UNIVERSITY OF GOUR BANGA

(Established under West Bengal Act XXVI of 2007)

N.H.-34 (Near Rabindra Bhawan), P.O.: Mokdumpur,
Dist.: Malda, West Bengal, Pin-732 103

UG Syllabus and Question Pattern (Honours & General)
(Computer Science)

Main Feature of the Syllabus

Computer Science (Honours)

Part / Course	Paper	Revised Paper Code	MCQ / Descriptive	Marks	Time	Total Marks	Total Time
Part-I	I	I-A	MCQ	20	30 Min	100	4.00 Hr
		I-B	Descriptive	80	3.30 Hr		
	II	II-A	MCQ	10	20 Min	50	2.00 Hr
		II-B	Descriptive	40	1.40 Hr		
	III	III	Practical	50	4.00 Hr	50	4.00 Hr
Part-II	IV	IV-A	MCQ	20	30 Min	100	4.00 Hr
		IV-B	Descriptive	80	3.30 Hr		
	V	V-A	MCQ	10	20 Min	50	2.00 Hr
		V-B	Descriptive	40	1.40 Hr		
	VI	VI	Practical	50	4.00 Hr	50	4.00 Hr
Part-III	VII	VII-A	MCQ	20	30 Min	100	4.00 Hr
		VII-B	Descriptive	80	3.30 Hr		
	VIII	VIII-A	MCQ	20	30 Min	100	4.00 Hr
		VIII-B	Descriptive	80	3.30 Hr		
	IX	IX	Practical	100	6.00 Hr	100	6.00 Hr
	X	X	Practical Hardware	50	4.00 Hr	50	4.00 Hr

Computer Science (General)

Part / Course	Paper	Revised Paper Code	MCQ / Descriptive	Marks	Time	Total Marks	Total Time
Part-I	I	I-A	MCQ	30	30 Min	100	3.00 Hr
		I-B	Descriptive	70	2.30 Hr		
	II	II	Practical	50	3.00 Hr	50	3.00 Hr
Part-II	III	III-A	MCQ	30	30 Min	100	3.00 Hr
		III-B	Descriptive	70	2.30 Hr		
	IV	IV	Practical	50	3.00 Hr	50	3.00 Hr
Part-III	V	V-A	MCQ	30	30 Min	100	3.00 Hr
		V-B	Descriptive	70	2.30 Hr		

❖ *Each MCQ Type Question carrying Two Marks*
❖ *Revised Paper Code as treated Official Paper Code*

Three-year B.Sc. (Honours) Courses of Studies in Computer Science effective from the Academic Session 2015-2016

Computer Science Honours Course Structure

Paper	Type/Marks/Time	Group	Title	Periods
Part-I				
I	Theoretical 100 (Multiple Choice -20 : Written - 80) (30mins : 3.30hrs)	A	Computer Fundamentals	25
		B	Introduction to Basic Electronics	35
		C	Digital System Design	45
		D	Computer Organization-I	45
II	Theoretical 50 (Multiple Choice -10 Written - 40) (20mins : 1.40hrs)	A	Data Structure-I	35
		B	Programming through C Language	40
III	Practical 50 4hrs	A	Hardware - Digital Practical	75
Part-II				
IV	Theoretical 100 (Multiple Choice -20 Written - 80) (30mins : 3.30hrs)	A	Graph Theory	30
		B	Discrete Mathematical Structures	45
		C	Numerical and Optimization Techniques	45
		D	Formal Languages and Automata Theory	30
V	Theoretical 50 (Multiple Choice -10 Written - 40) (20mins : 1.40hrs)	A	Data Structure-II	35
		B	System Software and Operating Systems	40
VI	Practical 50 4hrs	A	DOS Commands	10
		B	Programming through C Language	65
Part-III				
VII	Theoretical 100 (Multiple Choice -20 Written - 80) (30mins : 3.30hrs)	A	Microprocessor	45
		B	Computer Organization-II	40
		C	Data Communication & Computer Networks	65
VIII	Theoretical 100 (Multiple Choice -20 Written - 80) (30mins : 3.30hrs)	A	Object-Oriented Programming(C++)	45
		B	Software Engineering	30
		C	Database Management Systems	45
		D	Computer Graphics	30
IX	Practical 100 6hrs	A	Object-Oriented Programming(C++)	60
		B	RDBMS	60
		C	Shell Programming	30
X	Practical 50 4hrs	A	Hardware : Microprocessor Programming	75
	Practical 50	B	Project	75

PAPER – I (Theoretical : 100 Marks)

Group A: Computer Fundamentals
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.
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.
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. SSI, MSI, LSI, and VLSI classifications.

Group B: Introduction to Basic Electronics
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.
Amplifiers: Concepts, Class A & B.
Inverters using Transistors–transfer characteristics and threshold voltages. Switching characteristics of diodes and transistors.
Principle of FET and MOSFET. Concept of NMOS, PMOS and CMOS switch.
Principle of Multivibrators, Applications of Multi-vibrators – Monostable and Astable Multivibrators
OP-AMP, 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.

Group C : Digital System Design
Combinational Circuits: Half and Full Adder, 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, 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.

Group – D : Computer Organization – I
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/Time:
Q1. (Compulsory 20 MCQ questions – 20 marks – 30mins). Five questions to be answered taking atleast one question from each group. (All questions are of 16 marks: questions may have subdivisions, maximum marks of each subdivision may be upto 6 marks.) Time- 3.30hrs.

Text Books :
1.   Introduction to Computer Science, by P.K.Sinha (PHI)
2.   Electronics Fundamentals and Applications by D.Chattopadhay 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 (THEORETICAL : 50 MARKS)

Group – A: Data Structure-I
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.
Searching: Linear and Binary; Sorting: Bubble, Insertion and Selection.
Stacks and Queues : Definition. Different Representation. Uses and Applications, Infix, Prefix &Postfix notations, Infix to postfix : conversion and evaluation. Application of queues.
Recursion: Divide and Conquer, Elimination of Recursion.

Group – B: Programming through 'C' Language
Introduction: Basic Structure, Character sets, Keywords, Identifiers, Constants, Variables, Data Types, Program Structure.
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. Bitwise Operator.

Distribution of Questions/Marks :

Q1. (Compulsory 10 MCQ questions – 10 marks). Four questions to be answered taking atleast two questions from each group. (All questions are of 10 marks: questions may have subdivisions, maximum marks of each subdivision may be upto five marks).

Text Books :
1.   Data Structure by Ellis Horowitz, Sartaz Sahani, Galgotia
2.   Data Structure Using C by S. K. Bandyopadhyay and K. N. Dey, Pearson Education
3.   Data Structures and Algorithm Analysis in C by Mark Allen Weiss, 2nd Edition, Pearson Education
4.   C Programming by Karnighan,&Ritchie, PHI
5.   Programming through C by Richard Johnsonbaugh and Martin Kalin, Pearson Education
6.   A Book on C by Kelley and Pohl, Pearson Education

Paper- III (Practical : 50 marks)

Group-A : Hardware : Digital Practical

Marks Allotment: 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. Study of basic logic functions like AND, OR, NOT, NAND etc. Design of a debouncing switch. Logic probe, Clock (crystal timer). Verification of NAND and NOR gates as universal gates, De Morgan's Theorem.

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.

<center>**Part-II**</center>
Paper – IV (Theoretical : 100 MARKS)

Group – A : Graph Theory

Graphs : Definition, Königsberg Bridge Problem, 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(Floyd, Warshall, Kruskal, Prim's, Dijkstra).

Group – B : Discrete Mathematical Structures
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. Generating Function.
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
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 $1/3^{rd}$ Rules and its Composite forms.
Linear Programming: Linear Programming, Simplex Method, Duality, Transportation, Assignment problems.

Group – D : Formal Languages and Automata Theory

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

Distribution of questions/Marks/Time:
Q1. (Compulsory 20 MCQ questions – 20 marks – 30mins). Five questions to be answered taking atleast one question from each group. (All questions are of 16 marks: questions may have subdivisions, maximum marks of each subdivision may be upto 6 marks.) Time- 3.30hrs.

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-V : (Theoretical) : 50 Marks

Group-A : Data Structures-II
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.
Different searching techniques with its 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 (Quick sort, Merge Sort, Heap, Radix with
iterative and recursive description). Complexity, Advantages and Disadvantages.

Group-B : System Software and Operating Systems
Introduction: Different System Softwares : A brief of Operating Systems, Assemblers, Loaders, Linkers,
Interpreters, Compilers, various phases of compilation.
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 10 MCQ questions – 10 marks). Four questions to be answered taking atleast two questions from
each group. (All questions are of 10 marks: questions may have subdivisions, maximum marks of each subdivision
may be upto 5 marks).

Text Books :

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

Paper- VI (Practical : 50 marks)

Group – A : DOS Commands: Preliminary DOS Commands.
Group – B : Programming through 'C' Language: Problems should cover basic features of the Language;
Applications including numerical problems, Data Structure, Graph representation and manipulation.

Marks Allotment:	Sessional	-	05 marks
	Experiment1	-	05 marks
	Experiment2	-	30 marks
	Viva-voce	-	10 marks

Part – III
Paper – VII (Theoretical : 100 Marks)

Group – A : Microprocessor
 Evolution of Microprocessor: Architecture of 8 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, Preliminary concepts of 8086 microprocessor.

Group B : Computer Organization – II:
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 Behavior, Hardwired Control and Micro programmed Control : Basic Concept, Parallelism in Microinstruction.
I/O : Polling, Interrupts, DMA, I/O Bus and Protocol.

Group C : Data Communication and Computer Networks : Data Communications; Different topologies of networking; Transmission Media; Network : Protocol and standards; Analog & Digital Signals, Periodic & Non-periodic signals, Time and Frequency Domain; Bandwidth, Data rate, signal rate, serial and parallel transmission, Simplex, half duplex and duplex transmission, Multiplexing : FDM, TDM and Application, Different kinds of modulation and 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.
Intranet and Internet, Servers and Clients, Ports, Domain Name Server (DNS), Accounts, Internet Service Providers; Dial Up Connection, ISDN, BISDN; Cable, Modem; E-Mail: Account, Sending, Receiving, Mailing List, IRC, Voice and Video Conferencing, WWW, Browsers.

Distribution of questions/Marks/Time:
Q1. (Compulsory 20 MCQ questions – 20 marks – 30mins). Five questions to be answered taking atleast one question from each group. (All questions are of 16 marks: questions may have subdivisions, maximum marks of each subdivision may be upto 6 marks.) Time- 3.30hrs.

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 Behrour 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 – VIII (Theoretical : 100 Marks)

Group – A : Object Oriented Programming: 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: Software Life Cycle, Different Models : Waterfall, Spiral, etc.; 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: 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, Projection & Clipping: Cohen Sutherland line clipping, 2D & 3D Transformations, Lines, Curves and their presentations.

Group – D : Data Base Management System: 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/Time:

Q1. (Compulsory 20 MCQ questions – 20 marks – 30mins). Five questions to be answered taking atleast one question from each group. (All questions are of 16 marks: questions may have subdivisions, maximum marks of each subdivision may be upto 6 marks.) Time- 3.30hrs.

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

Paper – IX (Practical : 100 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 :standard database
Platform: Oracle
Problems   Application Database.

Group C :   Shell Programming
Platform :   UNIX/LINUX
Problems :   Problem set should cover the basic features of shell programming.

Marks Allotment :	Sessional	-	10 marks
	Viva-voce	-	20marks
	Experiment	-	70 marks
			(25+25+20)

Paper – X (Practical : 50 MARKS)

Group – A (Hardware) : Microprocessor Programming

Experiment with 8085A based micro computing kits
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.

Marks Allotment: Sessional   -   05 marks
                          Experiment   -   35 marks
                          Viva-voce   -   10 marks

Group – B : Project Work (Practical : 50 MARKS)

Guidelines: Each student of B.Sc Part III(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 III 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.

Marks Allotment :   Project Report   -   08 marks
                          Presentation   -   07 marks
                          Project Work   -   20 marks
                          Viva-voce   -   15 marks

Computer Science General Course Structure

Paper	Type/Marks/Time	Group	Title	Periods
Part- I				
I	Theoretical 100 (Multiple Choice -30 Written - 70) (30mins : 2.30hrs)	A	Computer Fundamentals	40
		B	Computer Architecture and Organization	40
		C	Digital Logic	40
II	Practical 50	A	Familiarity with Window Based PC Software	50
Part- II				
III	Theoretical 100 (Multiple Choice -30 Written - 70) (30mins : 2.30hrs)	A	Data Structures	40
		B	Operating Systems	40
		C	Programming in C	40
IV	Practical 50	A	I: Programming in C	40
			II: Familiarity with single user and multi user operating systems.	10
Part- III				
V	Theoretical 100 (Multiple Choice -30 Written - 70) (30mins : 2.30hrs)	A	Database Management Systems	45
		B	Data Communication and Computer Networks	45
		C	System Analysis and Design	30

Part - I

Paper- I (Theoretical - F.M. 100)

Group A: Computer Fundamentals

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.
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.
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, Algebraic and K-map method.
Elements of Computer Networks : Different topologies of network, Centralized and Distributed Processing, LAN, MAN 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 B: Computer Architecture and Organization

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 set, instruction formats, interrupts and subroutines, CISC and RISC processor.
CPU registers: PC, MAR, MBR etc.

Control Unit : Instruction and Execution Cycle, Control of sequence, jump and branch instruction; shift instruction.
I/O * : Controller, interrupt, DMA, Memory mapped I/O, System buses.
Memory : Memory devices *– static and dynamic RAM, ROM, cache; secondary memory (floppy disc, hard disc, tape, CD ROM, DVD); large memory using chips.

Group C: Digital Logic

Logic gates: AND, OR, NOT, XOR etc. ; Combinational Circuits; Simple logic design using logic gates and Universal gates: Half Adder/Subtractor, Full Adder/Subtractor, Encoder, Decoder, Code Converter, Comparator, Multiplexer, De-multiplexer, Parity checker and Generator. Implementation of basic Sequential circuits; Flip-Flops: RS, D, JK, T and Master-Slave; Implementation of Counters: Synchronous and Asynchronous; Multi-vibrators: Astable and monostable; Registers and shift registers.

Distribution of Questions/marks:
Q1. (Compulsory 20 MCQ questions – 30 marks – 30 mins). Five questions to be answered, taking at least one and atmost two questions from each groups. (All questions are of 14 marks: questions may have subdivisions, maximum marks of each subdivision may be upto six marks) Time- 2.30 hrs.

Paper – II (Practical – F.M. 50)

Group A: Familiarity with Window Based PC Software

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 Preperation, 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.

Marks Allotment:	Sessional	-	05 marks
	Experiment	-	35 marks
	Viva-voce	-	10 marks

<u>**Part - II**</u>

Paper – III (Theoretical - F.M. 100)

Group A: Data Structures

Concepts of data types, Elementary Structure, Words and their interpretation; Arrays: Types, Memory representation, Address translation, Functions of single and multi dimensional arrays with examples; Linked Structures: Singly linked list; List Manipulation with Pointers: Examples involving insertion and deletion of elements; Stack and Queues: Definition, Representation, Uses and applications-Recursion, Postfix Conversion and Evaluation, Applications of queues; Binary Trees: Definition, Quantitative properties, Path Length: Internal and external properties, Minimum and maximum path length of a binary tree, Importance; Searching: Linear and binary search; Sorting: Terminology, Performance evaluation, Different sorting techniques (Bubble, Insertion, Selection, Quick, Merge, Heap) with iterative and/or Recursive description, Advantages and disadvantages.

Group B: Operating Systems

What is OS; Concepts of Process, Files, Shell, System Calls. Structures: Monolithic, Layered, Virtual, Client-Server Model. Concept of Synchronization: Semaphores, Critical Regions, Monitor etc., Inter Process Communication Mechanisms. Processor; Message Passing, Scheduling; I/O: Devices and Device Controllers; Interrupt handlers and Device drivers. Memory: Multiprogramming, Swapping, Paging, Page Replacement Techniques; File System: Files and Directories, File Servers, Security and Protection. Deadlock: How it can happen; Ideas on Detection and Prevention.

Group C: Programming in C

Basic Structure : Character set, keywords, identifiers, constants, variables and type declaration. Sample programs, preprocessor.
Operators : Arithmetic, Relational, Logical, Assignment, Increment and Decrement, Conditional operator, operator precedence and associativity; arithmetic expression-evaluation. 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.

Distribution of Questions/marks:
Q1. (Compulsory 20 MCQ questions – 30 marks – 30 mins). Five questions to be answered, taking at least one and atmost two questions from each groups. (All questions are of 14 marks: questions may have subdivisions, maximum marks of each subdivision may be upto six marks) Time- 2.30 hrs.

Paper – IV (Practical – F.M. 50)

Group A: Section I: Programming in C

Problems should cover basic features of the Language.

Section II: 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.

Marks Allotment:

Sessional	-	05 marks
Experiment1	-	30 marks
Experiment2	-	05 marks
Viva-voce	-	10 marks

Part – III

Paper – III (Theoretical - F.M. 100)

Group A: Database Management System

Basic concepts: Advantages of DBMS, ANSI/SPARC architecture, physical, conceptual and external models; Entity-Relationship diagrams; Relational data models, Relational algebra, Query Language: SQL, File organization: Sequential, indexed sequential; Query Languages: Relational Algebra; Functional dependencies and normal forms: 1NF, 2NF, 3NF and BCNF; SQL; Security; Integrity.

Group B: Data Communication and Computer Networking

Concepts of centralized and distributed computing: Advantages of networking; Layered architecture; OSI and TCP/IP model: Basic features, LAN, MAN and WAN; Simple PC based network examples: block diagram, mode of operation and characteristic features. Internet: What is Internet; Basics of Web Site, WWW; Browser, HTML-Tags and Features; Internet Addressing: Physical, Logical, Port; Servers; Clients; Domain Name Server (DNS); Accounts; ISP; Connection: Dial Up, ISDN, ADSN, Cable modem; Email: Account, sending, receiving, mailing list, IRC; Voice & Video conferencing.

Group C: System Analysis and Design

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

Distribution of Questions/marks:
Q1. (Compulsory 20 MCQ questions – 30 marks – 30 mins). Five questions to be answered, taking at least one and atmost two questions from each groups. (All questions are of 14 marks: questions may have subdivisions, maximum marks of each subdivision may be upto six marks) Time- 2.30 hrs.