

Computer Science Honours Course

Course Structure

Paper	Type/Marks	Group	Title	Periods
Part-I				
I	Theoretical 100	A	Computer Fundamentals	35
		B	Introduction to Basic Electronics	35
		C	Digital System Design	35
		D	Computer Organization-I	45
II	Theoretical 50	A	Section-I : System Software-I Data Structure-I	10 25
	Practical 50	B	Section-II : Programming through C Language Hardware	40
Part-II				
III	Theoretical 100	A	Graph Theory	30
		B	Discrete Mathematical Structures	45
		C	Numerical and Optimization Techniques	45
		D	Formal Languages and Automata Theory	30
IV	Theoretical 50	A	Section-I : Data Structure-II Section-II : System Software-II	30 45
	Practical 50	B	Software : Operating System, PC Software, C Language	
Part-III				
V	Theoretical 100	A	Microprocessor	45
		B	Computer Organization-II	45
		C	Data Communication & Computer Network Internet Technology	40 20
VI	Theoretical 100	A	Object-Oriented Programming	30
		B	Software Engineering	30
		C	Computer Graphics	30
		D	Database Management System	60
VII	Practical 100	A	Hardware : Microprocessor Programming & I/O Interfacing	
		B	Project	
VIII	Practical 100	A	Object-Oriented Programming	
		B	RDBMS	
		C	Shell Programming	



PART – I PAPER – I (THEORETICAL) : 100 Marks

Group A: Computer Fundamentals

(35 Periods)

Introduction to Computer and Problem Solving: Information and Data.

Hardware: CPU, Primary and Secondary storage, I/O devices, Bus structure

Software: Systems and Application.

Generation of Computers: Super, Mainframe, Mini and Personal Computer.

Introduction to Programming Languages: Machine Language, Assembly Language, High Level Language.

Problem Solving: Flow Charts, Decision Tables and Pseudocodes. (8)

Number Systems and Codes:

Number representation: Weighted Codes, Non-weighted codes, Positional, Binary, Octal, Hexadecimal, Binary Coded Decimal(BCD), Conversion of bases. Complement notions. Binary Arithmetic, Binary Codes: Gray, Alphanumeric, ASCII, EBCDIC; Single Error-Detecting and Correcting Codes, Hamming Codes. (15)

Boolean Algebra:

Fundamentals of Boolean Algebra, Switches and Inverters, Functionally Complete Gates (AND, OR, NOT), NAND, NOR, Switching function and Boolean Function. De Morgan's Theorem, Minterm, Truth table and minimization of switching function upto four variables, Algebraic and K-map method of Logic circuit synthesis: Two level and Multi level. (12)

Group B: Introduction to Basic Electronics

(35 Periods)

Elementary circuit theory: Kirchoff's Laws with simple applications, Statement and illustration of Thevenin's & Norton's theorems(without proof) in resistive network only & its simple applications.

Elementary Physics of semi-conductors: Intrinsic and Extrinsic semiconductors, P & N type, Diode & its applications: P-N Junction diodes, Biasing of a junction diode, Depletion region & its effect, Zener diodes & its applications, Diode as a rectifier, Types of diodes, LED, LCD. Principle of junction transistor, Current components of transistor, Modes of a transistor (CB, CE and CC) and their properties, I/O characteristics of a transistor in CE mode. Relation between β & α -parameters of Transistor, Biasing of a transistor : Q point, load line, Self-bias, fixed bias & collector to base bias.

Amplifiers: Concepts, Class A & B.

Inverters using Transistors-transfer characteristics and threshold voltages. Switching characteristics of diodes and transistors-SCR & UJT.

Principle of FET and MOSFET, Depletion and Enhanced modes of operations, Characteristics and definition of different parameters, Symbols and Application for switching functions. Concept of NMOS, PMOS and CMOS switch.

Principle of Multivibrators, Applications of Multi-vibrators – Monostable and Astable Multivibrators

Principle of differential amplifiers, CMRR of differential amplifiers, Properties of Ideal OP-AMP, Concept of virtual ground, Offset parameters and its uses as an inverting, non-inverting amplifiers, adder/subtractor/multiplier/divider, differentiator, integrator and scale changer, Schmitt trigger.

Group C : Digital System Design

(35 Periods)

Combinational Circuits: Realization of AND and OR Gates using diodes and NOT Gate using transistors, Standard Gate Assemblies, IC chips packaging nomenclature, Half and Full Adder(3 & bit), Multi-bit adders – Ripple carry and Carry Look Ahead Adder, Adder/subtractor, BCD-Adder, Data selectors/multiplexers – expansions, reductions, function realization, universal function realization, multi-function realization, Decoders: function realization, De-multiplexer and function realization, Encoder, Priority Encoder, Parity bit Generator/checker, Gray Code Generator, Code Converters, Keyboard encoder, Seven segment display unit, Comparators.

Sequential Circuits: Model of Sequential computing, Difference between Combinational and Sequential circuit, RS-Latch: using NAND and NOR Gates, RS Latch as a Static RAM Cell, Problems of Basic Latch circuits, Digital Clock – Duty Cycle, Rising time, Falling time, Clocked Flip Flops - SR, JK, D, T, Level Trigger and Edge Trigger, Excitation Functions of each flip-flops, Flip-flops with Preset and Clear, Application of Flip-flops: Asynchronous Counter(UP/DOWN) upto 4 bit counter, Decade Counter, Mod – n Counter, Finite State machine Model – State Transition Diagram and Table, Synchronous Counters – different mod counters, Ring counter, Johnson's Counter, Registers, Registers with parallel load, Shift Registers.



Data Converter: D/A Conversion principle using basic circuit, R-2R Ladder circuit, Counter based A/D converter, Successive approximation method for A/D conversion.
DTL and TTL NAND gate circuits and its operations, Fan in & Fan out. SSI, MSI, LSI, and VLSI classifications.

Group – D : Computer Organization – I

(45 Periods)

Basic Computer Organization – IAS Computer, Von Neumann Computer, System Bus. Instruction Cycle, Data Representation, Machine instruction and Assembly Language, CPU Organization, Arithmetic and Logic Unit, Control Unit, CPU Registers, Instruction Registers, Program Counter, Stack Pointer. CISC & RISC processors.

Instruction: Operation Code and Operand. Zero, One, Two and Three address instruction. Instruction types. Addressing modes. Stack organization.

Memory: Types of Memory, RAM, ROM, EPROM, DRAM, SRAM, SAM, PLA, Associative memory. Different storage technology. I/O system organization and interfacing, Bus: SCSI, PCI, USB; Tri State Devices, Bus Arbitration.

Distribution of questions/Marks:

Q1. (Compulsory short questions – 20 marks). Five questions to be answered from the rest which consists of at least 8 questions. (All questions are of 16 marks: questions may have subdivisions. At least one question to be answered from each group).

Text Books :

1. Introduction to Computer Science, by P.K.Sinha (PHI)
2. Electronics Fundamentals and Applications by D.Chattopadhyay and P.C.Rakshit, 6th Edition, New Age International (P)
3. Digital Logic and Computer Design by M.Morris Mano, PHI
4. Digital Principle and Applications by Malvino & Leach, TMH
5. Digital Systems Principles and Applications by Ronal J. Tocci and Neal S. Widmer, 8th Edition, PHI
6. Digital Fundamentals by Floyd, Pearson Education
7. Computer Architecture and Organizations 2nd Edition, J. P. Hayes, TMH
8. Computer System Architecture by M. Morris Mano
9. Computer Organization and Architecture by William Stallings, Pearson Education
10. Electronics Devices and Circuit Theory by Boylestad, Nashelsky, PHI

PAPER – II : 100 MARKS

Group – A(THEORETICAL) : 50 Marks

Section – I : System Software-I

(10 periods)

Introduction: Different System Softwares : A brief of Operating Systems, Assemblers, Loaders, Linkers, Interpreters, Compilers, various phases of compilation.

Data Structure-I

(25 Periods)

Definition: Concepts of Data Types, Elementary structures, Data types and their interpretation

Arrays: Types, Memory Representation, Address Translation, Functions of single and multi-dimensional arrays with examples.

Linked Structures: Singly and doubly linked list(non-circular and circular), List manipulation with pointers: Searching, Insertion and deletion of elements.

Stacks and Queues : Definition. Representation. Uses and Applications, Infix, Prefix &Postfix notations, Infix to postfix : conversion and evaluation. Application of queues.

Recursion: Divide and Conquer, Elimination of Recursion.

Section-II: Programming through ‘C’ Language

(40 periods)

Introduction: Basic Structure, Character sets, Keywords, Identifiers, Constants, Variables, Data Types, Program Structure.



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Operators: Arithmetic, Relational, Logical and Assignment; Increment, Decrement and Conditional, Operator Precedence and Associations; Expressions. Expression evaluation and type conversion. Formatted input and output.

Statements: Assignment, Initialization, String handling with arrays, String handling functions, Functions – Arguments passing, Return values and their types, recursion. Enumerated data types. Structures. Arrays of structures. Arrays within structures.

Pointers: Declaration and initialization, Accessing variables through pointer arithmetic, Pointers and arrays, String, Pointer to Functions and Structures.

File Access: Opening, Closing, I/O operations.

Linked List : Concepts, Simple implementation, Dynamic Storage Allocation.

Low-Level Programming.

Distribution of Questions/Marks :

Q1. (Compulsory Short questions – 8 marks). Three questions to be answered from the rest which consists of at least 5 questions (All questions are of 14 marks: questions may have subdivisions. At least one question to be answered from each section).

Text Books :

1. System Programming by John J. Donovan, TMH
2. Compilers Principles, Techniques and Tools, by Alfred V. Aho, Ravi Sethi and Jeffrey D. Ullman, Pearson Education
3. System Software – An Introduction to System Programming by Leland L. Beck, Pearson Education, 3rd Edition
4. Data Structure by Liptsuitz, S. Outline Series
5. Data Structure by Ellis Horowitz, Sartaz Sahani, Galgotia
6. Data Structure Using C by S. K. Bandyopadhyay and K. N. Dey, Pearson Education
7. Data Structures and Algorithm Analysis in C by Mark Allen Weiss, 2nd Edition, Pearson Education
8. C Programming by Karnighan,&Ritchie, PHI
9. Programming through C by Richard Johnsonbaugh and Martin Kalin, Pearson Education
10. A Book on C by Kelley and Pohl, Pearson Education

Group-B(Practical) Hardware Laboratory : 50 Marks

<i>Marks Allotment:</i>	Sessional	-	05 marks
	Experiment	-	35 marks
	Viva-voce	-	10 marks

Pre-requisites:

Study of IC Data Books – Linear and Digital. Familiarity with breadboard, LED, 7 segment display etc. Observe the output waveform of a function generator in a CRO. Mean Time Period , Peak Voltage, Frequency and comparison with function generator readings, Study of basic logic functions like AND, OR, NOT, NAND etc. Ideas of fan in, fan out, Noise Margin, Threshold Voltage, Transfer Characteristics, Design of a NOT Gate(inverter) using transistors. Design of a debouncing switch. Logic probe, Clock (crystal timer). Verification of NAND and NOR gates as universal gates, De Morgan's Theorem.

Analog Circuits

- 1) Use Diodes to implement bridge rectifier. Observe the waveform on CRO. Measure peak values. Use three terminal regulator (IC 78XX) for voltage regulation. Drawing of load regulation characteristics.
- 2) Using Transistor construct NOT or Invert Operation and draw the transfer characteristics and measure the threshold voltage.
- 3) OP-AMP : Close loop gains inverting and non-inverting OP-AMP. Use of OP-AMP as adder, subtractor, differentiator, integrator. For each case offset null arrangement has to be done.

Digital Circuits:

Combinational Circuits:

- 1) Implement Half Adder/Half Subtractor/Full Adder/Full Subtractor using Logic Gates. Realize a logic function using basic/universal gates in SOP and POS form. Study the functionalities of 7483 and design a BCD adder using 7483 or equivalent.
- 2) Design of two level AND – OR, NAND –NAND, NOR-NOR circuits to realize any truth table. Realize XOR in two level and multilevel.



- 3) Design a 4 bit 2's complement adder – subtractor unit using 7483 or equivalent and XOR gates.
- 4) Design a circuit to convert BCD numbers to corresponding gray codes.
- 5) Design a 4:1 MUX using NAND gates. Study of 74153 and 74151. Design Full Adder/Subtractor using MUX.
- 6) Design a 2:4 decoder using NAND gates. Study of 74155 and 74138. Design Full Adder/Subtractor using decoders.
- 7) Design a parity generator/checker using basic gates.
- 8) Design magnitude comparator using basic/universal gates. Study of 7485.
- 9) Design a seven segment display unit.

Sequential Circuits:

- 1) Realize S-R, D, J-K and T flip-flop using basic gates. (Study the undefined state in S-R flip-flop).
- 2) Design a shift register (shift left and shift right) using flip-flops. (Study the functional characteristic of IC 74194 with emphasis on timing diagram).
- 3) Design Asynchronous and Synchronous counters. Study of IC 74193.
- 4) Study the functional characteristics of RAM IC chip. Study of open collector and tri-state output. Horizontal and vertical expansion of RAM chips by cascading. Use 74189, 7489, 2114 or any available chip.

Part-II Paper – III (Theoretical) : 100 MARKS

Group – A : Graph Theory

(30 Periods)

Graphs : Definition, Finite and Infinite Graphs, Directed and Undirected Graphs, Degree, Isolated vertex, Pendant vertex, Null graphs.

Walks : Paths and Circuits, Connected and Disconnected graphs, Euler's graphs, Hamiltonian paths and circuits, Trees, Definition and basic properties, Distance and contents, Matrix representation of graphs, Incidence, Adjacency and Circuit matrices, Graph Search – BFS, DFS, Spanning Trees, Shortest Path Problems.

Group – B : Discrete Mathematical Structures

(45 Periods)

Logic : Proposition, Predicates and Quantifiers. Sets, Functions, Growth of Functions, Relation, Equivalence Relation : Big O Notation, Big Omega and Big-Theta Notations.

Algorithms : Complexity of Algorithms, Space and Time, Polynomial and Exponential Algorithms.

Counting theory: Counting, Pigeon Hole Principle, Inclusion and Exclusion Principle, Permutations and Combinations, Recurrence relation, Definition and use.

Introduction to Probability: Definition of sample space, events, probability, simple problems, Conditional Probability, Probability distribution – Binomial Distribution (significance only), Random variable, expected value, Standard Deviations and Variance;

Group – C : Numerical and Optimization Techniques

(45 Periods)

Errors : Concepts, types of errors

System of Linear Equations: Properties of Set of Linear Equations – linearly dependent and independent, Rank, Singularity of Coefficient matrix, Ill-condition matrix, Gaussian Elimination, Gauss– Jordan Elimination, Iteration method & its convergence condition and testing, Gauss Iteration and Gauss-Seidel Iteration Algorithm and its applications.

Nonlinear Equation: Iterative Methods and different types convergence, divergences and its test conditions, Bisection algorithm, Regular-falsi method, Secant and Newton-Raphson method, Problems and its graphical significances.

Solution of Differential Equation: Euler Method, Taylor Method, Runge-Kutta second and fourth order method for solving differential equations.

Interpolation : Newton Forward and Backward interpolation, Lagrange interpolation

Curve Fitting: Linear, Quadratic, fittings.

Integration: Mathematical Foundation for Trapezoidal and Simpson's 1/3rd Rules and its Composite forms.

Linear Programming: Linear Programming, Simplex Method, Duality, Transportation, Assignment problems.

Group – D : Formal Languages and Automata Theory

(30 Periods)



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Introduction to Formal Languages and Grammar, Finite Automata, Regular Expressions, Deterministic and Non-Deterministic finite automata and their equivalence. State minimization, Chomsky Classification of Grammars, Concepts of Turing Machines and Universal Turing Machines.

Distribution of Questions/marks:

Q1. (Compulsory Short questions – 20 marks). Five questions to be answered from the remaining which consists of at least 8 questions. (All questions are of 16 marks: questions may have subdivisions. At least one question to be answered from each group).

Text Books :

1. Graph Theory by Narsingh Deo, PHI
2. Introduction to Graph Theory by D B West, 2nd edition, Pearson Education
3. Discrete Mathematics and its applications by Rosen, 5th Edition, TMH
4. Discrete Mathematics by C.L.Liu, TMH
5. Numerical Methods for Scientific and Engineering Computation by M.K.Jain, S.R.K.Iyengar, R.K.Jain, 4th Edition, New Age International Publishers
6. Computer Oriented Numerical Methods, 3rd Edition, V Rajaraman, PHI
7. Operations Research by Kanti Swarup, P.K. Gupta, Sultan Chand & Sons
8. Operations Research Techniques for Management by V.K.Kapoor, 7th Edition, Sultan Chand & Sons
9. Switching and Finite Automata Theory by Kohavi, TMH
10. Theory of Computer Science(Automata, Languages & Computation) by K L P Misra & N Chandrasekharan, PHI

Paper-IV : 100 Marks

Group-A(Theoretical) : 50 Marks

Section – I :Data Structures-II

(30 Periods)

Trees : Definition, Quantitative Properties, Binary Tree, Tree traversals, Internal and external path lengths: Properties, Minimum and maximum path length of a binary tree, Importance.

Binary Search Trees : Definition, Searching, Insertion, Deletion.

Searching: Linear and binary search, Performance and complexity.

Hashing : Concepts, Advantages and Disadvantages, Different types of hash functions, Collision and Collision Resolution Techniques – Open Addressing with probing, Linear Chaining, Coalesced Chaining, Application.

Sorting : Terminology, Performance Evaluation, Different Sorting Techniques (Bubble, Insertion, Selection, Quick sort, Merge Sort, Heap, Partition Exchange, Radix with iterative and recursive description). Complexity, Advantages and Disadvantages.

Section-II: Systems Software –II

(45 Periods)

Operating Systems : What is OS? Multiprogramming, Multitasking OS, Concepts of processes, Files, Shell, System Calls; Structures : Monolithic, Layered, Virtual, Client Server and Distributed Model.

Concepts of Synchronization : Semaphores, Critical Regions, Monitor Inter Process Communication Mechanism.

Processor Management : Scheduling and its types, Priority Queue.

I/O Management : Device and Device Controllers, Interrupt Handlers and Device drivers.

Memory Management : Real & Virtual memory ,Swapping , Paging, Segmentation , Page Replacement Techniques.

File Systems : Files and Directories, File Servers, Security and Protection.

Dead Lock : Definition, Prevention, Avoidance, Detection, Recovery.

Case Study : Standard OS.

Distribution of Questions/Marks:

Q1. (Compulsory Short questions – 8 marks). Three questions to be answered from the rest which consists of at least 5 questions (All questions are of 14 marks: questions may have subdivisions. At least one question to be answered from each section).

Text Books :

1. Operating Systems by H.M.Deitel, 2nd Edition, Pearson Education



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2. Operating System Concepts, A.Silberschatz, Peter B. Galvin, G. Gagne, 6th Edition, John Wiley & Sons, Inc.
3. References of Data Structure is given previously

Group – B(Practical) Software Laboratory : 50 marks

Section – I

(Lab Periods – 5)

Familiarity with single user and multi user operating systems.

Internal and External Commands. File name and extension, Batch File creation, Command Line Arguments, System Configuration.

Menus, Folders, Program Manager, File Creation, View and sort files, Document Preparation and Presentation.

Files and Directories, Copy, Delete, Rename Directory, Creation, Navigation, Editor, Pipes and Filters, Pattern searching.

Section-II

Programming through ‘C’ Language

(Lab Periods – 35)

Problems should cover basic features of the Language; Applications including numerical problems, Data Structure, Graph representation and manipulation.

Distribution of Marks:

Section I	-	one question to be answered	
Section II	-	-do-	
Marks Allotment :	Section I	-	5 marks
	Section II	-	30 marks
Sessional	-	05 marks	
Viva-voce	-	10 marks	

Part – III -Paper – V (Theoretical) : 100 Marks

Group – A : Microprocessor and Computer Organization – II

Microprocessor:

(45 Periods)

Evolution of Microprocessor: Architecture of 8 bit and 16 bit microprocessor Machine Language Instructions, Addressing Modes, Instruction Formats, Instruction Sets, Instruction Cycle, Clock Cycles, Timing Diagrams, Interrupts, DMA, Bus Standards and types, Interfacing concepts- Memory Interfacing, I/O Interfacing and Ports – Keyboard Interfacing, Display Interfacing, Storage Device Interfacing, Programming a Microprocessor, Interrupt Handling, Methods of Interrupts, Priority and Management Case Studies : 8085 and 8086 microprocessor.

Computer Organization – II:

(45 Periods)

Fixed and Floating Point Arithmetic : Addition, Subtraction, Multiplication and Division.

ALU – Combinational ALU, 2’s Complement Addition, Subtraction Unit

Memory Hierarchy: CPU Register, Cache Memory, Primary Memory, Secondary Memory and Virtual Memory.

Control Unit : Control Structure and Behaviour, Hardwired Control and Micro programmed Control : Basic Concept, Parallelism in Microinstruction.

I/O : Polling, Interrupts, DMA, I/O Bus and Protocol.

Computer Peripherals – VDU, Keyboard, Mouse, Printer, Scanner etc.

Group B : Data Communication and Computer Network

(40 Periods)

Data Communications; Transmission Media; Network : Protocol and standards; Analog & Digital Signals, Periodic & Non-periodic signals, Time and Frequency Domain; Multiplexing : FDM, TDM and Application, Encoding D/A and A/D Encoding; Error : Different types of Errors and their detection, Concepts of Centralized and Distributed Computing; Advantages of Networking; Layered Architecture : OSI Architecture, Basic Features, LAN, MAN and WAN; Simple PC based Network : Example, Block Diagram, Mode of Operation and Characteristic Features.

Group – C : Internet Technologies

(20 Periods)



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Intranet and Internet; Servers and Clients; Ports; Domain Name Server (DNS); Accounts, Internet Service Providers; Connections : Dial Up, ISDN, ADSL; Cable, Modem; E-Mail: Account, Sending, Receiving, Mailing List, IRC, Voice and Video Conferencing, WWW, Browsers.

Distribution of Questions/marks:

Q1. (Compulsory Short questions – 20 marks). Five questions to be answered from the remaining which consists of at least 8 questions. (All questions are of 16 marks: questions may have subdivisions. At least one question to be answered from each group).

Text Books :

1. Computer Architecture and Organizations 2nd Edition, J. P. Hayes, TMH
2. Computer System Architecture by M. Morris Mano
3. Computer Organization and Architecture by William Stallings, Pearson Education
4. Introduction to Microprocessor by Gonakar, PHI
5. Introduction to Microprocessor by Ajit Pal, PHI
6. Data Communications and Networking by Behrouz A. Forouzan, 4th Edition, TMH
7. Data and Computer communication by William Stallings, 6th Edition, Pearson Education
8. Computer Networks by Tanenbaum, Pearson Education

Paper – VI (Theoretical) : 100 Marks

Group – A : Object Oriented Programming (30 Periods)

Concepts: Difference with procedure oriented programming, Data Abstraction and Information Hiding : Objects, Classes and Methods, Encapsulation, Inheritance, Polymorphism, Object Oriented Programming through C++: Input/Output, Function and Operator Overloading, Constructors and Destructors, Copy Constructors and Assignment Operator, Overloading, Single and Multiple Inheritance, Polymorphism and Virtual Functions, Namespace, Exception Handling, Templates.

Group – B : Software Engineering (30 Periods)

Software Life Cycle, Different Models : Waterfall, Spiral; Software Requirement Analysis & Specification, Structured Analysis, DFD, Data Dictionary, Structured Design, Structure Charts, Software Testing : White Box and Black Box Testing, Software Quality Assurance.

Group – C : Computer Graphics (30 Periods)

Introduction : Co-ordinate System, Information Handling Software, Graphics Software, Area of Application, Translation, Rotation, Scaling, Matrix Representation, Homogeneous Co-ordinate System, Composite Transformation, Inverse Transformation, Computer Art, Animation, Morphing, Projection & Clipping, 2D & 3D Transformations, Lines, Curves and their presentations.

Group – D : Data Base Management System (60 Periods)

Basic Concept, File Management Systems, Advantages of DBMS, ANSI/SPARC Architecture, Physical, Conceptual and External Models, ER Diagram, Data Models : Relational, Hierarchical, Network; File Organization : Sequential, Indexed Sequential, Random, Inverted; Query Languages, Relational Algebra, Relational Calculus, Functional Dependencies, Normal Forms : 1NF, 2NF, 3NF and BCNF; Structured Query Languages (SQL), Elementary Concepts of Security, Integrity.

Case Studies : Any Commercial RDBMS Package.

Distribution of Questions/marks:

Q1. (Compulsory Short questions – 20 marks). Five questions to be answered from the remaining which consists of at least 8 questions. (All questions are of 16 marks: questions may have subdivisions. At least one question to be answered from each group).

Text Books :

1. Object Oriented Programming with C++ by Balagurusamy, TMH
2. Object Oriented Programming with C++ by Robert Lafore, PHI



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3. An Integrated Approach to Software Engineering by Pankaj Jalote, Narosa Publishing House
4. Introduction to System Analysis and Design by Igor Hawryszkiewicz, PHI
5. Fundamental of Computer Graphics and Multimedia by D. P. Mukherjee, PHI
6. Computer Graphics by Hearn and Baker, PHI
7. Database System Design by Elmasri, Navathe, Somayajulu, Gupta, Pearson Education
8. Database Systems: Concept, Design and Application by S. K. Singh, Pearson Education, 1st Edition
9. An Introduction to Database Systems by C.J. Date, A.Kannan, S.Swamynathan, Pearson Education
10. Relational Database Design by Jan L. Harrington, an imprint of Elsevier

Paper – VII (Practical) : 100 MARKS

Group – A (Hardware) : Microprocessor Programming & I/O Interfacing

Experiment with 8085A based micro computing kits (50 Marks)

- 1) Data movement between register – register, register-memory, memory-memory.
- 2) Arithmetic operations on single byte, word and multi-byte integer, signed and hexadecimal operands.
- 3) Ordered arrangement of a set of operands.
- 4) Bubble Sorting , Sequential and Binary Search.
- 5) Block Replacement and transfer.
- 6) Parity Generator.
- 7) Delay Routines.

Interfacing :

- 1) Display of Alphanumeric Characters on 7 segment displays.
- 2) Matrix Keyboard Interfacing and Identification of the keys.

Group – B : Project Work

(50 Marks)

Marks Allotment :	Project Report	-	08 marks
	Presentation	-	07 marks
	Project Work	-	25 marks
	Viva-voce	-	10 marks

Guidelines : Each student of B.Sc Part II (Computer Science Honours) will carry out one project work under the supervision of a faculty member of the college. The project will be assigned at the beginning of Part II academic session. The student will submit a project report representing the actual work in a suitable format. The student should defend the project before the examiners. The project work will be evaluated on the basis of presentation and viva-voce examination.. The examination will be as per University guidelines.

Project Report should contain the following:

- 1) Title of the Project
- 2) Objectives of the Project
- 3) Analysis Report in a suitable format
- 4) Detailed Design steps
- 5) Circuit Layout/Program Listing
- 6) Testing and Analysis
- 7) Conclusion and future scope for development
- 8) Bibliography

Broad areas:

Computer Networking, Network Protocol, Application DBMS, Multimedia, Graphics, Internet based application, Software Engineering Tool Development, Simulation, any other related topics, I/O Controller, I/O interfaces, Microprocessor based system.

Project Evaluation:



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Projects(Paper-VII, Group-B, Full Marks-50) for B.Sc(Hons) Part-II Examination are to be evaluated internally by the college itself in the presence of the project guide.

Paper – VIII (Practical) : 100 Marks

<i>Marks Allotment :</i>	Sessional	-	10 marks
	Viva-voce	-	20marks
	Experiment	-	70 marks

Group-A : Object Oriented Programming

Language : C++,

Problems : Problem set should cover the basic features of the language and implementation of different algorithms covered in theoretical papers.

Group-B : RDBMS

RDBMS :standard database

Front Ends : standard font end.

Problems : Application Database with GUI.

Group C : Shell Programming

Platform : UNIX/LINUX

Problems : Problem set should cover the basic features of shell programming.



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Computer Science General

SUMMARY OF PERIOD DISTRIBUTION : Total Marks : 400

Paper (F.M)	Group (F.M)	Type	Minimum Number of Periods	
			Theoretical(T)	Practical(P)
*COURSE WORK FOR PART-I EXAMINATION				
I(100)	*	T	120	
*COURSE WORK FOR PART-II EXAMINATION				
II(100)	*	P	35	120
III(100)	A(50)	T	60	
	B(50)	P	10	110
*COURSE WORK FOR PART-III EXAMINATION				
IV(100)	A(50)	T	60	
	B(50)	P	10	40

* Shown within the syllabus; T-Theoretical, P-Practical F.M-Full Marks

Note: Figures within() below indicate number of periods allotted for that topic.

Part – I Paper I (Theoretical) : 100 Marks

Distribution of Questions : Q1. (Compulsory – 20 marks, any ten questions to be answered out of fifteen, each carrying 02 marks). No. of questions (Group) : 02(A), 05(B), 06(C), 02(D) Q2 to Q9. Five questions to be answered out of eight as given below : Group A & B combined : any two – from three questions of 16 marks each with emphasis on Gr. B Group C : Any two – from three questions of 16 marks each. Group D : Any one – from two questions of 16 marks each All questions may have smaller subdivisions.

Group A : General Concepts

(15 Periods)

Information : Definition, Categories, Data : Storage, Retrieval and Processing.

Computer : Hardware – CPU, Primary & Secondary Storage, I/O Devices.

Software: Classification System and application; Stored Program Concept and Von-Neumann Architecture;

Evolution: types – supercomputers, mainframes, minis and workstations, PC's, Parallel Machines.

Computer Languages : Types – low level, Assembly, High Level

Application Software : User specific application development; standard packages.

System Software : Classifications – Operating Systems(OS); Translators – Compilers and Interpreters, Preprocessors, Assemblers, Macro Assemblers, Loaders, Linkers, Line and Screen Editors, other utilities.

Virus : Concept, detection and protection.

Multimedia : Basic concept, associated hardware and software.

Object Oriented Languages : Basic characteristics, brief comparison with other types of languages.

Group B : Algorithms & Data Structure : Brief Introduction

(35 Periods)

Algorithms and Problem Solving : Flowchart; algorithm definition and characteristics; structured form sequence; selection and iteration; recursive and non-recursive algorithms. Writing algorithms – use of pseudo language, structured constructs, indentation and comments. Efficiency – O notation (definition, basic properties and use)

Data Structures : Data types and structures – definition. Concept of sequential and linked allocation. Simple Structures (concept and implementation) : Array, Stack, Queue, Binary Tree.

Brief Study on Algorithms; linear search, binary search, bubble sort, quick sort, merge sort, heap sort.

Group C : Computer Architecture and Organization

(50 Periods)

*Basic Building Blocks*** : Combinational Logic – Boolean Algebra; AND, OR, NAND, NOR, XOR gates; adder, multiplexer, demultiplexer/decoder, encoder-sequential logic; flip-flops, registers, counters (synchronous & asynchronous) (**only conceptual study with block diagram and truth/state table)



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Computer Arithmetic and ALU : Positional number system and conversion – base 2, 8, 10, 16 Bits and Bytes : use in arithmetic, storage capacity, data transmission, alphanumeric codes (ASCII, EBCDIC).

Integer Representation: Unsigned, signed magnitude, 1's complement, 2's complement, biased, floating point representation – single and double precision IEEE format. Algorithms for integer and floating point addition, multiplication/division; range, precision and accuracy. Basic structure of an ALU.

CPU : Addressing modes, instruction formats. Handling of interrupts and subroutines, Instruction pipe lining, CISC and RISC processor.

Control Unit : Instruction and Execution Cycle; Control of sequence, jump and branch instruction; shift instruction.

*I/O ** : Controller, interrupt, DMA, Memory mapped I/O. Standard buses. Concept of interfacing. Devices; VDU, mouse, keyboard, joystick, scanner printers-DMP, LASER, ink jet, line/matrix.

Memory : Memory devices *– static and dynamic RAM, ROM, cache; secondary memory (floppy disc, hard disc, tape, CD ROM, DVD); large memory using chips.

(*brief description of basic characteristics, principle of operation related parameters, nomenclature and comparative study where applicable)

Elements of Computer Networks : Centralized and Distributed Processing LAN and WAN. Media Telephone lines, co-axial cables, optical fiber, satellite; VSAT; Basic components – LAN card, Modem; TCP/IP protocol. Concept of E-mail and Internet.

Group D : Brief Studies on OS

(20 Periods)

OS types (single user, multi user, multitasking) : Brief idea on resource management concepts.

GUI and Window : Basic idea. Case Study (latest version of OS). (## : characteristics, advantages and limitations, shell, memory management, file and directory system (I/O).)

Text Books :

1. Introduction to Computer Science by P.K.Sinha
2. Computer Architecture and Organizations 2nd Edition, J. P. Hayes, TMH
3. Computer System Architecture by M. Morris Mano
4. Data Structure by Liptsuitz, S. Outline Series
5. Data Structure by Ellis Horowitz, Sartaz Sahani, Galgotia
6. Data Structure Using C by S. K. Bandyopadhyay and K. N. Dey, Pearson Education

Part - II Paper II (Practical) : 100 Marks

Distribution of questions: Group A : One question to be answered 10 marks. Group B : One question to be answered 10 marks. Group C : One question to be answered 40 marks. Sessional Work – 20 marks; Viva-voce – 20 marks

Duration of Examination – 6 hours.

Note: Problems to be assigned to a student by drawing lots in a manner similar to that followed in other practical examinations. The sessional work must be submitted in a word processed version with computer printout of problems, algorithms, listings, output, discussions, graphs, charts, figures, handwritten output will not be accepted under any circumstances. Questions will not be package/product specific.

Group A : Operating System

(Theoretical – 8 periods. Minimum Laboratory work – 20 periods in total)

Booting, warm and cold reboot, internal and external commands; file name and extensions; wild card notation. Commands; directory, file management, disc management, general. Disc Organization : sectors, boot records, partitioning, FAT. Redirection, pipes. EDIT; Copy Con-batch file creation commands, command line arguments, loop structures, nested, config.sys, utilities.

Starting menus, simultaneous use, reduction/enlargement, folders, starting an application, running one or more application, help, exit.

Program manager: Move, Copy, Delete items/folders, changing attributes.

File Manager: Expansion of compressed files, management of multiple folders, creation/renaming; view and sort files, browse, identify and save settings, disc operations.



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Files and Directories, Copy, Delete, Rename Directory, Creation, Navigation, Editor, Pipes and Filters, Pattern searching.

Group B : Wordprocessing , Document Preparation & Presentation and Spreadsheet

(Theoretical – 02 periods, Minimum Laboratory Work – 20 periods)

WORDPROCESSING: Opening, creating, saving, quitting documents. Using menus and toolbars.

Text : Copy, delete, move, spell check; Character & page formatting; size, font, header, footer, bordering, coloring, margins and justification, graph, text

Picture: Creation, Editing and import, Printing. Use of other available features.

DOCUMENT PREPARATION & PRESENTATION: Slide Preparation, Adding Special Effects, Adding Picture, Animation, Time Control, Slide Show.

SPREADSHEET: Data Entry, Moving data, range selection, use of toolbars and menus : editing; calculation and use of formula, display, print. Graphs and Charts : formatting facilities for presentation (e.g. changing fonts, colours, sizes, adding titles, legends, gridlines).

Macros : Creation, running shortcut.

Group C : Programming in C (Theoretical 25 periods, Minimum Laboratory work – 80 periods)

Basic Structure : Character set, keywords, identifiers, constants, variables and type declaration. Sample programs, preprocessor.

Operators : Arithmetic, Relational, Logical, Assignment, Increment and Decrement, Conditional, comma; operator precedence and associativity; arithmetic expression-evaluation and type conversion. Character I/O, Escape sequence and formatted I/O.

Branching and Looping: if, if-else, while, do-while, for.

Arrays : One-dimensional and 2-dimensional. Different types of uses. String handling with arrays – read and write, concatenation, comparison, string functions.

User defined functions : Need; Call by Reference and Call by value; return values and types; nesting of functions; recursion.

Structures : Initialization; arrays of a structure, arrays within structures, structure within structure, size of structures, Dynamic Storage Allocation.

Pointers : Declaration and initialization; operators; pointer arithmetics; accessing variables, pointer & arrays, strings, functions, Linked lists, concepts and use in C with different examples.

File handling : Opening & Closing, I/O.

Other Features – bit level operations, macro definitions, union, command line arguments.

Paper III : Full Marks – 100 (Theoretical-50, Practical-50)

Group A (Theoretical) Full Marks : 50

Groups A1 & A2 together constitute Group A

Distribution of questions :

Q1. (Compulsory – 10 marks, any five questions to be answered out of eight, each carrying 02 marks)

No. of questions (Group) : 02(A1), 06(A2)

Q2 to Q9. Five questions to be answered out of eight as given below :

Group A1 (any one – from two questions of 08 marks each)

Group A2 (any four – from six questions of 08 marks each)

Questions may have smaller subdivisions.

Group A1 : System Analysis and Design

(20 Periods)

Introduction : System definition, characteristics; real-time and distributed systems.

System Life Cycle : Waterfall model, description of different phases.

Planning : Data gathering techniques; feasibility study. Cost-benefit analysis



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Design and Modelling : Logical and physical design; flowcharts and structured charts; DFD and ERD. Form design, User interface design

Modularity : Module specification concepts; coupling and cohesion

Maintenance : Evaluation, testing and validation. Maintenance issues

Case Study : Accounting and Finance System, Personnel system

Group A2 : Database Management

(40 Periods)

Overview : Files and database. Data independence. 3-level DBMS architecture, Data Dictionary, Database Languages

Traditional Models : Network, Hierarchical and Relational. Comparison

Relational Model : Definition and properties, Keys of different types

Relational Algebra : Operations – select, project, cross product, join, set.

Relational Calculus : Concept of tuple and Domain Calculus.

Query Language : SQL – basic concepts, Transaction Processing

Design : ER diagram to relational scheme; Normalization (upto 3NF)

File Organizations : Hashed, Sequential, heap, indexed sequential B-Tree.

Related topics : Concurrency and recovery; security and integrity.

Current trends in databases : Distributed, Client-Server, Object oriented

Text Books :

1. An Integrated Approach to Software Engineering by Pankaj Jalote, Narosa Publishing House
2. Introduction to System Analysis and Design by Igor Hawryszkiewicz, PHI
3. Database System Design y Elmasri, Navathe, Somayajulu, Gupta, Pearson Education
4. Database Systems: Concept, Design and Application by S. K. Singh, Pearson Education, 1st Edition
5. An Introduction to Database Systems by C.J. Date, A.Kannan, S.Swamynathan, Pearson Education

Group B (Practical) : Full Marks 50 Groups B1 & B2 together constitute Group B

Distribution of questions :

Group B1 : One question to be answered out of four

20 marks

Group B2 : One question to be answered out of four

10 marks

Sessional Work – 10 marks; Viva-voce – 10 marks

Duration of Examination - 6 hours

Note : Problems to be assigned to a student by drawing lots in a manner similar to that followed in other practical examinations. The sessional work must be submitted in a word processed version with computer printout of problems, algorithms, listings, output, discussions, graphs, charts, figures, Handwritten output will not be accepted under any circumstances. Question will not be package/product specific.

Group B1 : Database Design and Applications (Minimum Laboratory Periods – 70)

The student should be familiar with at least one standard commercial RDBMS software under desktop or multiuser environment. A small project is recommended. Topic of works should include :

Database Design : Data types, creating databases, adding records, edit, browse, delete, save.

Application Design : Menu and screen design; data validation; report design and generation; use of GUI facilities.

SQL : Constructs; insert, delete, update, view, temporary tables; nested queries, API types of call, native API, ODBC.

Trouble shooting : Validation , correctness, integrity, Performance tuning and documentation.

Group B2 : Assembly and Troubleshooting of PCs (Theoretical 10 periods, Minimum Laboratory Work – 40 periods)



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Theoretical:

PC Organization

Overview of Intel 16-bit, 32-bit/latest processor

(Block Diagram, bus width, clock speed, real and virtual memory, performance parameters)

Laboratory Work:

Students should get appropriate ideas reg the following : assembling a PC, upgradation of a PC, installation of different softwares, running diagnostic software for performance tuning and related topics.

Experiments (the following topics should at least be covered) :

1. Assemble a PC with a given configuration
2. Upgrade processor, RAM, SMPS, Operating System
3. Install mouse, keyboard, printer
4. Servicing problems : HDD – not booting from it, formatting, partitioning, virus removal, changing
5. FDD : Head alignment, seek error, sector not found
6. Power Supply problem
7. VDU problems
8. Networking problems including installation of LAN card
9. Install TV; tuner card, MPEG card, multimedia components
10. ROM location error
11. RAM : general protection error.

Part – III Paper IV Full Marks: 100(Theoretical 50, Practical 50)

Group A (Theoretical) Full Marks : 50

Distribution of questions : Q1. (Compulsory – 10 marks, any five questions to be answered out of eight, each carrying 02 marks) Q2 to Q9. Any five questions to be answered out of eight, each carrying 08 marks. Questions may have smaller subdivisions.

Group A : Communication and Computer Networks

(60 Periods)

Communication Concepts : Analog and Digital communication – basic concept and comparison. Signal types frequency spectrum, strength, bandwidth, data rate, channel capacity. S/N ratio, modulation and demodulation FSK, ASK.

Transmission media (brief idea, characteristics, comparison) : Guided (twisted pair, co-axial, optical fiber) and unguided (microwave, satellite-geo synchronous and low-orbit, VSAT).

Audio and Video communication systems : Analog and digital telephone, AM & FM radio, cable TV network, ISDN, paging, cordless and cellular phones, ATM.

Computer Networks : Distributed processing and resource sharing concepts. Classes – LAN, MAN, WAN

Architecture – OSI , TCP/IP and http protocol – brief study. Basic idea of protocols, routing, congestion control.

LAN : Ethernet and Token Ring topology (principle of operation, characteristics, comparison). High speed LANs Internetworking Modems, bridges and routers, connectivity concepts. Network security.

The Internet : basic idea, DNS and URL, IP address, browsers

E-mail : Architecture and services

Text Books :

1. Data Communications and Networking by Behrouz A. Forouzan, 4th Edition, TMH
2. Data and Computer communication by William Stallings, 6th Edition, Pearson Education
3. Computer Networks by Tanenbaum, Pearson Education

Group B (Practical) Full Marks – 50

Group B1 & B2 together constitute Group B.



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Distribution of questions : Group B1 : One question to be answered out of four 20 marks. Group B2 : One question to be answered out of four 10 marks. Sessional Work – 10 marks, Viva-voce – 10 marks
Duration of Examination – 6 hours

Note : Problems to be assigned to a student by drawing lots in a manner similar to that followed in other practical examinations. The sessional work must be submitted in a word processed version with computer printout of problems, algorithms, listings, output, discussions, graphs, charts, figures, Handwritten output will not be accepted under any circumstances.

Question will not be package/product specific.

Group B1 : Shell Programming (Minimum Laboratory Work 50 periods)

Files & Directories : Copy, delete, rename, compare files, create, navigate, remove directories, access vi editor, status of users, background jobs; Pipes & filters; cutting, pastings and sorting of files, pattern searching in a string.

Shell Programming : Concept and simple programming problems. Unix/Linux system administration-creation and maintenance of accounts, super user, disk management, backups, X-windows.

Group B2 : Programming in GUI environment (Theoretical – 10 periods, minimum Lab. Work – 40 periods)

Students should learn about programming on the following topics using one of the two languages, primarily through practical sessions, along with theoretical classes in between.

Basic Features; building objects with classes, operations with objects, class libraries. Multitasking and multithreading applications; software design involving forms, objects, events, functions, procedure and methods (32 bit programming). ODBC driver; Front and development for database. Multimedia applications.



ADDITIONAL INFORMATION

EQUIPMENT, COMPONENT & SOFTWARE

i. Computing System (minimum configuration)

PC with Pentium MMX colour monitor, keyboard, mouse, multimedia cards, speaker; Peripheral : at least DMP.
Add-ons (expected) : LAN facility, with proper OS.

Minimum number of units : 1 per batch of 2 students.

: As any particular package has not been specified in the syllabus, any other standard package may be used. At any point of time the latest version available is recommended.

ii. Other equipment and components

1. (a) Logic probes, Digital or Analog multimeter, soldering iron, Desoldering pump, wire cutter, screw driver set. (b) CRO (20 MHz or higher) storage type recommended.
2. Motherboard and CPU with manuals – current standard recommended I/O IDE card (if not inbuilt in motherboard). Cable set – IDE data cable, FDC, COM1 and COM2, LPT1 etc. Colour Monitor. Power Supply – SMPS (not less than 20C W).
3. Keyboard, floppy disk drive, HDD, CDROM drive, mouse, LAN card, MODEM. Speaker, microphone, headphone,.
4. System management and device installation software: Disk manager, installation CDROM, diagnostics – PC tools etc.

