Maharashtra Public Service Commission

Civil Services Exam – Mains Optional

Computer Science

(Code No : 404)

Paper - I

Standard : Degree (B.E.) **Total Marks** : 200
Nature of Paper : Conventional Type **Duration** : 3 Hours

Note : 1) Answers to this paper must be written in English only
2) This paper will test the candidate's ability to comprehend, to analyse, to interpret, to criticise and to appraise subject matter related to the topics/sub topics mentioned below.
3) It is expected from candidates to study the latest and recent developments and happenings pertaining to the topics/sub topics mentioned below.

Section - A (Marks : 50)

1) Mathematical Foundations :

.01) **Mathematical Logic :** Propositional logic; First Order logic.

.02) **Set Theory and Algebra** : Sets; Relations; Functions; Groups; Partial order; Lattice; Boolean algebra.

.03) **Combinatorics :** Permutations; Combinations; Counting; Summation; Generating functions; Recurrence relations; Asymptotics.

.04) **Graph Theory :** Connectivity; Spanning trees; Cut vertices and edges; Covering; Matching; Independent sets; Colouring; Planarity, Isomorphism.

Section - B (Marks : 50)

2) Data Structures and Algorithms :

.01) The notion of abstract data types, stack, queue, list, set, string, tree, binary search tree, heap, graph.

.02) Tree and graph traversals, connected components, spanning trees, shortest paths, hashing, sorting, searching, design techniques (greedy, dynamic, divide and conquer).

.03) Asymptotic analysis (best, worst, average cases) of time and space, upper and lower bounds, intractability.

Section - C (Marks : 50)

3) Computer Programming :

.01) C programming, program control (iteration, recursion, functions); pointers, structures, arrays; scope, binding, parameter passing.

.02) **O-O Programming concepts using C++ :**

a) Class, objects, Instantiation, Inheritance.

b) Polymorphism, overloading and other concepts.

Section - D (Marks : 50)

4) Formal Languages and Automata Theory :

.01) Regular Languages, finite automata, regular expressions, regular grammar.

.02) Context free languages, push down automata, context free grammars.

5) Elementary Computer Graphics :

Display systems, Input devices, 2D Geometry, Graphic operations, 3D Graphics, Graphic Standards.

Paper - II

Standard : Degree (B.E.) **Total Marks** : 200
Nature of Paper : Conventional Type **Duration** : 3 Hours

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Section - A (Marks : 50)

1) Computer Hardware :

.01) **Digital Logic :** Logic Functions, minimization, design and synthesis of combinational and sequential circuits, number representation and computer arithmetic (fixed and floating point).

.02) **Computer organisation and Architecture :** Machine instructions and addressing modes, ALU and data path, hardwired and micro programmed control.

.03) **Interfacing and Data Communication :** Memory interfacing, I/O interface (interrupt and DMA mode), serial communication interface, cache, main and secondary storage.

.04) Instruction pipelining, pipeline hazards, micro controllers, embedded systems.

Section - B (Marks : 50)

2) System Software :

.01) **Compiler Design :** Lexical analysis, Parsing, Syntax directed translation.

.02) Runtime environment, Linking (static and dynamic); Code generation.

.03) **Operating Systems (in the context of Unix) :** classical concepts (concurrency, synchronization, deadlock), processes, threads and interprocess communication.

.04) CPU scheduling, memory management, file systems, I/O systems, protection and security.

Section - C (Marks : 50)

3) Software Systems :

.01) **Information Systems and Software Engineering :** information gathering, requirement and feasibility analysis, data flow diagrams.

.02) Process specifications, input/output design, process life cycle, planning and managing the project, design, coding, testing, implementation, maintenance.

.03) **Databases :** relational model, database design, integrity constraints, normal forms.

.04) Query languages (SQL), file structures (sequential, indexed), b-trees, transaction and concurrency control.

Section - D (Marks : 50)

4) Computer Communications :

.01) **Data Communication :** data encoding and transmission, data link control, multiplexing, packet switching, LAN architecture, LAN systems (Ethernet, token ring), Network device : switches, gateways, routers.

.02) **Networks :** ISO/OSI stack, sliding window protocols, routing protocols,

TCP/UDP, application layer protocols and systems (http, smtp, dns, ftp), network security.

.03) **Web technologies :** three tier web based architecture; JSP, ASP, J2EE, NET systems; html, XML.

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