positions in Government organization or in case of exceptionally meritorious candidate.
p. All the posts will be filled as per the Recruitment Rules of C-DAC.
q. It is the responsibility of the candidates to assess his/her own eligibility for the post for which he/she is applying in accordance with the advertisement. In case, it is detected at any point of time in future during process of selection or even after appointment that candidate was not eligible as per prescribed qualification, experience etc, which could not be detected at the time of selection due to whatever circumstances, his/her candidature/appointment shall be liable to be cancelled/terminated as the case may be.
r. The number of unreserved/reserved posts advertised may vary and C-DAC reserves the right not to fill up some or all the posts advertised, if the circumstances so warrant.
s. The no. of posts/category may change based on final assessment without any notice/notification.
t. Location specified in this is only for the initial posting and the incumbents are liable to be transferred / posted to other locations subsequently.
u. C-DAC reserves the right to increase or decrease the number of posts or not to recruit against any post notified in this notification at its

discretion without any notice/notification.

v. The reserved vacancies include backlog vacancies and Horizontal Reservation applicable for PwD candidates with multiple disabilities from amongst categories (a) to (c).

w. Any canvassing directly or indirectly by the applicant will disqualify his/ her candidature.

x. Any dispute with regard to selection/recruitment process will be subject to Courts/Tribunals having jurisdiction over Pune, Maharashtra only.

Note:

1. The candidates are advised to visit C-DAC website regularly for notices/ information. Corrigendum/Extension etc., if any, shall be published in our website www.cdac.in only.
2. For any query or clarification, candidates can write to recruitment@cdac.in **or call on** Phone No.020-25503627/765

Corporate Human Resource Department
Centre for Development of Advanced Computing (C-DAC)
Innovation Park, Panchvati, Pashan, Pune - 411 008

IMPORTANT DATES:

A	Commencement of on-line Registration of application by candidates	Nov 2, 2024, 0:00 hrs
B	Last date for on-line registration of application by candidates	Dec 1, 2024, 18:00 hrs Exented till Dec 5, 2024 with crucial date for eligibility as Dec 1, 2024 only
C	Interview date	Will be communicated by email only

Centre for Development of Advanced Computing C-DAC
Innovation Park, Panchavati, Pashan, Pune - 411 008, Maharashtra (India)
Phone: +91-20-25503100 Fax: +91-20-25503131

Back

POSITION DETAILS

ADVT. NO.: CORP/GRP.A/04/2024

APPLY

Post	Scientist B (Level 10)
No. of Posts	4
Domain(s)	Hardware - VLSI Design, Enterprise Software Development, Cyber Security (R&D), Embedded systems & IoT
Location	Hyderabad
Age	30 Years (Age relaxation as per Govt. of India Instructions)
Educational Qualification	1) First Class B. E. / B. Tech. / MCA/ or equivalent degree in relevant discipline OR 2) Postgraduate in Engineering/Technology in relevant discipline OR 3) First Class Postgraduate degree in Science in relevant discipline or domain specific discipline
Post Qualification relevant Experience	Nil

Skill Sets	A. Enterprise Software Development
	
	• Experience in Web/ Mobile Application Development with database backend interfaces.
	• Knowledge and experience in the following technology areas
	  ○ HTML, Java Script, Node.js, Java/Python, Spring Framework, Spring Boot, JSON, React
	  ○ RESTful services
	  ○ PostgreSQL / MySQL / SQL Programming (database queries/ functions/ procedures)
	• Knowledge of Architecture design, Versioning tools, Integrations with third-party software, Test automation, Performance optimization, Cloud concepts, SDLC process.
	• Strong problem solving, debugging, and analytical skills
	• A critical thinker, quick learner and team player
	• Excellent verbal and written communication / documentation skills
	
	Desirable : Certification relevant to the job profile
	
	B. Cyber Security (R&D)
	
	• Deep knowledge of network security, application security, endpoint / mobile security
	• Extensive experience with cryptographic algorithms, encryption protocols, and secure key management practices.
	• Proficiency in blockchain platforms such as Ethereum, Hyperledger etc, and experience with smart contract development.
	• Skilled in conducting security audits, penetration testing, and vulnerability assessments in complex systems.
	• Knowledge of secure coding practices, software assurance, and software supply chain security.
	• Familiarity with security frameworks and standards
	
	Desirable : Certification relevant to the job profile
	
	C. Hardware - VLSI design
	
	• Digital Design (RTL design): IP design, ASIC/SoC design, FPGA based design from concept to implementation
	• Digital Verification: Guide development of test plans, test benches and automated test cases
	• Knowledge of synthesis, timing closure, and formal verification
	• Knowledge of Physical design and verification
	• Create scripting to support design and verification automation
	• Estimate and manage time/tasks completion to target schedule
	
	Desirable : Certification relevant to the job profile
	
	D. Embedded Systems & IOT
	
	• Programming Languages: C, C++, Shell Scripting, Assembly
	• Hardware Development: Analog and Digital Circuit Design, Microcontroller based Hardware Design, Sensor Interfacing, Power Circuit Design -AC to DC, DC to DC,SMPS Design
	• Embedded Firmware Development: Baremetal Firmware Development in C and C++ for Microcontrollers, RTOS firmware development, Hardware Abstraction Layer Development, Low Level Drivers, Linux Application Development, Linux Kernel Development, Linux Device Drivers, System Calls, IPC mechanisms, POSIX compliant firmware development
	• Communication Technologies: Wired & Wireless Communication Protocols - Ethernet, WiFi, Bluetooth, LoRa, NB-IoT, Network

	Communication Stacks - TCP/IP, LoRa, BLE, ZigBee, WiFi, 5G Desirable : Certification relevant to the job profile

Job Profile	A. Enterprise Software Development • Design, develop, document, test and debug new and existing software systems to suit project/product requirements. • Clearly articulate and document project/product requirements, cost estimates in standardised templates • Follow coding standards and best practices and agile methodologies • Manage project team to ensure timely delivery of deliverables • Liason with project stakeholders and users to gather, evaluate and incorporate feedback • Enhance TRL of developed product to suit market dynamics Documentation, Publications, Patents, Copyrights B. Cyber Security (R&D) • Design and Develop solutions in cybersecurity and blockchain technologies, addressing critical security challenges. • Conduct advanced research in cybersecurity areas such as Mobile Security, Vulnerability Research and Blockchain. • Engage with government agencies, departments and other stakeholders to understand security needs and translate them into technical requirements/ project proposals. • Manage partnerships with academic institutions, R&D organizations to advance collaborative research efforts. • Publish research findings in top-tier cybersecurity and blockchain journals and present at industry conferences. Documentation, Publications, Patents, Copyrights C. Hardware - VLSI design • Develop the IP/SoC level architecture work towards implementation of IP/SoC. • Provide technical documentation with specifications, block diagrams, and requirements to stakeholders. • Collaborate & work with departments/stakeholders including for architectures, requirements, and tradeoffs, including Digital/ Analog Design, Application/Test Engineering, & Reliability/Operations to resolve design, application, or test issues. • Develop system and chip level simulation verification techniques and methodology. • Excellent Communication Skills • Ability to work on complex problem solving • Resource planning for the tasks assigned • Project documentations: Preparation of Project Proposals,SRS, DPR, Design Documents etc. Documentation, Publications, Patents, Copyrights D. Embedded Systems & IOT <u>IoT and Embedded Device Security Evaluation</u> • Design and Development of methodologies and testing procedures for evaluating the hardware security of IoT devices and Embedded Systems • Setting up of lab facilities for Security related testing of IoT devices and Embedded systems • Developing procedures and evaluation mechanisms for side channel attack of IoT Devices and Embedded Systems <u>IoT and Embedded Systems Development</u> • IoT Hardware Development with wireless communication interfacing, power conditioning, and Sensor Interfacing for Applications such as Agriculture, Smart Cities, Automotive etc. • IoT firmware development for Embedded Linux and RTOS based systems

	• Build Systems Development, Cross compilations, Board Support Package Development and Customization, SDK Development, Product Debugging, Unit Testing and Integration Testing • Field Testing, Deployment and Productization activities associated with IoT systems for outdoor environments • Documentation, Publications, Patents, Copyrights
Salary	CTC Rs. 18.34 LPA approx.
Duration	

BACK APPLY

POSITION DETAILS

ADVT. NO.: CORP/GRP.A/04/2024

APPLY

Post	Scientist B (Level 10)
No. of Posts	5
Domain(s)	Applied AI and Data Analytics, Applied Computing (e-Governance), Dependable & Secure Computing (Cyber Security)
Location	Delhi
Age	30 Years (Age relaxation as per Govt. of India Instructions)
Educational Qualification	1) First Class B. E. / B. Tech. / MCA/ or equivalent degree in relevant discipline OR 2) Postgraduate in Engineering/Technology in relevant discipline OR 3) First Class Postgraduate degree in Science in relevant discipline or domain specific discipline
Post Qualification relevant Experience	Nil

Skill Sets	A. Applied AI & Data Analytics • Expert in applying AI, ML, DL technicqs for data analytics. • Proficiency in programming languages such as Python and relevant libraries (TensorFlow, PyTorch, scikit-learn, etc.). • Accurate and thorough documentation of AI models, methodologies, and outcomes • Strong Analytic & problem-solving skills with a Research oriented mindset. • Understanding web-technologies along with DevOpes & MLOpes B. Dependable & Secure Computing (Cyber Security) • Vulnerability assessment, penetration testing of web applications, mobile applications, web services. • Network security assessment, vulnerability assessment and penetration testing • Log analysis and incident analysis • Good knowledge of software development environment in PHP, Java, Python languages • Good knowledge of system and network infrastructure environment such as servers, workstations, Linux servers, Windows servers, routers, switches, firewall, web servers, application servers, database servers, etc. • Candidate with post qualification certification such as CEH, ISC2, etc. will be preferred. • Collaborate with cross-functional teams, including IT, software development, and business units, to ensure security is integrated into all aspects of operations. C. Applied Computing (e-Governance) • Software Development (Mobile / Web) • Open-Source Software Environment • Java: Core Java, Servlets, JSP, J2EE, Spring Boot, Thymeleaf, Maven, Microservices, REST APIs, etc. • ORM: JPA, Hibernate • Front End: HTML, CSS, Bootstrap, JavaScript, JQuery, Ajax, ReactJS • Cross platform Mobile app development for Android, IoS, Windows, Web using React Native, or similar platform • Data Handling: JSON, XML, etc. • Database: RDBMS, NO SQL (Postgres, MySql, Oracle, SQllite, etc.) • Documentation: SRS, HLDD, LLDD • Sound Knowledge in Core Java, Multithreading, Data Structures. • In-depth knowledge on Java Script and object oriented technique. • Design & development of large scale distributed systems in Java on Linux platform & services.

Job Profile	A. Applied AI & Data Analytics • Integration of Trained AI models with Web and Native applications • Train and fine-tune AI models using appropriate tools and frameworks, validating their performance through rigorous testing and cross-validation techniques. • Assist in documentation of concept notes, proposal & report etc • Support in feasibility study, Project scope, deliverables in collaboration with stakeholders and business partners • Assist in the integration of application components to meet business requirements; • Ability to understand business requirements and translate them into technical requirements B. Dependable & Secure Computing (Cyber Security) • Conduct thorough vulnerability assessments and penetration testing on web applications, mobile applications, and web services to identify security weaknesses. • Perform network vulnerability assessments and penetration testing to detect and mitigate security threats. • Analyze system and network logs to identify suspicious activities and potential security incidents. • Conduct forensic investigations to determine the root cause of security breaches and develop incident response plans. • Implement ISMS, Risk Assessment, Incident Response, Disaster Recovery, Security awareness and Training • Effectively communicate security risks and strategies to both technical and non-technical stakeholders. C. Applied Computing (e-Governance) • Database design, writing simple or complex PL/ SQL queries/ stored procedures/ Functions/ Triggers etc. using PostgreSQL database. • Strong knowledge and experience in designing and deploying performant Server-side / backend web services with REST APIs / SOAP / etc. Possess excellent understanding in the areas of web application programming. • Analyze/understand/prepare system/functional requirements documents develop core technical documents including architecture document, high-level design and low-level design. • Knowledge and experience in designing and deploying Micro services and experience working with AWS or other Cloud provider is extremely desirable. • Must have excellent verbal and written communication skills and the ability to interact professionally with a diverse group; developers, Stakeholders, and subject matter experts. • Extensive knowledge in management of typical Web application with high Volume of transactions. • Should have experience in developing J2EE applications with extensive database hits and extensive workflow management.
Salary	CTC Rs. 18.34 LPA approx.
Duration	

BACK APPLY

POSITION DETAILS

ADVT. NO.: CORP/GRP.A/04/2024

APPLY

Post	Scientist B (Level 10)
No. of Posts	5
Domain(s)	Hardware System Design, Hardware - VLSI / FGPA Design, System Administrator, HPC System Software Development
Location	Pune
Age	30 Years (Age relaxation as per Govt. of India Instructions)
Educational Qualification	1) First Class B. E. / B. Tech. / MCA/ or equivalent degree in relevant discipline OR 2) Postgraduate in Engineering/Technology in relevant discipline OR 3) First Class Postgraduate degree in Science in relevant discipline or domain specific discipline
Post Qualification relevant Experience	Nil

Skill Sets	A. Hardware - System Design • Hardware Design principles • System Design • Know-how of PCB Design will be more desirable • Embedded Design • Hardware Description Language • Excellent knowledge of digital and analog system designs, • Overall knowledge of System Design with 32/64 bit microcontrollers/SOCs/ Processors, DDRx memories, PCIe, LVDS, SPI, I2C, Ethernet, USB etc. • Testing and Board bring up with hardware software co-design • All phases (Schematic capture, Component engineering, Library creation, Place and route, Manufacturing data, Drawing) for Board designs, Simulation and Signal integrity applications on industry standard toolsets like Cadence Allegro, Mentor, etc. Multi –layer High Speed PCB Design DFM and DFT, EMI/ EMC etc. B. Hardware - VLSI/FPGA design • RTL design using Verilog / System Verilog • VLSI design verification using SV/UVM based test benches • Strong RTL debugging and analytical skills • Knowledge of C, C++ programming and scripting language Python is desirable • Knowledge of linting tools, automated testbench tools, formal analysis, and version management tools is desirable C. System Administrator • Working knowledge of the Linux operating system (RHEL/CentOS/AlmaLinux/Ubuntu, etc.) • Knowledge of Scripting using Bash and Python • Understanding of Parallel Computing, HPC architectures, Resource manager • Administration experience on HPC Cluster, latest accelerator cards, Lustre/GPFS/BeeGFS or any Parallel File System, High Performance Computing Workload Managers (PBS Pro, Grid Engine, LSF, SLURM, etc.) • Experience in deploying firewalls and applying network-level security for large-scale HPC Systems • Experience in deploying cluster provisioning, system management, Resource management, and Monitoring tools • Experience in applying user management and user base policy • Experience in Performance monitoring and fine-tuning HPC cluster systems • Experience in managing container tools like docker and enroot • Knowledge of Cloud computing, hypervisor, container technology, Kubernetes, singularity, script debugging • Experience in delivering workshops to Indian institutes and foreign institutes • Technical writing, writing system manuals, Good communication and interpersonal skills D. HPC System Software Development • Should be strong in C, C++ • Knowledge of Linux System Programming and Embedded Programming • Knowledge of Linux kernel internals

	• Knowledge of Device Driver Development on Linux / Windows • Knowledge of firmware design and development • Knowledge of scripting languages

Job Profile	A. Hardware - System Design • System design of Supercomputers/ HPC systems system • Design of Compute Servers, High speed Switches, Network Interface cards. • The design includes Latest Server class processors from Intel, ARM, etc. and Switch SOCs with Serial links of 200 Gbps (56 Gbps x 4) or more b/w, along with DDR4/5, PCIe4/5, Ethernet, NVMe drive interfaces, etc. • Understanding, designing schematics for PCBs • All phases of design (Schematic capture, Component engineering, Library creation, Place and route, Manufacturing data, Drawing) for Board designs, Simulation and Signal integrity applications on industry standard toolsets like Cadence Allegro, Mentor, etc. Multi –layer High Speed PCB Design DFM and DFT, EMI/ EMC etc. • Interaction with PCB and PCBA manufacturer to get the product manufactured as per requirement. • Testing and Board bring up with hardware software co-design, taking the product through various cycles of development – EVT, DVT and PVT B. Hardware - VLSI/FPGA design • FPGA Design Developer executing entire VLSI design cycle • IP Integration and Verification • System Level Validation • Implementation and Timing closure using latest EDA tools C. System Administrator • Building of largescale HPC Cluster • Scheduler and Resource manager configuration • Implementation of security in large-scale HPC systems • Development of HPC Cluster provisioning tools and HPC software stack • Petascale HPC system with Parallel File System daily maintenance and management • Benchmarking of HPC Systems • HPC System support to end-usersImplementation of HPC in cloud, Docker, VM, etc • Exploration of the performance of HPC architectures • Conducting Linux HPC workshops & hackathons, etc. • Managing the team of system administrators • Manage complex HPC issues and support system • Project plan implementation • Participate in the evaluation of emerging HPC technologies and explore new features that would create new capabilities and enhance system performance and usability. D. HPC System Software Development • Management Firmware development for server motherboard • Server Board bring-up (including BMC, BIOS and OS booting), testing and validation of hardware interfaces. • System software development for proprietary network protocol stack • Development of device driver/library and supporting tools

	• Profiling and benchmarking • Adaptation of MPI
Salary	CTC Rs. 18.34 LPA
Duration	

BACK APPLY

POSITION DETAILS

ADVT. NO.: CORP/GRP.A/04/2024

APPLY

Post	Scientist B (Level 10)
No. of Posts	8
Domain(s)	Quantum Computing, HPC Software, Cyber Physical System - Embedded systems & IoT, Hardware - VLSI Design
Location	Bangalore
Age	30 Years (Age relaxation as per Govt. of India Instructions)
Educational Qualification	1) First Class B. E. / B. Tech. / MCA/ or equivalent degree in relevant discipline OR 2) Postgraduate in Engineering/Technology in relevant discipline OR 3) First Class Postgraduate degree in Science in relevant discipline or domain specific discipline
Post Qualification relevant Experience	Nil

Skill Sets	A. HPC Software • Fundamentals of Computer Architecture and Operating System, Data structure and Algorithms • knowledge in C /C++ programming, Python, Shell scripting and Linux • BIOS/UEFI Firmware - Coreboot, EDKII • Compilers and Toolchain - GCC, LLVM, GNU Toolchain • Parallel Programming Models - MPI, OpenMP, Hybrid Programming (MPI + OpenMP), CUDA, OpenACC, OpenCL, SyCL • Performance Analysis and Debugging - GNU Profiler, GNU Debugger, TAU, HPCToolkit • Libraries and Benchmarks - Linear algebra (BLAS, LAPACK), Math libraries, NAS Parallel Benchmarks, Floating Point Number System • HPC Resource Management, Scheduler, Runtime and Containerization • Knowledge of High-Performance Computing concepts, Performance Analysis, Power Management at Application and System Levels • Understanding of Software Engineering Processes Strong background in software engineering theory and practices. • Excellent understanding in one or more of the following: system software/parallel programming/parallel computing/ software architecture/program analysis/formal methods/model based software engineering/any other similar field • Proficiency in atleast one programming language including domain specific languages • Understanding and hands on experience with SDLC practices and tools B. Cyber Physical System - IoT / Embedded • Strong background in Cyber Physical Systems theory and practices. • Excellent understanding in one or more of the following: Firmware design and implementation/Embedded programming/Multi-core programming / Embedded architecture/ formal methods/model based engineering/any other similar field OR internet protocols/ cybersecurity/data security/data privacy/network security/vulnerability assessment/penetration testing/security audit/any related field • Proficiency in atleast one programming language including domain specific languages applicable to IoT/Drones/Embedded Appliances/cyber security framework • Operating System Internals including RTOS • Understanding and hands on experience with SDLC practices and tools C. VLSI Design • Strong background in VLSI domain and design philosophies. • Excellent understanding in one or more of the following: Verilog/System Verilog/VHDL/EDA Tools/Device Packaging/Simulation and Emulation applicable to chip design/IP Core design and development/ IP/SoC Design and Verification/FPGA based design/formal methods for verification/model based engineering/any other similar field • Full understanding of Chip Design life cycle • Understanding and hands on experience with Coding practices and tools D. Quantum Computing • Strong background in one or more of Quantum technologies: computing, communication, cryptography, simulation, applications, hybrid computing. • Excellent understanding and experience in one or more of the following: Quantum System Software/Firmware design and

implementation for quantum control/Embedded programming/modeling and simulation of quantum entities/ Quantum-HPC-AI hybrid computing/Quantum applications/Quantum mechanics/Post Quantum Cryptography/Quantum Cryptography/Quantum algorithms/any other relevant field

- Proficiency in at least one programming / modeling language relevant to quantum technology where experience is claimed
- Understanding and hands on experience with SDLC practices and tools

Job Profile	A. HPC Software • Design, development and porting of BIOS, Linux Kernels, Compilers, Profilers, Debuggers, Libraries, HPC Schedulers • Porting & optimization of applications, and containerization • Software & Application Testing and Deployment, Project documentation, User Support and Training B. Cyber Physical System - IoT / Embedded • design, implement, and optimize Cyber Physical Systems that integrate computational components. • Engage in firmware design and implementation for embedded systems, ensuring robust and efficient software. • multi-core programming and embedded architecture design for development of high-performance applications. • implementing and assessing internet protocols and cybersecurity measures to protect data integrity and privacy. • vulnerability assessments and penetration testing to identify and mitigate potential security risks in systems. • Design, Development, Testing and Monitoring of Cyber Security Systems solutions for perimeter security, network security and device security • Network Packet capturing and analysis; Traffic Pattern Analysis; configuration of a wide range of Network and Cyber Security tools for monitoring and analysis • Knowledge of Cryptography and its implementation in various information security applications including PKI, Blockchain etc., Operating Systems, Computer Organization and Networking • Implementing and assessing Internet protocols and Cyber Security measures to protect data integrity and privacy. • Good knowledge of Virtualization, Vulnerability Assessment & Penetration Testing, Cyber Security policies, Cloud Infrastructure, Incident Response and Risk Mitigation etc • develop software solutions tailored to IoT, drones, or cybersecurity frameworks; design, implementation, testing and maintenance of embedded software • Participate in end-product development activities by contributing ideas, concerns, risk analysis and mitigation as required • system design and circuit design concepts, processor architecture, peripheral bus interconnects and flash programming • develop algorithms and models to enhance system performance and reliability. C. VLSI Design • Design and implement complex Digital, Analog and RF circuits. • ASIC designs of Complex CPUs and GPUs – Both front end and Backend of IC designs. • Prototype and validate the IP cores on FPGAs. • RTL simulation, verification and modelling using VHDL/Verilog/ System Verilog using industry-standard tools. • Digital ASIC Design (Simulation/ Synthesis / Static Timing Analysis/ Logic Equivalence Check/ Back-Annotation). • Develop and optimize VLSI architectures and layouts. • Physical Design flow handling form Netlist to GDSII flow - ASIC Synthesis, Floor Planning, Placement Optimizations, CTS, Routing and Timing Closure of Full-Chip designs. • Optimize power, performance, and area (PPA) metrics of VLSI designs. • Debug and resolve design issues at various stages of the VLSI design flow • Participate in the tape-out process and support silicon bring-up and validation. • Basic knowledge of C & Assembly level programming and scripting. • Preparation of detailed project documentations, Generation of clear and concise reports for stakeholders.

	D. Quantum Computing • support and maintain superconducting-based quantum computing systems. • hands-on daily maintenance, troubleshooting, and resolving system issues to ensure optimal operation. • working on subsystems like dilution refrigerators, control electronics, and interconnectivity within the quantum system • basic software development for creating necessary software packages required. • design / architect technical solutions as well as create white papers for the proposed designs and solutions
Salary	CTC Rs. 18.34 LPA approx.
Duration	

BACK APPLY