COMPUTER SCIENCE
(POST RELATED)
Subject Code: 971
Total Marks-200

Part-I
Marks-100

(a) Computer Programming:
Introduction to computer programming. Assembling language programming. Problem solving techniques, algorithm specification and development. Programming style, testing and debugging. Program design techniques: Structured and modular program design. Programming languages and paradigms: classification. Programming in C: Data type, statements, control structures, arrays, pointers, strings, functions, preprocessor directives, structures, unions and bit-fields, files. Introduction to object oriented programming: Encapsulation, inheritance and polymorphism, Mechanic Language Programming, Template functions and classes multi-threads exceptions, Class and object. Introductory programming with C++/JAVA.

(b) Digital System:
Number system: binary, octal, hexadecimal and BCD. Data representation. Logic gates and Boolean algebra: Combinational circuits. Circuit design using logic gates. Circuit and expression minimization: Karnaugh map and Quine-McCluskey. Basic flip-flops (FF), Design of half and full adder. Basic counters and register. Basic decoders, encoders, multiplexers and demultiplexers. ADC and DAC circuits. PLA design, Pulse mode and fundamental mode logic, Pulse & switching units, Newtrivibrations , Digital LC: DTL, TTL, III, CMOS MOS gates, Memory system, LED, LCD applications of Op-Amps. Cooparators.

(c) Discrete Mathematics:
Prepositional and predicate calculus: Basic concept. Theory of sets: set operations, algebra of sets. Mathematical induction. Basic concept of relations and its representation. Functions and its classification and pictorial representation. Graph theory and its application. Elementray number system. Principles of counting. Reversion, generating, functions, recurrence relation.

(d) Numerical Analysis:
Solving linear systems with Gaussian elimination and Gauss-Jordan elimination method. Interpolation: Newton's formula, Lagrange's formula. Numerical differentiations and integrations: Trapezoidal, Simpson's $1/3^{rd}$ and $3/8^{th}$ rule. Romberg integration. Solutions and Newton-Ralphson's method. Solution of ordering differential equation and least square approximation of functions.

(e) Data Structures:
Arrays: Representation and operations. Sparse and dense matrices: Concept and operation. Stacks and queues: Concept, structures and basic operations. Quick-sort and Polish notation: Applications of stack. Recursion: Concept and applications. Linked lists: Representation and various operations. Trees: Binary trees, traversing binary trees. Binary search trees: Various opeations. Binary heaps: Heap sort. Huffman's algorithm. Graphs: Representations and operations. Spanning trees, shortest path and topological sorting. Internal sorting: Insertion sort, selection sort, merge-sort, radix sort, Basic hashing techniques.

(f) Microprocessor and Interfacing:
Microprocessor and microcomputers. Evolution of microprocessor. Architecture of a general purpose microprocessor and its operation. Addressing modes. Common instruction types: Basic assembly instruction set. Intel 8086 microprocessor: Internal architecture, register structure, programming model, addressing modes and instruction sets. Interrupts its classification and interrupt handling, Memory management in Intel 80_x86 family: Real-mode memory management, segmentation and segmented to physical address translation. Protected mode memory management: Segmentation and virtual addressing, segment selectors and descruptors and tables. Intel 80386 and 80486 register formats. Paged memory operation and TLB structure I/O port organization and accessing. Interfacing the keyboard, printer and monitor. Structure and operation of certain chips as 8255A, 8253, 8272, 8259A, 8237. Bus interfaces and micro controllers.

(g) Computer Organization and Architecture:
Fundamentals of computer design. Processor and ALU design. Control design: Hardware control and micro-programmed control. Caches Memory organization. Exceptions System organization Bus and hazards I/O subsystem and I/O processor. Parallel processing: Concept, pipeline processors. Interrupts systolic arrays and fault-tolerant computers.

(h) Compiler and theory of computation. Introduction to compiliary. Basic issues, logical analysis, hexical analysis, syntax analyses. Semantic analysis, type cheeking, run-time environments, code generation, code optimization and language theory.

COMPUTER SCIENCE

Part-II

Marks-100

(a) Algorithm:

Algorithm and complexity: Asymptotic notations. Basic algorithm techniques and analysis: Divide and conquer, dynamic programming, greedy method, branch and bound, string matching, computational geometric problems, graph algorithms, spanning trees, shortest paths, max-flow problem, searching algorithms. Techniques for analysis of algorithms, approximation algorithms, parallel algorithms.

(b) Operating System:

Introduction, evolution, goals and components of OS. Types of OS Process management: Process states PCB, job and process scheduling. CPU scheduling algorithms, critical section problems and solutions. Semaphores, Inter-process communication techniques. Deadlick handling methods. Memory management techniques: Paging, segmentation and page replacement policies. Secondary storage management: Disk scheduling algorithms. File management: File system structure, organization, FCB, space allocation, tree structured file system. Protection and security: classification and handling techniques.

(c) Database Management System:

Definition of DBMS, types of DBMS, its advantages and disadvantages, Data model: ER model and relational model. Integrity constraints. Functional dependencies. Assertions and triggers. File organization: Definition of various file organization, classification and Representation. Indexing techniques: sparse and dense indexing. B+ tree indexing, hash indexing. Relational database design: normalization, 2NF, 3NF and BCNF. Query processing: Various notations, cost estimation of selection operation and join operation. Transaction concept and concurrency control: Lock based protocol, deadlock handling. SQL and application using SQL.

(d) Software Engineering:

Introduction, Software process. Project management. Requirements engineering processes. System models: Context, data, behavioral and object models. Object oriented design techniques. Real-time software design. System design with reuse. Critical system design dependability, software maintenance, critical system specification and development Verification and validation. Software testing. Software cost estimation: COCOMO model Halstead formula, Graph: Cel analysis of complexity measures, software reliability and availability, Quality assurance.

(e) Data Communication:

Introduction to OSI and TCP/IP protocol. Data transmission basics: analog and digital data, spectrum and bandwidth. Transmission impairments. Data rate channel capacity. Transmission media: Twisted pair, coaxial cable and optical fiber, wireless transmission. Data encoding: NRZ. NRZI, Manchester and differential Manchester modulation techniques-AM, FM, PM, Della modulation, compounding Equations, ASK, PSK, FSK. QPSK. QAM sampling theorem, PCM. PPM. PAM. Data transmission: Synchronous and asynchronous and asynchronous. NUll modem configuration. Data link control error and flow control CRC and HDLC. Multiplexing: FDM, TDM, statistical TDM. Basic circuit switching and packet switching techniques.

(f) Computer Network and the Internet:

Protocol, fundamentals of control protocol,

Introduction and network types, LAN, MAN, WAN. Topologies: Star, switched, bus, ring. Ethernet LAN standards. Internetworking: Network interconnection, bridges, routers. Network layer protocols: IP, ARJP, ICMP, IP addresses. Unicast and multicast routing protocols. IPV6 congestion control, Transport layer protocol: TCP and UDP. Introduction to wireless LAN, VSAT, analog and digital cellular system. Network security: Types of attack, encryption techniques and digital signatures. ATM switches, ATM protocol; DNS, HTTP, Email.

(g) Artificial Intelligence:

Overview of AI. General concepts of knowledge. Introduction to PROLOG. Knowledge representation. Intelligent agents. First order logic. Knowledge organization and manipulation: Search strategies, matching techniques and game planning. Natural language processing, Probabilities reasoning, expert systems and computer vision, Knowledge acquisition: Learning in symbolic and non-symbolic representation.