

সূচিপত্র:

ক্রমিক নং	বিষয় কোড	বিষয়ের নাম
আবশ্যিক বিষয় (MCQ Type)		
১.		বাংলা
২.		ইংরেজি
৩.		বাংলাদেশ বিষয়াবলি
৪.		আন্তর্জাতিক বিষয়াবলি
৫.		মানসিক দক্ষতা
৬.		গাণিতিক যুক্তি
পদ-সংশ্লিষ্ট বিষয়		
১.	১১১	বাংলা
২.	১২১	ইংরেজি
৩.	১৫১	সংস্কৃত
৪.	১৭১	মনোবিজ্ঞান
৫.	১৮১	ইতিহাস
৬.	১৯১	ইসলামের ইতিহাস ও সংস্কৃতি
৭.	২০১	ইসলামী শিক্ষা
৮.	২১১	দর্শন
৯.	২২১	শিক্ষা
১০.	২৮১	তথ্য ও যোগাযোগ প্রযুক্তি
১১.	৩১১	ভূগোল
১২.	৩৩১	অর্থনীতি
১৩.	৩৪১	রাষ্ট্রবিজ্ঞান
১৪.	৩৫১	সমাজবিজ্ঞান
১৫.	৩৬১	সমাজকল্যাণ
১৬.	৩৯১	গার্হস্থ্য অর্থনীতি
১৭.	৫১১	পদার্থবিদ্যা
১৮.	৫৩১	রসায়ন
১৯.	৫৪১	ফলিত রসায়ন
২০.	৫৫১	গণিত
২১.	৫৬১	ফলিত গণিত
২২.	৫৭১	ভূ-তত্ত্ব
২৩.	৫৮১	উদ্ভিদবিদ্যা
২৪.	৫৯১	প্রাণিবিদ্যা
২৫.	৬০১	প্রাণ রসায়ন
২৬.	৬২১	মৃত্তিকা, পানি ও পরিবেশ বিজ্ঞান
২৭.	৬৬১	খাদ্য ও পুষ্টি বিজ্ঞান
২৮.	৭০১	হিসাববিজ্ঞান
২৯.	৭১১	ফিন্যান্স
৩০.	৭২১	মার্কেটিং
৩১.	৭৩১	ব্যবস্থাপনা
৩২.	৮০১	কৃষি
৩৩.	৮৬১	সমুদ্রবিদ্যা
৩৪.	৮৯২	ইলেকট্রিক্যাল এন্ড ইলেকট্রনিক্স ইঞ্জিনিয়ারিং
৩৫.	৯৭১	কম্পিউটার সায়েন্স
৩৬.	৯৮১	পরিসংখ্যান

বিষয়ের নাম: বাংলা
পূর্ণমান : ২০

ভাষা :

প্রয়োগ-অপপ্রয়োগ, বানান ও বাক্য শুদ্ধি, পরিভাষা, সমার্থক ও বিপরীতার্থক শব্দ, ধ্বনি, বর্ণ, শব্দ, পদ, বাক্য, প্রত্যয়, সন্ধি ও সমাস

মান বন্টন

১৫

সাহিত্য :

ক. প্রাচীন ও মধ্যযুগ

খ. আধুনিক যুগ (১৮০০-বর্তমান পর্যন্ত)

০৫

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Name of the Subject: English

Total Marks: 20

**Marks
Distribution
15**

PART- I : Language

A. Parts of Speech:

The Noun:

- The Determiner
- The Gender
- The Number

The Pronoun

The Verb:

- The Finite: transitive, intransitive
- The Non-finite: participles, infinitives, gerund
- The Linking Verb
- The Phrasal Verb
- Modals

The Adjective

The Adverb

The Preposition

The Conjunction

B. Idioms & Phrases:

Meanings of Phrases

Kinds of Phrases

Identifying Phrases

C. Clauses:

The Principal Clause

The Subordinate Clause:

- The Noun Clause
- The Adjective Clause
- The Adverbial Clause & its types

D. Corrections:

- The Tense
- The Verb
- The Preposition
- The Determiner
- The Gender
- The Number
- Subject-Verb Agreement

E. Sentences & Transformations:

- The Simple Sentence
- The Compound Sentence
- The Complex Sentence
- The Active Voice
- The Passive Voice

The Positive Degree
The Comparative Degree
The Superlative Degree

F. Words:

Meanings
Synonyms
Antonyms
Spellings
Usage of words as various parts of speech
Formation of new words by adding prefixes and suffixes

G. Composition:

Names of parts of paragraphs/letters/applications

PART- II: Literature

05

H. English Literature:

Names of writers of literary pieces from Elizabethan period to the 21st Century.

Important drama, Poetry and prose of different ages.

বিষয়ের নাম: বাংলাদেশ বিষয়াবলি

পূর্ণমান : ২০

	মান বণ্টন
১. বাংলাদেশের জাতীয় বিষয়াবলি : বাংলাদেশের আর্থসামাজিক ও রাজনৈতিক ইতিহাস: আধুনিক যুগ (১৭৫৭ থেকে অদ্যবধি)	০৪
২. বাংলাদেশের কৃষিজ সম্পদ : শস্য উৎপাদন এবং এর বহুমুখীকরণ, খাদ্য উৎপাদন ও ব্যবস্থাপনা।	০২
৩. বাংলাদেশের জনসংখ্যা, জনশুমারি, জাতি, গোষ্ঠী ও ক্ষুদ্র নৃগোষ্ঠী সংক্রান্ত বিষয়াদি।	০২
৪. বাংলাদেশের অর্থনীতি : উন্নয়ন পরিকল্পনা প্রেক্ষিত, জাতীয় আয়-ব্যয়, রাজনীতি ও বার্ষিক উন্নয়ন কর্মসূচি, দারিদ্র্য বিমোচন ইত্যাদি।	০২
৫. বাংলাদেশের শিল্প ও বাণিজ্য : শিল্প উৎপাদন, পণ্য আমদানি ও রপ্তানিকরণ, গার্মেন্টস শিল্প ও এর সার্বিক ব্যবস্থাপনা, অন্যান্য শিল্পসমূহ, বৈদেশিক লেন-দেন, অর্থ প্রেরণ, ব্যাংক ও বীমা ব্যবস্থাপনা ইত্যাদি।	০২
৬. বাংলাদেশের সংবিধান : প্রস্তাবনা ও বৈশিষ্ট্য, মৌলিক অধিকারসহ রাষ্ট্র পরিচালনার মূলনীতিসমূহ, সংবিধানের সংশোধনীসমূহ।	০২
৭. বাংলাদেশের রাজনৈতিক ব্যবস্থা : রাজনৈতিক দলসমূহের গঠন, ভূমিকা ও কার্যক্রম, ক্ষমতাসীন ও বিরোধী দলের পারস্পরিক সম্পর্কাদি, সুশীল সমাজ ও চাপ সৃষ্টিকারী গোষ্ঠীসমূহ এবং এদের ভূমিকা। জুলাই-আগস্ট গণঅভ্যুত্থান ২০২৪ পরবর্তী এবং সংস্কার প্রস্তাবনা।	০২
৮. বাংলাদেশের সরকার ব্যবস্থা : আইন, শাসন ও বিচার বিভাগসমূহ, আইন প্রণয়ন, নীতি নির্ধারণ, জাতীয় ও স্থানীয় পর্যায়ে প্রশাসনিক ব্যবস্থাপনা কাঠামো, প্রশাসনিক পুনর্বিন্যাস ও সংস্কার।	০২
৯. বাংলাদেশের জাতীয় অর্জন, বিশিষ্ট ব্যক্তিত্ব, গুরুত্বপূর্ণ প্রতিষ্ঠানসমূহ, জাতীয় পুরস্কার, বাংলাদেশের খেলাধুলাসহ চলচ্চিত্র, গণমাধ্যম-সংশ্লিষ্ট বিষয়াদি।	০২

বিষয়ের নাম: আন্তর্জাতিক বিষয়াবলি
পূর্ণমান : ২০

	মান বণ্টন
১. বৈশ্বিক ইতিহাস, আঞ্চলিক ও আন্তর্জাতিক ব্যবস্থা, ভূ-রাজনীতি।	০৪
২. আন্তর্জাতিক নিরাপত্তা ও আন্তরাষ্ট্রীয় ক্ষমতা সম্পর্ক।	০৪
৩. বিশ্বের সাম্প্রতিক ও চলমান ঘটনাপ্রবাহ।	০৪
৪. আন্তর্জাতিক পরিবেশগত ইস্যু ও কূটনীতি।	০৩
৫. আন্তর্জাতিক সংগঠনসমূহ এবং বৈশ্বিক অর্থনৈতিক প্রতিষ্ঠানাদি।	০৩
৬. সিভিল সার্ভিসের গোড়াপত্তন এবং যুক্তরাজ্য, যুক্তরাষ্ট্র, চীন, জাপান, ভারত, নেপাল, শ্রীলংকা ও পাকিস্তান সিভিল সার্ভিস	০২

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বিষয়ের নাম: গাণিতিক যুক্তি
পূর্ণমান : ১০

	মান বণ্টন
১. বাস্তব সংখ্যা, ল.সা.গু, গ.সা.গু, শতকরা, সরল ও যৌগিক মুনাফা, অনুপাত ও সমানুপাত, লাভ ও ক্ষতি।	০২
২. বীজগাণিতিক সূত্রাবলি, বহুপদী উৎপাদক, সরল ও দ্বিপদী সমীকরণ, সরল ও দ্বিপদী অসমতা, সরল সহসমীকরণ।	০২
৩. সূচক ও লগারিদম, সমান্তর ও গুণোত্তর অনুক্রম ও ধারা।	০২
৪. রেখা, কোণ, ত্রিভুজ ও চতুর্ভুজ সংক্রান্ত উপপাদ্য, পিথাগোরাসের উপপাদ্য, বৃত্ত সংক্রান্ত উপপাদ্য, পরিমিতি-সরলক্ষেত্র ও ঘনবস্তু।	০২
৫. সেট, বিন্যাস ও সমাবেশ, পরিসংখ্যান ও সম্ভাব্যতা।	০২

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বিষয়ের নাম: মানসিক দক্ষতা
(MENTAL ABILITY)

পূর্ণমান : ১০

১. ভাষাগত যৌক্তিক বিচার (Verbal Reasoning)
২. সমস্যা সমাধান (Problem Solving)
৩. বানান ও ভাষা (Spelling and Language)
৪. যান্ত্রিক দক্ষতা (Mechanical Reasoning)
৫. স্থানাঙ্ক সম্পর্ক (Space Relation)
৬. সংখ্যাগত ক্ষমতা (Numerical Ability)

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INFORMATION AND COMMUNICATION TECHNOLOGY
(POST RELATED)
Subject Code: 281
Total Marks-100

PART-I
Marks: 50

Basic Physics

Basic elements: charge, Coulomb's law, electric field, Gauss's law, electric potential, magnetic field; Faraday's law, Maxwell's equations, Waves and oscillations, Theory of special relativity, Electromagnetic waves, Photoelectric effect, Quantum theory of light, X-ray and X-ray diffraction, Compton effect; De Broglie waves, Phase and group velocity, Wave function and wave equation.

Introduction to Computer Systems

Introduction to computations; Early history of computing devices; Computers; Major components of a computer; Hardware: processor, memory, I/O devices; Software: Operating system, application software; Basic architecture of a computer; Basic Information Technology; The Internet; Number system: binary, octal, hexadecimal, binary arithmetic.

Electrical Circuits

Circuit variables and elements: voltage, current, power, energy, independent and dependent sources, resistance; Basic laws of electrical circuits: Ohm's law, Kirchoff's current law (KCL) and Kirchoff's voltage law (KVL); Simple resistive circuits: series and parallel circuits, voltage and current division, source transformation; Methods of analysis: nodal and mesh analysis; Circuit theorems: Thevenin's, Norton's and superposition theorems, maximum power transfer and reciprocity theorem; Capacitors and inductors: inductors and capacitors, their characteristics, series-parallel combination of inductors and capacitors; RLC Transients. Series and parallel AC circuits: impedance and phasor diagram, series and parallel networks, voltage divider rule, admittance and susceptance; mesh and nodal analysis, wye-delta and delta-wye conversions; superposition theorem, Thevenin's theorem, Norton's theorem, maximum power transfer theorem.

Digital Logic Design

Digital logic: Boolean algebra, De Morgan's Theorems, logic gates and their truth tables, canonical forms, combinational logic circuits, minimization techniques; Arithmetic and data handling logic circuits, decoders and encoders, multiplexers and demultiplexers; Combinational circuit design; Flip-flops, race around problems; Counters: asynchronous counters, synchronous counters and their applications; PLA design; Synchronous and asynchronous logic design; State diagram, Mealy and Moore machines; State minimizations and assignments; Pulse mode logic; Fundamental mode design.

Basic Electronics

Diode circuit: current-voltage characteristics of a diode, DC and AC models, dynamic resistance and capacitance, load line, Zener regulator, half wave and full wave rectifier, voltage multiplier, clipper and clamper; Bipolar junction transistors: construction and operation, amplifying action, common base, common emitter, common collector, load line, different biasing, stability factor, small signal equivalent circuit models, BJT as a switch; Single stage amplifier: voltage and current gain, input and output impedance of a common base, common emitter and common collector, h-parameter; Field effect transistor (FET): JFET structure, operation and characteristics. MOSFET construction, operation and characteristics.

Microprocessor and Interfacing

Introduction to microprocessor: overview of computer architecture, evolution of microprocessors, difference between microprocessor and microcontroller; Introduction to 8086/8088: basic architecture of 8086, memory segmentation, flags, addressing modes, pins & signals, single and multi-processor systems; Microprocessor programming: instruction sets, introduction to assembly language programming; Tools: assemblers, debuggers, development systems; Clock and bus controller interfacing: clock generator, bus demultiplexer, bus controller interfacing; Memory Interfacing: SRAM and EEPROM interfacing, Types of I/O: parallel I/O, programmed I/O, interrupt driven I/O, I/O port address decoding, programmable peripheral interface (8255A), interface examples– Keyboard matrix, LCD/7-Segment display, printer, stepper motor, A/D and D/A converter; Timer interfacing: The 8254 programmable interval timer (PIT), timing applications; Serial I/O interface: asynchronous and synchronous communication, physical communication standard-EIA RS232, programmable communication interface, interfacing serial I/O devices- mouse, modem, PC Keyboard; Interrupts: interrupt driven I/O, software & hardware interrupts, interrupt vectors and vector table, interrupt processing, programmable interrupt controller (8259A), DMA: DMA controller (8237).

Computer Architecture

Information representation; Measuring performance; Instructions and data access methods: operations and operands of computer hardware, representing instruction, addressing styles; Arithmetic Logic Unit (ALU) operations, floating point operations, designing ALU; Processor design: datapaths & single cycle and multicycle implementations; Control Unit design - hardware and microprogrammed; Hazards; Exceptions; Pipeline: pipelined datapath and control, superscalar and dynamic pipelining; Memory organization: cache, virtual memory, channels.

Communication Theory

Spectral analysis: Fourier series, sampling function, power spectrum, Fourier transform, convolution, Parseval's theorem; Information theory: entropy, information rate, Shannon's theorem, channel capacity; Analog communication system: different modulations, modulation circuits and detectors; Digital modulation: different standard modulation schemes; Pulse and digital signals: pulse amplitude modulation (PAM), pulse code modulation (PCM), delta modulation (DM), adaptive delta modulation (ADM); Multiplexing: time-division multiplexing (TDM) frequency-division multiplexing (FDM), multiple-access network- time-division multiple-access (TDMA), frequency-division multiple access (FDMA); code-division multiple-access (CDMA).

Computer Networking and Security

Protocol hierarchies; Data link control: HDLC; DLL in Internet; DLL of ATM; LAN Protocols: Standards IEEE 802.*; Hubs, Bridges, and Switches, FDDI, Fast Ethernet; Routing algorithm; Congestion control; Internetworking, WAN; Fragmentation; Firewalls; IPV4, IPV6, ARP, RARP, Mobile IP, Network layer of ATM; Transport protocols; Transmission control protocol: connection management, transmission policy, congestion control, timer management; UDP; AAL of ATM; Network security: Cryptography, DES, IDEA, public key algorithm; Authentication; Digital signatures; Gigabit Ethernet; Domain Name System: Name servers; Email and its privacy; SNMP; HTTP; World Wide Web.

INFORMATION AND COMMUNICATION TECHNOLOGY

PART-II

Marks: 50

Programming Language

Structured programming language: data types, operators, expressions, control structures; Functions and program structure: parameter passing conventions, scope rules and storage classes, recursion; Header files; Preprocessor; Pointers and arrays; Strings; Multidimensional array; User defined data types: structures, unions, enumerations; Input and Output: standard input and output, formatted input and output, file access; Variable length argument list; Command line parameters; Error Handling; Graphics; Linking; Library functions.

Object Oriented Programming language: Philosophy of Object Oriented Programming (OOP); Advantages of OOP over structured programming; Encapsulation, classes and objects, access specifiers, static and non-static members; Constructors, destructors and copy constructors; Array of objects, object pointers, and object references; Inheritance: single and multiple inheritance; Polymorphism: overloading, abstract classes, virtual functions and overriding; Exceptions; Object Oriented I/O; Template functions and classes; Multi-threaded Programming.

Theory: Discrete Mathematics, Theory of Computation and Basic Graph Theory

Set theory; Relations; Functions; Graph theory; Propositional calculus and predicate calculus; Mathematical reasoning: induction, contradiction and recursion; counting; Principles of inclusion and exclusion; Recurrence relations; Algebraic structures: rings and groups.

Graphs: simple graphs, digraphs, subgraphs, vertex-degrees, walks, paths and cycles; Trees, spanning trees in graphs, distance in graphs; Complementary graphs, cut-vertices, bridges and blocks, k-connected graphs; Theory of Computation: Language theory; Finite automata: deterministic finite automata, nondeterministic finite automata, equivalence and conversion of deterministic and nondeterministic finite automata, pushdown automata; Context free languages; Context free grammars; Turing Machines: basic machines, configuration, computing with Turing machines

Data Structures and Algorithms

Internal data representation; Abstract data types; Elementary data structures: arrays, lists, stacks, queues, trees, graphs; Advanced data Structures: heaps, Fibonacci heaps, B-trees; Recursion, sorting, searching, hashing, storage management.

Techniques for analysis of algorithms; Methods for the design of efficient algorithms: divide and conquer, greedy method, dynamic programming, back tracking, branch and bound; Basic search and traversal techniques; Topological sorting; Connected components, spanning trees, shortest paths; Flow algorithms; Approximation algorithms; Parallel algorithms; Algebraic simplification and transformations; Lower bound theory; NP-completeness, NP-hard and NP-complete problems.

Database Systems

Concepts of database systems; Data Models: Entity-Relationship model, Relational model; Query Languages: Relational algebra, SQL; Constraints and triggers; Functional dependencies and normalization; File organization and data storage; Indexing: primary and secondary indexes, B+ trees, hash tables; Query optimization; Transaction management; Recovery; Concurrency control; Access control and security; Semi-structured database: XML, XPath, XQuery; Object oriented and object relational databases.

Software Engineering and Information System Design

Concepts of Software Engineering, Software Engineering paradigms, Different phases of software System Development, Different types of information, qualities of information. Project Management Concepts, Software process and project Metrics, Software Project Planning, Risk Analysis and management, Project Scheduling and Tracking. Analysis Concepts and principles: requirement analysis, Analysis modeling, data modeling. Design concepts and principles, Architectural design, User Interface design, Object Oriented software development and design: Iterative Development and the Unified Process. Sequential waterfall life cycles, Inception. Use case model for requirement writing, Elaboration using System Sequence Diagram, Domain Model. Visualizing concept classes. UML diagrams, Interaction and Collaboration Diagram for designing Software.

Designing Objects with responsibilities. GRASP patterns with General Principles in assigning responsibilities: Information expert, Creator, Low Coupling and High Cohesion, Creating design class diagrams and mapping design to codes. Software Testing: White Box and Black Box testing. Basis Path Testing. Testing for specialized environment. Software testing strategies: Unit Testing, Integration Testing, Validation Testing, System Testing, Art of debugging. Analysis of System Maintenance and upgrading: Software repair, downtime, error and faults, specification and correction, Maintenance cost models, documentation. Software Quality Assurance, Quality factors. Software quality measures. Cost impact of Software defects. Concepts of Software reliability, availability and safety. Function based metrics and bang metrics. Metrics for analysis and design model. Metrics for source code, testing and maintenance

Operating System

Operating System: its role in computer systems; Operating system concepts; Operating system structure; Process: process model and implementation, Inter-Process Communication (IPC), classical IPC problems, process scheduling, multiprocessing and time-sharing; Memory management: swapping, paging, segmentation, virtual memory; Input/Output: hardware, software, disk, terminals, clocks; Deadlock: resource allocation and deadlock, deadlock detection, prevention and recovery; File Systems: files, directories, security, protection; Case study of some operating systems.

Artificial Intelligence

Introduction to old and new AI techniques; Knowledge representation; Propositional and first order logic; Search techniques in AI; Probabilistic reasoning; Natural language processing. Introduction to expert system. Introduction to machine learning; Learning algorithms: supervised and unsupervised; Practical application of machine learning; Regression; Clustering.

COMPUTER SCIENCE

(POST RELATED)

Subject Code: 971

Total Marks-100

Part-I

Marks-50

(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. Cooperators.

(c) Discrete Mathematics:

Propositional 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 $1/3^{\text{rd}}$ and $3/8^{\text{th}}$ 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 80x86 family: Real-mode memory management, segmentation and segmented to physical address translation. Protected mode memory management: Segmentation and virtual addressing, segment selectors and descriptors 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-50

(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. Deadlock 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, DSSS 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, ARP, 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.

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