Syllabus
for
Data Science, Artificial Intelligence, Cyber Security etc. (MTQP04)

Note:

i. The Question Paper which will have 75 questions.

ii. All questions will be based on Subject-Specific Knowledge.

iii. All questions are compulsory.

iv. The Question paper will be in English.

Data Science, Artificial Intelligence, Cyber Security etc. (MTQP04)

1. **Set Theory & Algebra:** Sets; Relations; Functions; Compositions of functions and relations,Group; Partial Orders; Boolean Algebra.
2. **Theory of Computations:** Finite Automata and Regular Expressions, on –determinism and NFA, Properties of Regular Sets, Context free grammar: Chomsky Normal Form (CNF), Griebach Normal Form (GNF), Push-down automata, Moore and mealy Machines, Turing machines.
3. **Digital Logic:** Number representations and computer arithmetic (Fixed and floating point), Logic functions, Minimizations, Design and synthesis of combinational and sequential circuits, A/D AND D/A CONVERTERS.
4. **Computer Organization and Architecture:** Machine instructions and addressing modes, ALU and data –path, CPU control design, memory interface, I/O interface (Interrupt and DMA mode), Instruction pipelining, Cache and main memory, Secondary storage.
5. **Microprocessors and interfacing:** Instructions sets, addressing modes, Memory interfacing, interfacing peripheral devices, Interrupts. Microprocessor architecture, Instructions set and Programming (8085), Microprocessor applications, DMA, Interrupt and Timer.
6. **Programming and Data Structures:** Programming in C; Functions, Recursion, Parameter passing, and Definition of data structure. Arrays, Stacks, Queues linked lists, trees, priority queues and heaps, Binary search trees.
7. **Algorithm**: Algorithm concepts, Analyzing and design, asymptotic notations and their properties, Worst and average case analysis; Design: Greedy approach, Dynamic programming, Divide and conquer; Tree and graph transversals, Spanning trees, shortest paths: Hashing, Sorting Searching.
8. **Operating System**: Main functions of operating systems, Processes, Threads, Interprocess communication, concurrency, Synchronization, Deadlock, CPU scheduling, I/O scheduling, Resource scheduling. Deadlock and scheduling algorithms, banker's algorithm for deadlock handling. Memory management and virtual memory. File Systems, I/O systems, DOS, UNIX and Windows.
9. **Computer Networks**: OSI Model, TCP/IP model, LAN technologies (Ethernet,Token ring), Transmission media – twisted pair, coaxial cables fiber–optic cables, Flow and error control techniques, Routing algorithms, Congestion control, IP (v4), Application layer protocols (icmp , dns, smtp, pop, ftp, http);Sliding window protocols; Internetworking: Switch /Hub, Bridge, Router, Gateways, Concatenated virtual circuits, Firewalls: Network Security; Cryptography- public key, secret key. Domain Name System (DNS)-Electronic Mail and World Wide Web (WWW).

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10. **Artificial Intelligence**: Basic concepts of AI; Intelligent agents; solving problems by searching – Uniformed search, Informed search; Logical agents; first order logic; knowledge representations.
11. **Cryptography & Network security:** Computer & network security concepts, Classical encryption techniques: Symmetric cipher model, Caesar Cipher, Playfair Cipher, Hill Cipher.
12. **Data Science**: Basic concepts; data, types of data–structured, unstructured; data representation,machine learning algorithms-supervised, unsupervised, reinforcement, clustering, classification and regression problems, data preprocessing, normalization, smoothing, visualization.