JAGAT GURU NANAK DEV
PUNJAB STATE OPEN UNIVERSITY PATIALA
(Established by Act No.19 of 2019 of Legislature of the State of Punjab)

Syllabus for the Post of Programmer

Duration: 90 Minute Max. Marks: 75

Programming Concepts Using C , C++ , Java , PHP (30 Marks)

Arrays**:** Declaration; initialization; 2-dimensional and 3-dimensional array, passing array to function, strings and string functions, and character arrays.

Pointers: variables, swapping data, swapping address v/s data, misuse of address operators, pointers and arrays , pointers to pointers , strings , pointer arithmetic, additional operators , portability, pointers to functions, using pointers with arrays , void pointers .
Structures and unions: syntax and use, members, structures as function arguments, structure pointers, array of structures as arguments, passing array of structure members, call by reference.

Functions; prototype, passing parameters, storage classes, identifier visibility, Recursive functions. Command-line arguments. Scope rules, Multi-file programming, Introduction to macros.

File processing in C and C++.

Arrays, Stacks, Queues, Linked Lists, Trees, Graphs

Searching, Sorting, Time and Space Complexity, Algorithm design techniques like greedy, dynamic programming, divide-and-conquer etc.

Introduction to classes and objects; Constructor; destructor; Operator overloading; Function overloading; function overriding; friend function; copy constructor;Inheritance,: Single , Multiple, and Multilevel Inheritance

Virtual function and Polymorphism: Dynamic binding, Static binding; Virtual functions; Pure virtual function; concrete implementation of virtual functions; Dynamic binding call mechanism; Implementation of polymorphism; virtual destructors. Templates: Function Templates, Class Templates, Member Function Template and Template Arguments, Exception Handling, Standard Template Library

Java Program Development , Java Source File Structure , Comparison with other languages (C & C++), Java and Internet, Features of Java, Java Virtual machine, ByteCode , Lexical Tokens, Identifiers, Keywords, Literals, Comments , Primitive Datatypes, Variables: Assignment, Initialization and Conversions, Operators: Arithmetic, Assignment, Modulus, Relational, Boolean, Bitwise., Precedence Summary ,Unicode Character Set , Arrays: Single and Multidimensional. Control Statements and Looping Structures

Class Fundamentals, Object reference, Garbage Collection, Constructors, Access Control, Modifiers, methods, Nested, Inner Class & Anonymous Classes , Abstract Class, Argument Passing Mechanism , Method Overloading, Recursion , Dealing with Static Members. Finalize() Method, Native Method. Use of "this " reference , Cloning Objects, Generic Class Types, Inheritance in Java , Overriding Super Class Methods, Use of "super", Polymorphism in inheritance , Type Compatibility and Conversion ,Packages & Interfaces: Defining and importing packages , Understanding Class path , Implementing interfaces.

Exceptions & Errors ,Types of Exception ,Control Flow In Exceptions , Use of try, catch, finally, throw, throws in Exception Handling ,In-built and User Defined Exceptions, Checked and UnChecked Exceptions, Operation on String ,Mutable & Immutable String , Using Collection Bases Loop for String , Tokenizing a String ,Creating Strings using StringBuffer,

Multi-Threaded Programming ,Thread Life-Cycle , Thread Priorities , Synchronizing Threads , Inter-communication of Threads, DeadLock. Applet & Application, Applet Architecture, Parameters to Applet , Embedding Applets in Web page. Utility Methods for Arrays , Observable and Observer Objects , Date & Times , Using Scanner.

Web Application Design & Development: HTML, JavaScript, CSS, Client/Server Side Programming using Php Creating dynamic websites, error handling and debugging, Php MySQL/Oracle Database Connectivity.

Database Management Systems (DBMS) (15 Marks)

ER Diagram, data models- Relational and Object Oriented databases.

Data Base Design**:** Conceptual data base design, Normalization Primitive and Composite data types, concept of physical and logical databases, data abstraction and data independence, data aggregation and Relational Algebra.

Application Development using SQL**:** Host Language interface, embedded SQL programming, Stored procedures and triggers and views, Constraints assertions, Inverted and multilist structures, Query Optimization, Transaction Processing, concurrency control and recovery management.

Computer Networks (15 Marks)

Goals and applications of networks. LAN, MAN & WAN architectures. Concept of WAN subnet. Overview of existing networks. OSI Reference Model Architecture, TCP/IP Model

Internetworking concept and architectural model. Connection-oriented and connection-less approaches. Concept of Autonomous systems and Internetwork Routing. Classful IP addresses. Subnetting, IP Multicasting. Internet Protocol (IP): connectionless delivery of datagrams (MTU, fragmentation, reassembly).

Internet control protocols: ICMP, ARP and RARP. Routing algorithms: Interior (OSPF), Exterior(BGP). Transport Layer: UDP and TCP concepts.

Client-Server application development using TCP & UDP sockets. Basic Server Architectures. Network Security: Firewalls and their components; Encryption techniques and examples of encryption standards.

Software Engineering (15 Marks)

Concept of Software engineering, Evolving role of software, Concept of software, Software Characteristics, Software Components, Software Engineering Challenges (Scale, Quality Productivity, Consistency and Repeatability, Change), Software standard, Software Engineering approach. Software Process Models: Waterfall Model, Prototyping Model, Spiral Model, Incremental Model, Concurrent Development Model.

Software Process and Project Metrics: Measures, Metrics and Indicators, Software measurement : Size -Oriented Metrics , Function - Oriented Metrics , Extended Function point metrics. Capability Maturity Model Integration (CMMI), Process Planning, Estimation, COCOMO Model, Risk Analysis & Management: Software risks, Risk identification, Risk monitoring and management. **Software requirements**: need for SRS, requirement process; Requirement specification (characteristics, components), Concept of Use Cases, Concept of validation

Design Engineering: Function oriented design, Design principles, Coupling and Cohesion, Design Notations & Specifications, Structured Design Methodology; Object-Oriented Design, OO Concepts, Design Concepts, Design Methodology, Dynamic & Functional Modeling, DesignVerification.

Software Quality Concepts: Quality, Quality control, Cost of quality; Software Quality Assurance (SQA), Formal approaches to SQA, Software Reliability: Measures of Reliability, Software safety, Quality Standards. Software Testing: Testing fundamentals, Black-Box Testing, White Box Testing, Regression Testing, Smoke Testing, Alpha Testing, Beta Testing, Recovery Testing, Security Testing, Stress testing, Performance testing.