

**Following is the amended syllabus of B.Sc(Honours) course in Computer Science, University of  
Calcutta.  
Effective From Session 2011**

## Syllabus of B.Sc (Hons) course in Computer Science

### Computer Science Honours Course Course Structure

Paper	Type/Marks	Group	Title	Periods
<b>Part-I</b>				
I	Theoretical 100	A	Computer Fundamentals	30
		B	Introduction to Basic Electronics	35
		C	Digital System Design	45
		D	Computer Organization-I	40
II	Theoretical 50	A	Section-I: System Software Fundamentals and Operating Systems	50
	Practical 50	B	Section-II : Data Structure-I Hardware	25 150
<b>Part-II</b>				
III	Theoretical 100	A	Discrete Mathematical Structures	75
		B	Numerical Methods and Algorithms	45
		C	Formal Languages and Automata Theory	30
IV	Theoretical 50	A	Section-I : Data Structure-II	30
	Practical 50	B	Section-II : Programming through C Language Software : C Language	45 150
<b>Part-III</b>				
V	Theoretical 100	A	Microprocessor	50
		B	Computer Organization- II	50
		C	Computer Networks	50
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	100
		B	Software: RDBMS	50
VIII	Practical 100	A	Object-Oriented Programming	100
		B	UNIX Shell Programming	50

#### Text Books :

1. Computer Fundamentals by SK sir Note.....
2. Electronics Fundamentals and Applications by D.Chattopadhyay and P.C.Rakshit., New Age Intl (P)
3. Computer System Architecture by M. Morris Mano
4. Digital circuits by Sullivan, Vikas Publication.
5. Data Structure by D. Samanta
6. Operating System Concepts by A. Silberschatz, P. B. Galvin, G. Gagne, John Wiley & Sons, Inc.

**PART – I**

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

**Group A: Computer Fundamentals**

**(30 Periods)**

*Introduction to Computer and Problem Solving:* Information and Data.

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

*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 Pseudo codes. (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; Parity Bits. Single Error-Detecting and Correcting Codes, Hamming Codes, Fixed and Floating Point Arithmetic: Addition, Subtraction, Multiplication and Division. (12)

*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 and Maxterm, Truth table and minimization of switching function up to four variables, Algebraic and K-map method of logic circuit synthesis: Two level and Multi level.

(10)

**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. (2)

*Elementary Physics of semi-conductors:* Intrinsic and Extrinsic semiconductors, P & N type, Diode & its applications: Types of diodes, P-N Junction diodes, Biasing of a junction diode, Depletion region & its effect, Zener diodes & its applications, Diode as a rectifier, LED. (7)

*Bipolar Junction Transistor:* 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  $\alpha$  &  $\beta$ -parameters of transistor, biasing of a transistor : Q point, load line, Self-bias, fixed bias & collector to base bias and stability factors. Transistor as an amplifier (8)

*Inverters using Transistors:* Transfer characteristics and threshold voltages. Switching characteristics of diodes and transistors-SCR. (2)

*Unipolar Junction Transistor:* 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. (8)

*Operational Amplifier :* Principle of differential amplifiers, CMRR of differential amplifiers, properties of ideal Op-amp, transfer characteristics of op-amp, concept of virtual ground, offset parameters and its uses as an inverting, non-inverting amplifiers, adder/subtractor, differentiator, integrator and scale changer. Schmitt trigger. Principle of Multi-vibrators, applications of Multi-vibrators – Monostable, Bistable and Astable multivibrators . (8)

**Group C: Digital System Design**

**(45 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 bits), 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/Demultiplexers: function realization, De-multiplexer and function realization, Encoder, Priority Encoder, Parity bit Generator/checker, Gray Code Generator, Code Converters, I/O features of BCD to 7- segment LED decoder/driver(7447/7448), Seven segment display unit, Comparators. (16)

*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,

---

## Syllabus of B.Sc (Hons) course in Computer Science

---

Flip-flops with Preset and Clear, Application of Flip-flops: Asynchronous Counter(UP/DOWN) up to 4 bit counter, Mod – n Counter, Synchronous Counters – different mod counters, Ring counter, Registers: Registers with serial and parallel load, Shift Registers. (17)

*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. Noise margin.SSI, MSI, LSI, and VLSI classifications. (12)

### **Group – D: Computer Organization – I (40 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. (10)

*Instruction:* Operation Code and Operand. Zero, One, Two and Three address instruction. Instruction types. Addressing modes. Stack organization. (15)

*Memory:* Types of Memory, RAM, ROM, EPROM, EEPROM. Different storage technologies. I/O system organization and interfacing, Tri State Devices. (15)

#### ***Distribution of questions/Marks:***

Q1. (Compulsory 10 short questions for 2 marks each). Five more questions to be answered from the remaining taking at least one from each group. There has to be at least eight questions other than question 1, two from each of the Groups.

(All questions other than question 1 are of 16 marks; questions may have subdivisions).

### **PAPER – II: 100 MARKS**

#### **Group – A (THEORETICAL): 50 Marks**

##### **Section - I: System Software Fundamentals and Operating Systems (50 periods)**

*System Software Fundamentals:* Different System Software: A brief introduction to Operating Systems, Assemblers, Loaders, Linkers, Interpreters, Compilers, various phases of compilation. (10)

*Introduction to Operating Systems:* What is OS? Multiprogramming, Multitasking OS, Concepts of processes, Files, Shell, System Calls; Structures: Monolithic, Layered, Virtual, Client Server and Distributed Model. (4)

*Concepts of Synchronization:* Semaphores, Critical Regions, Monitor Inter Process Communication Mechanism. (7)

*Processor Management:* Scheduling and its types. (4)

*I/O Management:* Device and Device Controllers, Interrupt Handlers and Device drivers. (3)

*Memory Management:* Real & Virtual memory, Swapping, Paging, Segmentation, Page Replacement Techniques. (7)

*File Systems:* Files and Directories, File Servers, Security and Protection, Disk Management. (4)

*Dead Lock:* Introduction, Prevention, Avoidance, Detection, Recovery. (7)

*Case Study:* UNIX/LINUX, WINDOWS. (4)

##### **Section II: Data Structure-I (25 Periods)**

*Introduction:* Concepts of Data types, Elementary structures, Data types and their interpretation. (2)

*Arrays:* Types, Memory Representation, Address Translation, Functions of single and multi-dimensional arrays with examples. (5)

*Linked Structures:* Singly and doubly linked list (non-circular and circular), List manipulation with pointers: Searching, Insertion and deletion of elements. (6)

*Stacks and Queues:* Representation. Uses and Applications, Infix, Prefix & Postfix notations, Infix to postfix: conversion and evaluation; Application of queues. (10)

*Recursion:* Divide and Conquer, elimination of recursion. (2)

---

## Syllabus of B.Sc (Hons) course in Computer Science

---

### *Distribution of Questions/marks:*

Q1. (Compulsory 4 short questions of 2 mark each). Three more questions are to be answered from the remaining taking two from Section I and one from Section II. There has to be six questions other than question 1, four from section I and two from section II. (All questions other than question 1 are of 14 marks; questions may have subdivisions).

**Group-B ( Hardware Practical): 50 Marks**

**(150 Periods)**

### *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 of 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 to 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 a 4 bit 2's complement adder – subtractor unit using 7483 or equivalent and XOR gates.
- 3) Design a circuit to convert BCD numbers to corresponding gray codes.
- 4) Design a 4:1 MUX using NAND gates. Study of 74153 and 74151. Design Full Adder / Subtractor using MUX.
- 5) Design a 2:4 decoder using NAND gates. Study of 74155 and 74138. Design Full Adder / Subtractor using decoders.
- 6) Design a parity generator/checker using basic gates.
- 7) Design magnitude comparator using basic/universal gates. Study of 7485.
- 8) 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) Study the functional characteristic of IC 74194 with emphasis on timing diagram.
- 3) Design Asynchronous and Synchronous counters. (Mod-8, Mod-10 up counter)
- 4) Study the functional characteristics of RAM IC chip. Study of open collector and tri-state output. Horizontal expansion of RAM chips by cascading. (Use 74189, 7489, or any available chip).

### **Duration of Examination : 4 hours**

**Marks Allotment:**

Sessional	-	05 marks
Experiment	-	35 marks
Viva-voce	-	10 marks

### **Text Books:**

1. Digital Electronics Practice using IC by R. P. Jain and m. M. S. Anand, TMH
2. Up to TTL 7400, BPB Publication.

**Part-II**

Paper	Type/Marks	Group	Title	Periods
<i>Part-II</i>				
III	Theoretical 100	A	Discrete Mathematical Structures	75
		B	Numerical Methods and Algorithms	45
		C	Formal Languages and Automata Theory	30
IV	Theoretical 50	A	Section-I : Data Structure-II	30
	Practical 50	B	Section-II : Programming through C Language Software : C Language	45 150

**PAPER – III(THEORETICAL) : 100 Marks**

**Group – A : Discrete Mathematical Structures**

**(75 Periods)**

*Graphs:* Introduction, Finite and Infinite Graphs, Directed and Undirected Graphs, Degree, Isolated vertex, Pendant vertex, Null graphs. (4)

Walks, Paths and Circuits, Connected and Disconnected graphs, Euler’s graphs, Hamiltonian paths and circuits, Trees, Introduction and basic properties, Distance and contents, Matrix representation of graphs, Incidence, Adjacency and Circuit matrices, Graph Search – BFS, DFS, Spanning Trees, Shortest Path Problems. (20)

*Mathematical Logic:* Proposition, Predicates and Quantifiers. Sets, Functions, Growth of Functions, Relation, Equivalence Relation: Big O Notation, Big Omega and Big-Theta Notations. (7)

*Algorithms:* Complexity of Algorithms, Space and Time, Polynomial and Exponential Algorithms. (6)

*Counting theory:* Counting, Pigeon Hole Principle, Inclusion and Exclusion Principle, Permutations and Combinations, Recurrence relations and Generating functions. (18)

*Introduction to Probability:* Sample space, events, probability, simple problems, Conditional Probability, Binomial Distribution (significance only), Random variable, expectation, Variance and Standard Deviations. (20)

**Group – B: Numerical Methods and Algorithms**

**(45 Periods)**

[For the methods covered in this group, the algorithm design using pseudo code needs to be done]

*Errors:* Introduction, types of errors. (2)

*Interpolation:* Newton Forward and Backward interpolation, Lagrange interpolation. (4)

*System of Linear Equations:* Properties: linear dependency, Rank, Singularity of Coefficient matrix, Ill-condition matrix, Solution methods: Gaussian Elimination, Gauss-Jordan Elimination, Gauss-Seidel method, convergence and errors. (10)

*Solution of Nonlinear Equation:* Bisection algorithm, Regula-falsi method, Secant and Newton-Raphson method, convergence and its graphical significances. (10)

*Solution of Differential Equations:* Euler Method, Modified Euler Method, Taylor Method, Runge-Kutta second and fourth order method for solving differential equations. (10)

*Integration:* Trapezoidal and Simpson’s 1/3<sup>rd</sup> Rules and its Composite forms. (4)

*Curve Fitting:* Linear, Quadratic fittings. (5)

**Group – C: Formal Languages and Automata Theory**

**(30 Periods)**

Introduction to Formal Languages and Grammar, Chomsky Classification of Grammars, Regular Expressions, Finite Automata - deterministic and non-deterministic and their equivalence, state minimization, introduction to Turing Machines.

---

## Syllabus of B.Sc (Hons) course in Computer Science

---

### ***Distribution of Questions/marks:***

Q1. (Compulsory 10 short questions of 2 marks each). Five more questions to be answered from the remaining taking at least two from Group A, and at least one from each of the other groups. There has to be at least eight questions other than question 1, with four from Group A, and two from each of Group B and C. (All questions are of 16 marks; questions may have subdivisions.)

### **PAPER-IV: 100 Marks**

#### **Group-A (Theoretical): 50 Marks**

##### **Section – I: Data Structures-II**

**(30 Periods)**

*Trees:* Introduction, 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:* Introduction, Searching, Insertion, Deletion. (14)

*Searching:* Linear and binary search, performance and complexity. (4)

*Hashing:* Concepts, Advantages and Disadvantages, Different types of hash functions, Collision and Collision Resolution Techniques – Open Addressing with probing, Linear Chaining, Coalesced Chaining, Application. (4)

*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: Programming through C Language**

**(40 periods)**

#### **(Example programs may be used to explain each of the topics)**

*Introduction:* History, Basic Structure, Algorithms, Structured programming constructs. (2)

*C Programming elements:* Character sets, Keywords, Constants, Variables, Data Types, Operators- Arithmetic, Relational, Logical and Assignment; Increment and Decrement and Conditional, Operator Precedence and Associations; Expressions, type casting. Comments, Functions, Storage Classes, Bit manipulation, Input and output. (6)

*C Preprocessor:* File inclusion, Macro substitution. (2)

*Statements:* Assignment, Control statements- if, if\_else, switch, break, continue, goto, Loops-while, do\_while, for. (6)

*Functions:* argument passing, return statement, return values and their types, recursion (4)

*Arrays:* String handling with arrays, String handling functions. (4)

*Pointers:* Definition and initialization, Pointer arithmetic, Pointers and arrays, String functions and manipulation, Dynamic storage allocation. (7)

*User defined Data types:* Enumerated data types, Structures. Structure arrays, Pointers to Functions and Structures, Unions. (4)

*File Access:* Opening, Closing, I/O operations. (5)

### ***Distribution of Questions/marks:***

Q1. (Compulsory 4 short questions of 2 mark each). Three more questions are to be answered from the remaining at least one from Section I and at least one from Section II. There has to be six questions other than question 1, three from section I and three from Section II.

(All questions other than question 1 are of 14 marks; questions may have subdivisions).

#### **Group – B (Software Practical): 50 Marks**

##### **Programming through ‘C’ Language**

**(Lab Periods 150)**

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

#### **Duration of Examination : 4 hours**

Distribution of Marks:

C Program	-	one question to be answered
Marks Allotment :		
Experiment	-	35 marks (Algorithm/Flowchart - 5 marks Source Code - 25 marks Input/Output & Discussion 5 marks)
Sessional	-	05 marks
Viva-voce	-	10 marks





**Part – III**

**PAPER – V (THEORETICAL): 100 Marks**

**Group – A: Microprocessor and Computer Organization – II**

**Microprocessor:**

(50 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, Programming a Microprocessor, Interrupts, Interfacing concepts- Memory Interfacing, I/O Interfacing and Ports – PPI 8255 Keyboard Interfacing, Display Interfacing, Interrupt and subroutine handling, Methods of Interrupts, Priority and Management  
Case Studies : 8085 and 8086 microprocessor.

**Computer Organization – II:**

(50 Periods)

**ALU** – Combinational ALU, 2's Complement Addition, Subtraction Unit, Booth's Algorithm for multiplication and division.

**Hierarchy:** CPU Register, Cache Memory, Primary Memory (DRAM, SRAM, SAM, PAL, PLA), Secondary Memory and Virtual Memory, Associative memory.

**CISC and RISC processors:** Introduction, relative merits and demerits.

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

**I/O:** Polling, Interrupts and subroutines, Memory mapped I/O and I/O mapped I/O, DMA, I/O Bus and Protocol, SCSI, PCI, USB, Bus Arbitration.

**Computer Peripherals:** VDU, Keyboard, Mouse, Printer, Scanner etc.

**Group B: Computer Networks**

(50 Periods)

Data Communication Concepts: Analog & Digital Signals, Periodic & Non-periodic signals, Time and Frequency Domain; Bandwidth and Data rate; Signal rate, Serial & Parallel transmission, Various modes of transmission: Simplex/ Half Duplex, Duplex,

Features of guided and non- guided transmission media, Impairments.

Purpose of Modulation & Encoding; AM, FM, PM Multiplexing: Purpose & Definition of FM & TDM.

Goals of Computer Network, LAN, MAN and WAN. OSI & TCP/IP Architecture.

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

**Distribution of Questions/marks:**

Q1. (Compulsory 10 short questions of 2 mark each). Five more questions are to be answered from the remaining taking two from Group A and one from Group B. There has to be six questions other than question 1, four from Group A and two from Group B.

(All questions other than question 1 are of 14 marks; questions may have subdivisions).

**Text Books :**

1. Computer Architecture and Organizations by J. P. Hayes, TMH.
4. Introduction to Microprocessor by Gaonkar, Penrum Publishers.
8. Data Communications and Networking by Behrouz A. Forouzan, TMH.

**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.

**Distribution of Questions / marks:**

## Syllabus of B.Sc (Hons) course in Computer Science

---

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
4. Fundamentals of Software Engineering, Rajib Mall, PHI
8. Computer Graphics by Hearn and Baker, PHI
9. Database System Design by Elmasri, Navathe, Somayajulu, Gupta, Pearson Education

### PAPER – VII (Practical): 100 Marks

#### Group – A (Hardware: Microprocessor Programming & I/O Interfacing ): 50 Marks

##### 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.

##### Interfacing:

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

##### Duration of Examination : 4 hours

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

#### Group – B (Software: RDBMS): 50 Marks

RDBMS: ORACLE, SQL Server

Front Ends: Developer 2000, Visual Basic.

Problems: Application Database with GUI.

##### Duration of Examination : 4 hours

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

### PAPER – VIII ( Software Practical): 100 Marks

Section I: Object Oriented Programming      *Language:* C++, Visual C++ Programming

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

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

Unix Shell Programming.

*Platform:* SCO UNIX, LINUX

*Problems:* Problem set should cover the basic features of Unix / Linux and shell programming.

##### Duration of Examination : 6 hours

Marks Allotment:	Sessional	-	10 marks
	Viva-voce	-	20 marks
	Experiment	-	70 marks
	Section I	-	40
	Section II	-	30

### Text Books :

1. SQL / PL / SQL The Programming language of Oracle by Ivan Bayross, BPB.
2. Unix Shell Programming by Y. Kanetkar, BPB.
3. Your UNIX: The Ultimate Guide by Sumitava Das.