

Approved by the Competent Authority U/s 11(7) of  
University Act, 2014 on dated 01.07.2019.

**DEPARTMENT OF COMPUTER SCIENCE AND APPLICATIONS**  
**SCHEME OF EXAMINATION FOR**  
**BACHELOR OF COMPUTER APPLICATIONS (BCA)**  
w. e. f. Academic Session 2019-20

Semester - I				
Paper Code	Title of the Paper	Maximum Marks		Total
		External	Internal	
BCA-19-11	Computer Fundamentals	80	20	100
BCA-19-12	Office Automation Tools	80	20	100
BCA-19-13	Programming with C	80	20	100
BCA-19-14	Digital Electronics	80	20	100
BCA-19-15	Technical Communication Skills	80	20	100
BCA-19-16	Management Information System	80	20	100
BCA-19-17	Software Lab - I	80	20	100
BCA-19-18	Software Lab - II	80	20	100
BCA-19-19	Student Seminar	-	20	20
Total				820

Semester - II				
Paper Code	Title of the Paper	Maximum Marks		Total
		External	Internal	
BCA-19-21	Data Structures using C	80	20	100
BCA-19-22	Computer Organization	80	20	100
BCA-19-23	Software Engineering	80	20	100
BCA-19-24	Data Base Management System	80	20	100
BCA-19-25	Discrete Mathematics	80	20	100
BCA-19-26	Modeling and Simulation	80	20	100
BCA-19-27	Software Lab - III	80	20	100
BCA-19-28	Software Lab - IV	80	20	100
BCA-19-29	Student Seminar	-	20	20
Total				820



Semester – III				
Paper Code	Title of the Paper	Maximum Marks		Total
		External	Internal	
BCA-19-31	Object Oriented Programming using C++	80	20	100
BCA-19-32	Computer Oriented Numerical Methods	80	20	100
BCA-19-33	Web Designing	80	20	100
BCA-19-34	Operating System	80	20	100
BCA-19-35	Computer Oriented Optimization Techniques	80	20	100
BCA-19-36	Information Security	80	20	100
BCA-19-37	Software Lab – V	80	20	100
BCA-19-38	Software Lab - VI	80	20	100
BCA-19-39	Student Seminar	-	20	20
Total				820

Semester – IV				
Paper Code	Title of the Paper	Maximum Marks		Total
		External	Internal	
BCA-19-41	Programming with Java	80	20	100
BCA-19-42	Computer Oriented Statistical Methods	80	20	100
BCA-19-43	Computer Networks	80	20	100
BCA-19-44	Client Side Scripting	80	20	100
BCA-19-45	Internet Technologies	80	20	100
BCA-19-46	Artificial Intelligence	80	20	100
BCA-19-47	Software Lab – VII	80	20	100
BCA-19-48	Software Lab - VIII	80	20	100
BCA-19-49	Student Seminar	-	20	20
Total				820

*Ashwani*

Semester – V				
Paper Code	Title of the Paper	Maximum Marks		Total
		External	Internal	
BCA-19-51	Computer Graphics	80	20	100
BCA-19-52	Introduction to Cloud Computing	80	20	100
BCA-19-53	Data Warehousing	80	20	100
BCA-19-54	Software Project Management	80	20	100
BCA-19-55	Elective 1. Angular JS 2. Node JS	80	20	100
BCA-19-56	Elective 1. Big Data Tools 2. Android Programming	80	20	100
BCA-19-57	Software Lab – IX	80	20	100
BCA-19-58	Software Lab - X	80	20	100
BCA-19-59	Student Seminar	-	20	20
Total				820

Semester - VI		
Paper No.	Title of the Paper	Total
BCA-19-61	Project Report for On the Job Training	150
	Presentation & Viva-voce	150
	Internal Assessment	100
Total		400
<b>Grand Total of Marks (From semester I to VI)</b>		<b>4500</b>

Seminar will be 2 lectures/week

Contact Hour for each paper will be 6 lectures /week.

Internal Marks must be awarded in accordance with BCA Ordinance.



## BCA-19-11 Computer Fundamentals

**Maximum marks:** 100  
**Time:** 3 hours

**External:** 80  
**Internal:** 20

### **Course Objectives:**

1. To understand the components of computer, software, hardware.
2. To provide an overview of peripheral devices.
3. To provide internet, multimedia and animation concepts.
4. To get familiar with Windows Operating System.

**Examiner's Note:** All Questions are compulsory. The Question Paper is divided into four sections A, B, C, and D. Section A is compulsory and comprises of 12 questions of one mark each, 3 from each unit of the syllabus. The question shall be asked in such a manner that there are no direct answers including one word answer, fill in the blanks or multiple choice questions. Section B comprises of 4 questions of 3 marks each, one from each unit. Section C comprises of 4 questions of 6 marks each, one from each unit. Each question shall have two alternatives, out of which student will be required to attempt one. Section D comprises of 4 questions of 8 marks each, one from each unit. Each question shall have two alternatives, out of which student will be required to attempt one.

### UNIT-I

**Computer Fundamentals:** Computer components, Generations of computers, Characteristics and classification of computers, hardware, software, firmware, Memory and its types: Random access, sequential access, Magnetic disk, optical disc, flash memory, Programming languages: Low level programming languages, High level languages, Assembler, Compiler, Interpreter.

### UNIT-II

**Peripheral devices:-** Keyboard, Pointing Devices: Mouse, Trackball, Touch Panel, Joystick, Light Pen, Scanners, Monitor, OMR, Bar-code Reader, Hard Copy Devices: Impact and Non-Impact Printers-Daisy Wheel, Dot Matrix, Laser Printer, Plotters, speakers, Projector.

### UNIT-III

**Internet and Multi Media:** What is Internet?, Advantages and Disadvantages of Internet, Electronic Mail, Attaching a document with e-mail, FTP, Telnet, World Wide Web, Uniform Resource Locator (URL), Web Browsers, Internet Search Engine, What is Multimedia?, Multimedia Components: Text, Graphics, Animation, Audio, Video, Multimedia applications.

### UNIT-IV

**Using Windows Operating System:** What is an Operating System, Main functions of an Operating System, Starting Windows, Using the Mouse, Start Menu, Shutting Down, Customizing the Desktop, Maximizing Minimizing Restoring Moving Resizing and Closing an Application Window, Control Panel, Taskbar, Window Explorer, Creating new Folder or File, copying and moving files and folders, Recycle Bin, Using System Tools, User Accounts, Creating Shortcuts on Desktop, Windows Media Player, Windows accessories.

**Suggested Readings:**

1. Sinha, P. K., Sinha, Priti, "Computer Fundamentals", BPB Publications, 6th Edition.
2. Rajaraman, V., Adabala, N., "Fundamentals of Computers", PHI, 6th Edition, 2014.
3. Norton, Peter, "Introduction to Computers", Mc Graw Hill, 7th Edition, 2017.
4. Taxali, Ravi Kant, "Computer Course", Mc Graw Hill, 2014.



## BCA-19-12 Office Automation Tools

**Maximum marks:** 100

**Time:** 3 hours

**External:** 80

**Internal:** 20

### **Course Objectives:**

1. To understand the important Application softwares used in office automation.
2. To provide the concepts word processing software for document writing.
3. To provide internet, multimedia and animation concepts.
4. To get familiar with Windows Operating System.

**Examiner's Note:** All Questions are compulsory. The Question Paper is divided into four sections A, B, C, and D. Section A is compulsory and comprises of 12 questions of one mark each, 3 from each unit of the syllabus. The question shall be asked in such a manner that there are no direct answers including one word answer, fill in the blanks or multiple choice questions. Section B comprises of 4 questions of 3 marks each, one from each unit. Section C comprises of 4 questions of 6 marks each, one from each unit. Each question shall have two alternatives, out of which student will be required to attempt one. Section D comprises of 4 questions of 8 marks each, one from each unit. Each question shall have two alternatives, out of which student will be required to attempt one.

### UNIT-I

**Word Processing:** Starting Word Processing software, Creating and saving a document, Opening a document, Inserting, selecting, copying, moving, deleting and pasting, text, Undoing, redoing, Applying bold, italic, underline style on text, changing size, color and font of text, using Format painter, aligning text, Formatting paragraphs: Line spacing, paragraph indents, space before and after paragraph, using bullets and numbering in paragraphs, Spelling and grammar, Autocorrect, inserting page number, page break, header and footer, border and shading, inserting picture, shapes and screenshot, using Mail merge.

### UNIT-II

**Spreadsheet Designing:** Starting Excel, Workbook and Worksheet or Spreadsheet, Aligning and formatting data in cells, Cell range, Math, Trigonometric, Date and Time, Logical, Text and Statistical Functions, AutoSum, inserting/deleting rows, columns and cells, Merge and center, creating charts (column, line, pie, bar), changing column width and row height, using IF() function, Sorting data, Filtering data.

### UNIT-III

Lookup and Reference Functions, Database Functions, Information Functions, Using conditional formatting with multiple cell rules, creating new rules and managing existing rules, Creating Pivot Table, Using Pivot Table Options, Changing and Updating Data Range, Formatting Pivot Table and making Dynamic Pivot Table, Creating Pivot Chart, Types of Pivot Charts and their usage, Formatting Pivot Charts and making Dynamic Pivot Charts.

### UNIT-IV

**Presentation Designing:** Starting Presentation software, Creating New Presentation, adding slides, Entering/Editing Text in Slides, Formatting text and paragraph, inserting a picture, Clip Art and Screenshot, Inserting Chart, Shapes, Word Art, Text Box, Inserting table, PowerPoint

Views, Slideshow, Slide Transition Effects, Animation, Inserting Video and Audio, Printing Presentation Slides

**Suggested Readings:**

1. Taxali , Ravi Kant, "*Computer Course*", Mc Graw Hill Education, 2014.
2. Saxena , Sanjay, "*A First Course in Computers*", Vikas Publishing House, 2015.
3. Balagurusami , E., "*Fundamentals of Computers*", Mc Graw Hill, 2009.
4. Weverka, Peter, "*Office 2010 All-in-One for Dummies*", Wiley Publishing, Inc., 2010

*Ashwini*

## BCA-19-13 Programming with C

Maximum marks: 100

Time: 3 hours

External: 80

Internal: 20

### Course Objectives:

1. This course aims to provide the students with a foundation in computer programming.
2. To develop the basic programming skills in students.
3. To applying the basic knowledge of programming to solve problems.
4. To get familiar with High Level Language 'C'.

**Examiner's Note:** All Questions are compulsory. The Question Paper is divided into four sections A, B, C, and D. Section A is compulsory and comprises of 12 questions of one mark each, 3 from each unit of the syllabus. The question shall be asked in such a manner that there are no direct answers including one word answer, fill in the blanks or multiple choice questions. Section B comprises of 4 questions of 3 marks each, one from each unit. Section C comprises of 4 questions of 6 marks each, one from each unit. Each question shall have two alternatives, out of which student will be required to attempt one. Section D comprises of 4 questions of 8 marks each, one from each unit. Each question shall have two alternatives, out of which student will be required to attempt one.

### UNIT-I

**Introduction to C:** C Character set, Tokens, keywords and identifiers, constants, variables, data types and preprocessors. C Operators: Arithmetic, relational, logical, bitwise, unary, assignment and conditional operators and their hierarchy.

**Input/Output Statements in C:** format specifiers, getch, getchar, getche, gets and puts. Formatted input and output using scanf and printf statements.

### UNIT-II

**Control Statements:** Types of control statements, if-else, nested if-else, else-if ladder, switch statement, conditional control statement (? :), loops: for, while and do- while, break, continue and go to.

### UNIT-III

**Functions:** Library Functions, User Defined Functions, Functions with and without Return Value, Functions with and without parameter passing, Parameter Passing – Call by Value, Call by Reference, Recursion.

### UNIT-IV

**Enumeration, Structure and Union,** Use of Enumerators in Programming  
**Pointers :** Pointer to a Variable, Pointer to function, Pointer to Structure

### Suggested Readings:

1. Balaguruswami, E., "Programming in ANSI C", Tata McGraw Hill, 7th Edition.
2. Kanetker, Yashwant, "Let us C", BPB Publications, 15th Edition.
3. Gottfried, Byron, "Programming with C", Tata McGraw Hill, 2nd Edition.
4. Kernighan, B. W., Ritchie, D. M., "The C Programming Language", PHI, 2nd Edition.
5. Koffman, Hanly, "Problem Solving and Program Design in C", Pearson, 8th Edition.



## BCA-19-14 Digital Electronics

Maximum marks: 100

Time: 3 hours

External: 80

Internal: 20

### Course Objectives:

1. To introduce the fundamentals of Digital Electronics.
2. To get familiar with Number System and Logic Gates, Logic .
3. To understand the concept of Logic circuit, Flip-flop, Register, Counters and Memory.

**Examiner's Note:** All Questions are compulsory. The Question Paper is divided into four sections A, B, C, and D. Section A is compulsory and comprises of 12 questions of one mark each, 3 from each unit of the syllabus. The question shall be asked in such a manner that there are no direct answers including one word answer, fill in the blanks or multiple choice questions. Section B comprises of 4 questions of 3 marks each, one from each unit. Section C comprises of 4 questions of 6 marks each, one from each unit. Each question shall have two alternatives, out of which student will be required to attempt one. Section D comprises of 4 questions of 8 marks each, one from each unit. Each question shall have two alternatives, out of which student will be required to attempt one.

### UNIT-I

**Number System and Logic Gates:** Decimal, Binary, Octal and Hexadecimal Number System, Addition, Subtraction, multiplication and division of binary numbers, Number code: 8421, BCD, Grey, ASCII, EBCDIC codes, Conversions from one number system to another, Logic Gates: AND, OR, NOT, NAND, NOR, XOR, XNOR

### UNIT-II

**Combinational Logic Circuits:** Boolean operations, Basic Laws of Boolean Algebra, Demorgan's theorem, Principle of Duality, Sum-of-Products Methods, Truth Table, Karnaugh-Map, Pairs, Quads, and Octets, Karnaugh Simplifications, Don't-care Conditions, Product-of-sums Method, Adder circuits: Half, Full, 4-bit adder

### UNIT-III

**Flip Flop and Registers:** Flip Flop: RS Latch, RS, D, T, JK Flip Flop, JK Master Slave Flip Flop, Clock wave forms, Registers: Types of Registers, Serial In Serial Out (SISO), Serial In Parallel Out (SIPO), Parallel In Serial Out (PISO), Parallel In Parallel Out (PIPO), Universal Shift Register

### UNIT-IV

**Counters and Memory:** Asynchronous counters, Synchronous counters, ring counter, ripple counter, Johnson counter Memories: Basic terms and ideas, Magnetic Memory, Optical Memory, Memory Addressing, ROMs, PROMs, and EPROMs, RAMs.

### Suggested Readings:

1. Leach, D. P., Malvino, A.P., Saha, G., "Digital Principles and Applications", Mc-Graw Hill, 8th Edition.
2. Mano, Morris M., "Digital Logic and Computer Design", PHI Publications, 1st Edition.
3. Floyd, T. L., "Digital Fundamentals", Pearson Education, 11th Edition, 2014.
4. Kumar, Anand A., "Fundamentals of Digital Circuits", PHI, 4th Edition, 2016

## BCA-19-15 Technical Communication Skills

**Maximum marks:** 100

**Time:** 3 hours

**External:** 80

**Internal:** 20

### **Course Objectives:**

1. To introduce the fundamentals of writing Technical documents.
2. To get familiar with Email correspondence and Presentation skills.
3. To improve the communication skills.
4. To know the strategies of Interview facing.

**Examiner's Note:** All Question are compulsory. The Question Paper is divided into four sections A, B, C, and D. Section A is compulsory and comprises of 12 questions of one mark each, 3 from each unit of the syllabus. The question shall be asked in such a manner that there are no direct answers including one word answer, fill in the blanks or multiple choice questions. Section B comprises of 4 questions of 3 marks each, one from each unit. Section C comprises of 4 questions of 6 marks each, one from each unit. Each question shall have two alternatives, out of which student will be required to attempt one. Section D comprises of 4 questions of 8 marks each, one from each unit. Each question shall have two alternatives, out of which student will be required to attempt one.

### **UNIT-I**

Writing Resume, Curriculum Vitae and Bio Data (Design, Style); Writing Cover Letter, Job Applications, Statement of Purpose, Life Essay.

Writing Technical Correspondence : Report Writing, Process Writing, Technical Description: Instructions, Manuals,

### **UNIT-II**

Samples of Technical Letters: Letters of Inquiry, Replies of Inquiry Letters, Letters Placing Orders, Instruction Letters and Adjustment Letters.

Email Correspondences: Format, Standard Practices and Strategies.

Oral Presentation Skills : How to make presentation (focus of paralinguistic features of speech : Pause, Voice, Stress, Intonation, Non Verbal Cues)

### **UNIT-III**

Techniques of Group Discussion : Subject Knowledge, Communication Skills, Leadership Skills, Group Behaviour.

Individual Contribution: Topic Analysis, Discussing Opinion & Problems, Exchanging Opinions, Suggestions and Proposals.

### **UNIT-IV**

Pre interview presentation skills, Self Analysis, Research the Organisation, Job Analysis, Revision of Subject Knowledge, Developing Interview File, Interview Questions Types and Strategies.

### **Suggested Readings:**

1. Jones, L&R Alexander, "New International Business English", UK:CUP, 2006
2. Rizvi, M.A., "Effective Technical Communication", Mc Graw Hill Education, 2005



## BCA-19-16 Management Information System

**Maximum marks:** 100

**Time:** 3 hours

**External:** 80

**Internal:** 20

### **Course Objectives:**

1. To introduce the fundamentals of writing Technical documents.
2. To get familiar with Email correspondence and Presentation skills.
3. To improve the communication skills.
4. To know the strategies of Interview facing.

**Examiner's Note:** All Question are compulsory. The Question Paper is divided into four sections A, B, C, and D. Section A is compulsory and comprises of 12 questions of one mark each, 3 from each unit of the syllabus. The question shall be asked in such a manner that there are no direct answers including one word answer, fill in the blanks or multiple choice questions. Section B comprises of 4 questions of 3 marks each, one from each unit. Section C comprises of 4 questions of 6 marks each, one from each unit. Each question shall have two alternatives, out of which student will be required to attempt one. Section D comprises of 4 questions of 8 marks each, one from each unit. Each question shall have two alternatives, out of which student will be required to attempt one.

### **UNIT-I**

Systems approach to MIS: Definition of MIS, Report writing software, MIS and Human factor considerations, concept of organizational information sub-system, MIS & problem solving.

Information Management: Who are the users? Manager & Systems, Evolution of Computer based information system (CBIS), Model of CBIS. Information systems organization: Trend to End-User computing, justifying the CBIS, Achieving the CBIS, Managing the CBIS, Benefits & Challenges of CBIS implementation.

### **UNIT-II**

Systems from Management & Functional perspective & their relationship: Executive Information System, Decision Support System Sales & Marketing Information System, Manufacturing Information System, Human-Resource Information System. Finance & Account Information System.

### **UNIT-III**

Firm in its environment, what are the information resources? Who manages the information resources? Strategic planning for information resources. End-User Computing as a strategic issue, Information resource management concept. Business Value of information system.

### **UNIT-IV**

E-Commerce: E-Commerce strategy, Electronic Data Interchange, E-commerce methodology, E-commerce technology, Business application of the Internet. Electronic Business success strategies. Global business drivers, challenges, strategy:

*Ashalya*

divide, conquer, appease, cooptation, business organization, problems in implementing global information systems, Computer crime, ethics & social issues.

**Suggested Readings:**

1. Kelkar S.A. "*Management Information Systems: A Concise Study*", PHI, 2nd Edition, 2009.
2. Laudon, Kenneth C. Laudon, Jane P., "*Management Information Systems: Managing the Digital Firm*", 2015.
3. Basandra, Suresh K., "*Management Information Systems*", Basandra Books, 2013
4. Simkin, Mark G., "*Introduction to Computer Information Systems for Business*", S. Chand & Co., 1996.
5. Senn, James A., "*Analysis and Design of Information Systems*", McGraw-Hill, 2nd Edition



## BCA-19-17 Software Laboratory - I

**Maximum marks:** 100

**Time:** 3 hours

**External:** 80

**Internal:** 20

The practical exam will be divided into two parts.

### 1. Typing Test (30 Marks for External)

The department / concerned college may use freeware software for typing test which are able to check speed as well as accuracy.

The award of typing test will be as under:

Accuracy-> Speed	<70%	>=70% to <75%	>=75% to <80%	>=80% to <85%	>=85% to <90%	>=90% to <95%	>=95%
<20 WPM	0	10	12	14	16	18	20
>=20 WPM to <30WPM	0	12	15	17	20	23	25
>=30 WPM	0	15	18	21	24	27	30

### 2. Office Automation Tools (50 Marks for External)

The examiner has to set two questions with internal choice for practical implementation of the concepts studied by student in Paper BCA – 19 – 12



**BCA-19-18 Software Laboratory - II**

**Maximum marks:** 100

**Time:** 3 hours

**External:** 80

**Internal:** 20

The students have to implement at least 15 programs during the course in accordance with paper BCA-19-13.

The examiner has to set two programs with internal choice on the spot covering the concepts covered in paper BCA-19-13.



**BCA-19-19 Student Seminar**

**Maximum marks:** 100

**Time:** 3 hours

**External:**

**Internal:** 20

The students have to deliver a Seminar on the latest development in the field of Computer Science. The Teacher concerned will assign the different topics to all the students.



## BCA-19-21 Data Structures using C

Maximum marks: 100

Time: 3 hours

External: 80

Internal: 20

### Course Objectives:

1. To introduce the fundamentals of Data structures.
2. To get familiar with Arrays, String and various searching techniques.
3. To know about stack, queue and linked lists.
4. To understand the advanced data structures Tree and Graph.

**Examiner's Note:** All Question are compulsory. The Question Paper is divided into four sections A, B, C, and D. Section A is compulsory and comprises of 12 questions of one mark each, 3 from each unit of the syllabus. The question shall be asked in such a manner that there are no direct answers including one word answer, fill in the blanks or multiple choice questions. Section B comprises of 4 questions of 3 marks each, one from each unit. Section C comprises of 4 questions of 6 marks each, one from each unit. Each question shall have two alternatives, out of which student will be required to attempt one. Section D comprises of 4 questions of 8 marks each, one from each unit. Each question shall have two alternatives, out of which student will be required to attempt one.

### UNIT-I

**Arrays and Strings:** Array definition and its types, declaration & Initialization of one-dimensional and two-dimensional array, Pointer to Array, String definition, reading and writing strings, string handling functions.

Linear Search, Binary Search, Bubble Sort, Selection Sort, Insertion Sort, Merge Sort

### UNIT-II

**Stacks and Queues :** Representation of Stacks, Stack Operations, Applications of Stacks, Queues, Dequeue, Circular Queue, Operation on Queues, Application of Queues.

**Linked List :** Introduction, Types, Operations (Insertion, Deletion, Traversal, Searching, Sorting), Applications, Dynamic Memory Management, Implementation of Linked Representation.

### UNIT-III

**Trees:** Definition and Basic Terminologies, Representation of Tree, Types of Tree, Binary Tree, Representation of Binary Tree, Tree Traversals, Creation of tree from traversals, Threaded Binary Tree, Binary Search Tree, Operations on Binary Search Tree, Conversion of General Tree to Binary Tree

### UNIT-IV

**Graph :** Definitions and Basic Terminologies, Matrix Representation of Graph, Walks, Traits, Paths, Circuit, Connectivity, Components, Operations on Graph, Labelled Graph,



Homomorphism, Isomorphism, , Reachability, Depth First Search, Breadth First Search, Single Pair Shortest Path, All Pair Shortest Path

**Suggested Readings:**

1. Lipschutz Seymour, "*Shaum's Outlines Data Structures*", Tata McGraw Hill, Special India Edition, 2013
2. Trembley J. P., Sorenson P.G., "*An Introduction of Data Structures with Applications*", Tata McGraw Hill, 2<sup>nd</sup> Edition

*Ashu*

## BCA-19-22 Computer Organization

**Maximum marks:** 100

**Time:** 3 hours

**External:** 80

**Internal:** 20

### **Course Objectives:**

1. To understand hardware organization of computer.
2. To get familiar with floating point arithmetic algorithms.
3. To know about CPU organization and control design.
4. To understand the Parallel processing and memory organization.

**Examiner's Note:** All Question are compulsory. The Question Paper is divided into four sections A, B, C, and D. Section A is compulsory and comprises of 12 questions of one mark each, 3 from each unit of the syllabus. The question shall be asked in such a manner that there are no direct answers including one word answer, fill in the blanks or multiple choice questions. Section B comprises of 4 questions of 3 marks each, one from each unit. Section C comprises of 4 questions of 6 marks each, one from each unit. Each question shall have two alternatives, out of which student will be required to attempt one. Section D comprises of 4 questions of 8 marks each, one from each unit. Each question shall have two alternatives, out of which student will be required to attempt one.

### **UNIT-I**

Computer Arithmetic: Hardware implementation and algorithms for addition and subtraction with signed-magnitude data, signed 2's complement data, multiplication for signed-magnitude data, Booth multiplication algorithm, array multiplier, division for signed magnitude data, divide overflow. Hardware implementation and algorithms for floating point addition, subtraction, multiplication and division.

### **UNIT-II**

CPU Organization: Processor organization, Machine instructions, instruction cycles, instruction formats and addressing modes, microprogramming concepts, and micro program sequencer.

Control Design: Hardwired Control – classical method, one-hot method; Microprogrammed Control – basic concepts and structure of a microprogrammed control unit, horizontal versus vertical microinstruction formats, microinstruction addressing.

### **UNIT-III**

Parallel Processing:: Types and levels of parallelism, Instruction Level Parallel (ILP) processors, dependencies between instructions, principle and general structure of pipelines, performance measures of pipeline, pipelined processing of integer, Boolean, load and store instructions,

### **UNIT-IV**

Memory Organization: Hierarchical memory system, associative memory, cache memory - associative, direct and set associative mappings, replacing & writing data in cache, cache performance.

I/O Organization: I/O interface, Interrupt structure, transfer of information between CpU/memory and I/O devices, and IOPs

**Suggested Readings:**

1. Mano, M. Morris, "*Digital Logic and Computer Design*", Pearson Education, 3<sup>rd</sup> Edition.
2. Hayes, J.P., "*Computer Architecture and Organization*", 3rd Edition, McGraw Hill.
3. Tanenbaum A. S., Austin T., "*Structured Computer Organization*", Pearson, 6th Edition.
4. Stallings W., "*Computer Organization and Architecture*", PHI, 10th Edition.



## BCA-19-23 Software Engineering

Maximum marks: 100

Time: 3 hours

External: 80

Internal: 20

### Course Objectives:

1. To understand the concept of Software Engineering and Requirement Specification.
2. To know how to plan and design a software project.
3. To get familiar with coding, testing and maintenance of the software.

**Examiner's Note:** All Question are compulsory. The Question Paper is divided into four sections A, B, C, and D. Section A is compulsory and comprises of 12 questions of one mark each, 3 from each unit of the syllabus. The question shall be asked in such a manner that there are no direct answers including one word answer, fill in the blanks or multiple choice questions. Section B comprises of 4 questions of 3 marks each, one from each unit. Section C comprises of 4 questions of 6 marks each, one from each unit. Each question shall have two alternatives, out of which student will be required to attempt one. Section D comprises of 4 questions of 8 marks each, one from each unit. Each question shall have two alternatives, out of which student will be required to attempt one.

### UNIT-I

**Introduction to Software Engineering:** Software crisis, Software engineering Approach and Challenges, Software development process models: Waterfall, Rapid prototyping, Time boxing and Spiral Models, Comparison of models.

**Requirement Analysis:** Software Requirements, Problem Analysis, Requirement Specification: characteristics, components and structure of SRS document, functional and non functional requirements, Functional specification with use cases.

### UNIT-II

**Planning a Software Project:** Process Planning, Effort Estimation: uncertainties in effort estimation, building effort estimation models, COCOMO model, Project Scheduling and Staffing, Software configuration management plan, Quality Plan, Risk Management, Project Monitoring Plan

### UNIT-III

**Designing a Software Project:** Function Oriented Design: Design Principles, Module level concepts, design notations and specification, Structured design methodology. Object-oriented design: OO Analysis and Design, OO concepts, Coupling, cohesion, Unified modeling language(UML), Detailed Design and PDL, verification and validation, Cyclomatic complexity.

### UNIT-IV

**Coding and Testing:** Common coding errors, Coding Process, Refactoring, Verification, Metrics, Testing: Error, Fault and Failures, Test cases and test criteria, Black Box testing, White Box testing, Testing Process, Reliability estimation Metrics, Types of Maintenance

### Suggested Readings:

*Dehati*

1. Pressman, S. R., "*Software Engineering- A Practitioner's Approach*", Tata McGraw Hill, 8th Edition.
2. Jalote, Pankaj, "*An integrated Approach to Software Engineering*", Narosa Publishing House, 3rd Edition.
3. Gill, Nasib S., "*Software Engineering*", Khanna Book Publishing, 2018.



## BCA-19-24 Data Base Management System

Maximum marks: 100

Time: 3 hours

External: 80

Internal: 20

### Course Objectives:

1. To understand the basic concept of DBMS.
2. To know about the Entity relationship model.
3. To get familiar Structured Query Language.
4. To acquire the knowledge of Transaction Processing Concepts of Relational Database.

**Examiner's Note:** All Question are compulsory. The Question Paper is divided into four sections A, B, C, and D. Section A is compulsory and comprises of 12 questions of one mark each, 3 from each unit of the syllabus. The question shall be asked in such a manner that there are no direct answers including one word answer, fill in the blanks or multiple choice questions. Section B comprises of 4 questions of 3 marks each, one from each unit. Section C comprises of 4 questions of 6 marks each, one from each unit. Each question shall have two alternatives, out of which student will be required to attempt one. Section D comprises of 4 questions of 8 marks each, one from each unit. Each question shall have two alternatives, out of which student will be required to attempt one.

### UNIT - I

**Basic Concepts:** Definition of Data Base and Data Base Management System, File Systems vs. DMBS, Characteristics of the Database Approach, Abstraction and Data Integration, Database users. Advantages and Disadvantages of DBMS. Database Systems Concepts and Architecture: Data Models, Schema and Instances, DBMS architecture, Data Independence, Database languages, DBMS functions.

### UNIT - II

**Entity Relationship Model:** Purpose of ER Model, Entity Types, Entity Sets, Attributes, keys, Relationships, Roles and Structural Constraints, E-R Diagrams, Design of an ER Database Schema, Reduction of an ER schema to Tables. Relational Data Model: Relational Model Concepts, Integrity Constraints over Relations, Relational Algebra – Basic Operations.

### UNIT - III

**SQL:** Data Definition and Data Types, DDL, DML, and DCL, Views & Queries in SQL, Specifying Constraints & Indexes in SQL. Relational Database Management System: ORACLE- Basic structure, Storage Management in ORACLE Database Structure & implementation in ORACLE, Programming ORACLE Applications. Conventional Data Models: Network and Hierarchical Data Models.

### UNIT - IV

**Relational Database Design:** Functional Dependencies, Decomposition, Normal forms based on primary keys- (1NF, 2NF, 3NF, BCNF), Multi-valued Dependencies, 4 NF, Join dependencies, 5 NF. Transaction Processing Concepts: Introduction to Transaction, Properties of Transaction,



Transaction Processing System Concepts, Schedules and Recoverability, Serializability of Schedules.

**Suggested Readings:**

1. Elmasri, R. and Navathe, S. B., "*Fundamentals of Database Systems*", Pearson Education, 7th Edition, 2017.
2. Silberschatz, A., Korth, H. F., Sudarshan, S., "*Database System Concepts*", McGraw Hill, 6th Edition, 2010.
3. Ramakrishnan, R., Gehrke, J., "*Database Management Systems*", McGraw Hill, 3rd Edition, 2002
4. Bayross, Ivan, "*SQL, PL/SQL the Programming Language of Oracle*", BPB Publication, 4th Edition, 2010.



## BCA-19-25 Discrete Mathematics

Maximum marks: 100

Time: 3 hours

External: 80

Internal: 20

### Course Objectives:

1. To understand the basic concept of discrete mathematical structures.
2. To know about the Relation and Function in Set Theory.
3. To get the idea of Propositional Calculus and Counting.
4. To acquire the knowledge of Boolean algebra, Graph and Tree structures.

**Examiner's Note:** All Question are compulsory. The Question Paper is divided into four sections A, B, C, and D. Section A is compulsory and comprises of 12 questions of one mark each, 3 from each unit of the syllabus. The question shall be asked in such a manner that there are no direct answers including one word answer, fill in the blanks or multiple choice questions. Section B comprises of 4 questions of 3 marks each, one from each unit. Section C comprises of 4 questions of 6 marks each, one from each unit. Each question shall have two alternatives, out of which student will be required to attempt one. Section D comprises of 4 questions of 8 marks each, one from each unit. Each question shall have two alternatives, out of which student will be required to attempt one.

### UNIT - I

**Set Theory:** Basic Set Theory, operations on Sets, Algebra of sets, venn Diagrams.

**Relations:** Binary Relations, Complement of relations, Inverse of Relations, Composite relations, properties, Equivalence, Partial Order and Total order relations.

**Functions:** Functions on Set, Domain, Co-domain, Representation of Functions, Types, Identity and Inverse Functions, Composition of Functions, Applications

### UNIT -II

**Propositional Calculus:** Propositional logic, Equivalences, Predicates, Quantifiers, Nested quantifiers, Rules of Inference, Normal Forms, Proofs: Methods, strategy.

**Counting:** Pigeonhole Principle, Inclusion-Exclusion Principle, Permutations and Combinations, Binomial Coefficients, Counting Principles, Applications.

### UNIT -III

**Advanced counting Techniques:** Recurrence Relations, Solving Recurrence Algorithms and Recurrence Relations, Solution of Recurrence Relations Function.

**Lattices and boolean algebra:** Lattices, Hasse Diagram, Principle of Duality, Types of Lattices, Special Lattices, Boolean Expression, Equivalent circuits, Dual, Normal Forms.

### UNIT -IV

**Graphs:** Introduction, Terminology, Types of Graphs, Representation of Graphs, paths and Circuits, Cutset and Cut - Vertices, Graph Isomorphism, Homomorphism, Connectivity, Bipartite Graphs, Subgraphs, Operations on Graphs, Euler and Hamiltonian Paths, Shortest Path Problem, Planar & Dual Graphs, Coloring Covering and Partitioning.

**Tree:** Tree Notations, Properties of tree, Types of Tree, Minimum Spanning Tree (MST).

### Suggested Readings:

DCSA, CRSU, Jind

*Abstract*



1. Kenneth G. Rosen, "*Discrete Mathematics and Its Applications*", Tata McGraw Hill, 7th Edition.
2. Koshy T., "*Discrete Mathematics with Applications*", Elsevier India, 1st Edition.
3. Gossett E., "*Discrete Mathematics with Proof*", Wiley India Pvt. Ltd, 2nd Edition.
4. Lipshutz Seymour, Lipson Marc, "*Shaum's Outlines of Discrete Mathematics*", Tata McGraw Hill, 3rd Edition.



## BCA-19-26 Modeling and Simulation

Maximum marks: 100  
Time: 3 hours

External: 80  
Internal: 20

### Course Objectives:

1. To understand the concept of Simulation and Modeling.
2. To know about various techniques of Simulation.
3. To get the idea of Queuing Models.

**Examiner's Note:** All Question are compulsory. The Question Paper is divided into four sections A, B, C, and D. Section A is compulsory and comprises of 12 questions of one mark each, 3 from each unit of the syllabus. The question shall be asked in such a manner that there are no direct answers including one word answer, fill in the blanks or multiple choice questions. Section B comprises of 4 questions of 3 marks each, one from each unit. Section C comprises of 4 questions of 6 marks each, one from each unit. Each question shall have two alternatives, out of which student will be required to attempt one. Section D comprises of 4 questions of 8 marks each, one from each unit. Each question shall have two alternatives, out of which student will be required to attempt one.

### UNIT-I

System and System Environment, Components of a System, Discrete and Continuous System, Models of System and Types of Models, Discrete Event System Simulation, Advantages and Disadvantages of Simulation, Areas of Applications.

### UNIT-II

Techniques of Simulation: Properties of Random Numbers, Techniques of Generating Random Numbers, Pseudo Random Numbers, Monte Carlo Method, Types of System Simulation, Real Time Simulation, Stochastic Variables, Discrete Probability Functions.

### UNIT-III

Useful Statistical Models, Discrete Distributions, Continuous Distributions, Poisson's Process, Empirical Distributions

### UNIT-IV

Queuing Models: Characteristics of Queuing Systems, Queuing Notations, Measure of Performance of Queuing Systems, Steady State Behavior of Infinite Population Markovian Model.

### Suggested Readings:

1. Deo, Narsingh, "System Simulation with Digital computer", PHI, 2004.
2. Gordon, Geofrery, "System Simulation", 2nd Revised edition.
3. Myron H. MacDougall, "Simulating Computer Systems: Techniques and Tools", The MIT Press

**BCA-19-27 Software Laboratory - III**

**Maximum marks:** 100

**Time:** 3 hours

**External:** 80

**Internal:** 20

The students have to implement at least 15 programs during the course in accordance with paper BCA-19-21

The examiner has to set two programs with internal choice on the spot covering the concepts covered in paper BCA-19-21



**BCA-19-28 Software Laboratory - IV**

**Maximum marks: 100**

**Time: 3 hours**

**External: 80**

**Internal: 20**

The students have to implement at least 15 programs during the course in accordance with paper BCA-19-24

The examiner has to set two programs with internal choice on the spot covering the concepts covered in paper BCA-19-24



**BCA-19-29 Student Seminar**

**Maximum marks: 100**

**Time: 3 hours**

**External:**

**Internal: 20**

The students have to deliver a Seminar on the latest development in the field of Computer Science. The Teacher concerned will assign the different topics to all the students.



## BCA-19-31 Object Oriented Programming using C++

Maximum marks: 100

Time: 3 hours

External: 80

Internal: 20

### Course Objectives:

1. To understand the concept of mapping real objects into programming constructs.
2. To know about various Object oriented techniques like Inheritance, Polymorphism.
3. To get the idea of Templates.

**Examiner's Note:** All Question are compulsory. The Question Paper is divided into four sections A, B, C, and D. Section A is compulsory and comprises of 12 questions of one mark each, 3 from each unit of the syllabus. The question shall be asked in such a manner that there are no direct answers including one word answer, fill in the blanks or multiple choice questions. Section B comprises of 4 questions of 3 marks each, one from each unit. Section C comprises of 4 questions of 6 marks each, one from each unit. Each question shall have two alternatives, out of which student will be required to attempt one. Section D comprises of 4 questions of 8 marks each, one from each unit. Each question shall have two alternatives, out of which student will be required to attempt one.

### UNIT-I

**Structure of C++ program:** Data-types, Variables, Static Variables, Operators in C++, Arrays, Strings, Structure, Functions, Recursion, Control Statements.

**Introduction to Class:** Class Definition, Classes and Objects, Access Specifiers: Private, Public and Protected, Member functions of the class, Constructor and Destructor, Parameterized Constructor, Copy Constructors.

### UNIT-II

**Inheritance:** Reusability, Types of Inheritance: Single inheritance, Multiple, Multilevel, Hybrid Inheritance, Public, Private, and Protected Derivations, Using derived class, Constructor and destructor in derived class, Object initialization and conversion, Nested classes(Container classes), Virtual Inheritance and Virtual base class.

### UNIT-III

**Polymorphism:** Function Overloading, Static Class Members, Static Member Functions, Friend Functions, Operator Overloading: Unary and Binary Operator Overloading. Abstract class, Virtual function, Pure virtual function, Overloading vs. Overriding. Memory management: new, delete, object Creation at Run Time, This Pointer. Exception handling: Throwing, Catching, Rethrowing an exception, specifying exceptions, processing unexpected exceptions, Exceptions when handling exceptions, resource capture and release.

### UNIT-IV

**Templates:** Introduction, Class templates and Function templates, Overloading of template function, namespaces. Introduction to STL: Standard Template Library: benefits of STL, containers, adapters, iterator, vector, list.

Suggested Readings:

DCSA, CRSU, Jind

Page No.30

1. Stroustrup Bjarne, "*The C++ Programming Language*", Addison-Wesley Professional, 4th Edition.
2. Scildt Herbert, "*The Complete Reference C++* ", Tata McGraw-Hill, 4th Edition.
3. Lafore Robert, "*Object Oriented Programming in C++*", Pearson, 4th Edition
4. Lippman S.B., Lajoei J., Moo B.E., "*C++ Primer*", Pearson, 4th Edition



## BCA-19-32 Computer Oriented Numerical Methods

Maximum marks: 100

Time: 3 hours

External: 80

Internal: 20

### Course Objectives:

1. To understand the concept computational numerical methods.
2. To know about System of Linear Equations, Numerical Differentiation and Integration.
3. To implement various Iterative Numerical Methods.

**Examiner's Note:** All Question are compulsory. The Question Paper is divided into four sections A, B, C, and D. Section A is compulsory and comprises of 12 questions of one mark each, 3 from each unit of the syllabus. The question shall be asked in such a manner that there are no direct answers including one word answer, fill in the blanks or multiple choice questions. Section B comprises of 4 questions of 3 marks each, one from each unit. Section C comprises of 4 questions of 6 marks each, one from each unit. Each question shall have two alternatives, out of which student will be required to attempt one. Section D comprises of 4 questions of 8 marks each, one from each unit. Each question shall have two alternatives, out of which student will be required to attempt one.

### UNIT-I

Computer Arithmetic: Floating-point representation of numbers, arithmetic operations with normalized floating point numbers and their consequences. Error in number representation - pitfalls in computing.

Roundoff Error and Floating Point Arithmetic, Error Propagation, Interval Arithmetic, Statistical Roundoff Estimation.

System of Linear Equations: Gauss Elimination Method, Gauss-Jordan Method, Cholesky Decomposition, Error Bounds, Round Off Error Analysis of Gauss Elimination Method, Roundoff Error Analysis in Solving Triangular Systems, Ill conditioned Equations.

### UNIT-II

Numerical Differentiation and Integration: Differentiation formulae based on polynomial fit, Pitfalls in differentiation, Trapezoidal, Simpson's rules and Gaussian Quadrature.: Integration Formulas of Newtons and Cotes, Peano's Error Representation, Euler – Maclaurin Summation Formula, Integration by Extrapolation, Gaussian Integration Method, Integrals with Singularities.

### UNIT-III

Iterative Methods: Bisection, False position, Newton-Raphson methods, Discussion of convergences. Graeffe's Root Squaring Method and Bairstow's Method. Gauss-Seidal iterative method, Euler method, Euler's Modified Method, Taylor-Series Method, Runge-Kutta method, Predictor-Corrector methods.

### UNIT-IV

Eigenvalue Problems: Basic facts of Eigenvalues, Jordan Normal Form of a Matrix, Frobenius Normal Form of a Matrix, Schur Normal Form of Matrix, Hermitian and Normal Matrix, Singular Value of Matrices, Reduction of Hermitian Matrix to Diagonal and Tridiagonal Form,



Methods for determining Eigenvalues and Eigenvectors, Computation of Singular Value of Matrix, Generalized Eigenvalue Problems, Estimation of Eigenvalues.

**Suggested Readings:**

1. Sastry, S. S., *"Introductory Methods of Numerical Analysis"*, PHI Learnings, 5th Edition
2. Balagurusamy, E., *"Numerical Methods"*, Tata McGraw Hill, 1st Edition
3. Jain, M. K., Iyengar S. R., Jain R. K., *"Numerical Methods for Scientific and Engineering Computation"*, Tata McGraw Hill, 6th Edition
4. Stoer J., Bulirsch R., *"Introduction to Numerical Analysis"*, Springer, 2nd Edition.

*Ashwini*

## BCA-19-33 Web Designing

Maximum marks: 100  
Time: 3 hours

External: 80  
Internal: 20

### Course Objectives:

1. To understand the concept of designing a Web site.
2. To know about basics of Internet and HTML, DHTML.
3. To acquire the knowledge of Java Script and XML.

**Examiner's Note:** All Question are compulsory. The Question Paper is divided into four sections A, B, C, and D. Section A is compulsory and comprises of 12 questions of one mark each, 3 from each unit of the syllabus. The question shall be asked in such a manner that there are no direct answers including one word answer, fill in the blanks or multiple choice questions. Section B comprises of 4 questions of 3 marks each, one from each unit. Section C comprises of 4 questions of 6 marks each, one from each unit. Each question shall have two alternatives, out of which student will be required to attempt one. Section D comprises of 4 questions of 8 marks each, one from each unit. Each question shall have two alternatives, out of which student will be required to attempt one.

### UNIT - I

**Internet Basics:** The Internet and its Advantages disadvantages, Basic Internet Protocols, World Wide Web, URL, Web Page, Web Browser, Web Servers, Client-Server model, FTP, Telnet, Search Engine.

**Mark Up Languages:** Introduction to HyperText Markup Language (HTML), Elements, Lists, Tables, Linking documents, Frames, Forms, Creating HTML pages.

### UNIT - II

**Dynamic Hypertext Mark Up language:** Cascading Style Sheets: Features, Core Syntax, Types, Style Sheets and HTML, StyleRules -Cascading and Inheritance, Text Properties, CSS Box Model, Normal Flow, Box Layout, Positioning and other useful-Style Properties.

### UNIT - III

**Client-Side Programming:** Introduction to JavaScript, Perspective, Basic Syntax, Data Types, Variables Statements, Operators, Literals, Control statements, Functions, Arrays, Document Object Model, Built-in Objects.

### UNIT - IV

**XML:** Relation between XML, HTML, SGML, Goals of XML, Structure and Syntax of XML, Well Formed XML, DTD and its Structure, Namespaces and Data Typing in XML, Transforming XML Documents. XPATH.

### Suggested Readings:

1. Jackson, Jeffrey C., "Web Technologies: A Computer Science Perspective", Pearson Education, 2006.
2. Powell, Thomas, "The Complete Reference HTML", Tata McGraw Hill, 3rd Edition.
3. Godbole, A., Kahate A., "Web Technologies", Tata McGraw Hill, 3rd Edition, 2013.
4. Bayross, Ivan, "Web Enabled Commercial Application Development", BPB, 2005.

## BCA 19-34 Operating System

Maximum marks: 100

Time: 3 hours

External: 80

Internal: 20

### Course Objectives:

1. To understand the design and functionality of Operating System.
2. To know about Process management and concurrent processes..
3. To acquire the knowledge of Memory management.
4. To provide the idea of various Disk scheduling techniques and Security.

**Examiner's Note:** All Question are compulsory. The Question Paper is divided into four sections A, B, C, and D. Section A is compulsory and comprises of 12 questions of one mark each, 3 from each unit of the syllabus. The question shall be asked in such a manner that there are no direct answers including one word answer, fill in the blanks or multiple choice questions. Section B comprises of 4 questions of 3 marks each, one from each unit. Section C comprises of 4 questions of 6 marks each, one from each unit. Each question shall have two alternatives, out of which student will be required to attempt one. Section D comprises of 4 questions of 8 marks each, one from each unit. Each question shall have two alternatives, out of which student will be required to attempt one.

### UNIT - I

**Introduction and Process Management:** Operating System Services, System Calls, System Programs, Process concepts, Process operations, Interprocess Communication, Scheduling Criteria, Scheduling Algorithms, Comparative Study of Scheduling Algorithms.

### UNIT - II

**Concurrent Processes:** Critical Section Problem, Semaphores, Classical Process Co-ordination Problems and their Solutions, Monitors, Synchronization Examples. Deadlocks: Deadlock Characterization, Deadlock Prevention and Avoidance, Deadlock detection and Recovery.

### UNIT - III

**Memory Management:** Swapping, Paging, Segmentation, Virtual Memory Concepts: Demand Paging, Page Replacement Algorithms, Thrashing, Storage Management: File Concepts, File Access and Allocation Methods.

### UNIT - IV

**Secondary Storage :** Disk Structure, Disk Scheduling algorithm: FCFS, SSTF, SCAN, LOOK, C-SCAN, C-LOOK. Protection & Security: Goals & Principles of Protection, Domains of Protection, Access Matrix, Access Controls. Security: Security problem, Threats, Security tools, Classification.

### Suggested Readings:

1. Silberschatz, A., Galvin, P. B., Gagne, G., "Operating System Concepts", Wiley, 10th Edition.
2. Tanenbaum, A. S., Woodhull, A. S., "Operating Systems: Design and Implementation", PHI, 3rd Edition.
3. Godbole, A. S., Kahate, A., "Operating Systems", Tata McGraw Hill, 2005
4. Stallings, W., "Operating Systems", PHI, 9th Edition.

*Ashish*

## BCA-19-35 Computer Oriented Optimization Techniques

Maximum marks: 100

Time: 3 hours

External: 80

Internal: 20

### Course Objectives:

1. To understand various Optimization Techniques in Operations Research.
2. To know about the concept of Liners Programming and Assignment problems.
3. To acquire the knowledge of Transportation and PERT, CPM and Goal Programming.
4. To provide the idea of Decision Making and Dynamic Programming.

**Examiner's Note:** All Question are compulsory. The Question Paper is divided into four sections A, B, C, and D. Section A is compulsory and comprises of 12 questions of one mark each, 3 from each unit of the syllabus. The question shall be asked in such a manner that there are no direct answers including one word answer, fill in the blanks or multiple choice questions. Section B comprises of 4 questions of 3 marks each, one from each unit. Section C comprises of 4 questions of 6 marks each, one from each unit. Each question shall have two alternatives, out of which student will be required to attempt one. Section D comprises of 4 questions of 8 marks each, one from each unit. Each question shall have two alternatives, out of which student will be required to attempt one.

### UNIT – I

Introduction: The Historical development, Nature, Meaning and Management Application of Operations research. Modelling, Its Principal and Approximation of O.R.Models, Main characteristic and phases, General Methods of solving models, Scientific Methods, Scope, Role on Decision Making and Development of Operation Research.

Linear Programming: Formulation, Graphical solution, standard and matrix form of linear programming problems, Simplex method and its flow chart, Two-phase Simplex method, Degeneracy.

### UNIT – II

Assignment Models: Formulation of problem, Hungarian Method for Assignment Problems, Unbalanced Assignment Problems, Restricted Assignment Problems, Travelling Salesman Problem.

Transportation Problem : North West Corner Rule, Row Minima, Column Minima, Lowest Cost Entry, Vogel Approximation method, MODI Method, Degeneracy, Unbalanced and Restricted Transportation Problems, Transshipment Problems.

### UNIT – III

PERT and CPM: Basic steps in PERT/CPM, Techniques, Network Diagram Representation, Forward and Backward Pass-computation, Representation in Tabular form, Determination of Critical path, Critical activity, Difference between CPM and PERT, Floats and Slack Times.

#### UNIT – IV

Dynamic Programming : Developing Optimal Decision Policy, Dynamic Programming under Certainty: Shortest Route Problem, Multiplicative Separable Return Function and Single Additive Constraint, Additive Separable Return Function and Single Additive Constraint, Additively Separable Return Function and Single Multiplicative Constraint.

#### Suggested Readings:

1. Gupta P.K., Hira D.S., "*Operation Research*", Sultan Chand & Sons, 7th Edition.
2. Kanti Swarup, Gupta P.K., Man Mohan, "*Operation Research*", Sultan Chand & Sons, 2014.
3. Taha H. A., "*Operation Research – An Introduction*", Pearson, 10th Edition.
4. Rao S.S., "*Engineering Optimization: Theory and Practice*", New Age International, 3rd Edition.
5. Mittal, K.V., Mohan C., "*Optimization Methods in Operations Research and System Analysis*", New Age International, 3rd Edition.



## BCA-19-36 Information Security

Maximum marks: 100

Time: 3 hours

External: 80

Internal: 20

### Course Objectives:

1. To understand Basic Encryption and Decryption Techniques in Information Security.
2. To know about the concept of Liners Programming and Assignment problems.
3. To acquire the knowledge of Transportation and PERT, CPM and Goal Programming.
4. To provide the idea of Decision Making and Dynamic Programming.

**Examiner's Note:** All Question are compulsory. The Question Paper is divided into four sections A, B, C, and D. Section A is compulsory and comprises of 12 questions of one mark each, 3 from each unit of the syllabus. The question shall be asked in such a manner that there are no direct answers including one word answer, fill in the blanks or multiple choice questions. Section B comprises of 4 questions of 3 marks each, one from each unit. Section C comprises of 4 questions of 6 marks each, one from each unit. Each question shall have two alternatives, out of which student will be required to attempt one. Section D comprises of 4 questions of 8 marks each, one from each unit. Each question shall have two alternatives, out of which student will be required to attempt one.

### UNIT-I

Basic Encryption and Decryption: Introduction to Ciphers, Monoalphabetic Substitutions Such as the Caesar Cipher, Cryptanalysis' of Monoalphabetic Ciphers , Polyalphabetic Ciphers such as Vigenere Tableaux , Cryptanalysis of Polyalphabetic Ciphers, Perfect Substitution Cipher Such as the Vernam Cipher, stream and block Ciphers.

### UNIT-II

Properties of Arithmetic Operations: Inverses, Primes, Greatest common Divisor, Euclidean Algorithm, Modular Arithmetic, Properties of Modular Arithmetic, Computing the inverse, Fermat Theorem, Algorithm for Computing Inverses, Random number generation.

### UNIT-III

Secure Secret key (Symmetric ) Systems : Data Encryption standard (DES),Analyzing and Strengthening of DES, Public Key (Asymmetric key)Encryption Systems: Concept of Public key Encryption system, Introduction to Merkle, Hellman Knapsacks, Rivest, Shamir, Adelman (RSA) Encryption.

### UNIT-IV

Digital Signature Algorithms (DSA), Hash Algorithms: Hash concept,Description of Hash Algorithms, Algorithms such as MD4 and MD5, Secure Hash Algorithms (SHA).

### Suggested Readings:

1. William Stallings, "Cryptography and Network Security - Principles and Practice", Pearson, 7th Edition, 2017.

2. William Stallings , " *Network Security Essentials: Applications and Standards*" , Pearson, 6th Edition, 2018.
3. Charlie Kaufman, Radia Perlman, Mike Speciner, "*Network Security : Private Communication in Public World*", Pearson, 2nd Edition, 2016.



**BCA-19-37 Software Laboratory - V**

**Maximum marks: 100**

**Time: 3 hours**

**External: 80**

**Internal: 20**

The students have to implement at least 15 programs during the course in accordance with paper BCA-19-31

The examiner has to set two programs with internal choice on the spot covering the concepts covered in paper BCA-19-31



**BCA-19-38 Software Laboratory - VI**

**Maximum marks: 100**

**Time: 3 hours**

**External: 80**

**Internal: 20**

The students have to implement at least 15 programs during the course in accordance with paper BCA-19-33

The examiner has to set two programs with internal choice on the spot covering the concepts covered in paper BCA-19-33



**BCA-19-39 Student Seminar**

**Maximum marks: 100**

**Time: 3 hours**

**External:**

**Internal: 20**

The students have to deliver a Seminar on the latest development in the field of Computer Science. The Teacher concerned will assign the different topics to all the students.



## BCA-19-41 Programming with Java

Maximum marks: 100

Time: 3 hours

External: 80

Internal: 20

### Course Objectives:

1. To understand the concept of platform independent programming.
2. To know about the Virtual Machine and Object oriented programming using Java.
3. To acquire the knowledge about Java Packages and Exception handling.
4. To provide the idea of Multithreaded and Applet Programming.
5. To how to handle Events in GUI programing.

*Examiner's Note: All Question are compulsory. The Question Paper is divided into four sections A, B, C, and D. Section A is compulsory and comprises of 12 questions of one mark each, 3 from each unit of the syllabus. The question shall be asked in such a manner that there are no direct answers including one word answer, fill in the blanks or multiple choice questions. Section B comprises of 4 questions of 3 marks each, one from each unit. Section C comprises of 4 questions of 6 marks each, one from each unit. Each question shall have two alternatives, out of which student will be required to attempt one. Section D comprises of 4 questions of 8 marks each, one from each unit. Each question shall have two alternatives, out of which student will be required to attempt one.*

### UNIT-I

Introduction: Java Features, Java Virtual Machine(JVM), Byte code, Java API, Java Development Kit (JDK), Garbage Collection.

Language Basics: Keywords, Constants, Variables and Data Types, Operators and Expressions, Decision Making , Branching and Looping.

Introducing Classes, Objects and Methods: Defining a Class, Methods Declaration, Creating Objects and accessing Class members, Constructors, Methods Overloading, Wrapper Classes, Inheritance, Methods Overriding, Final Class, variables and methods, Abstract Class and Methods, Interfaces.

### UNIT-II

Arrays, Strings and Vectors: Creating and using Arrays, String operations, String Buffer, String Builder, and StringTokenizer class, Vector class.

Packages and Exceptions: Java API packages, Creating and using packages, static import, Exceptions handling, Types of Exceptions, multiple catch statements, 'throw' and 'throws', using 'finally' statement, Creating your own exceptions.

### UNIT-III

Multithreaded Programming: Single threaded and multi-threaded program, Creating threads using Thread class, Life cycle of a Thread, Stopping and blocking a Tread, getting and setting the Thread Priority, Synchronization, implementing the Runnable interface.

Managing Input/Output Streams: Concept of streams, Byte and Character streams, Reading and Writing from Console and Files. Input output exceptions.

#### UNIT-IV

Applet Programming: How Applets differs from Java Application, Applet Life Cycle, APPLET Tag, Running an Applet, Passing Parameters to Applet.

Event Handling: Mechanism, The Delegation Event Model, Event Classes, Event Listener Interfaces, Adapter and inner classes.

GUI Programming: Working with Frame Window, Graphics and Text, AWT Controls and classes.

#### Suggested Readings:

1. Balagurusamy, E., "*Programming with Java : A Primer*", McGraw Hill, 3<sup>rd</sup> edition.
2. Herbert Schildt, "*Java: The Complete Reference*", McGraw Hill, 7<sup>th</sup> edition.
3. Eckel, Bruce, "*Thinking in Java*", Prentice Hall, 4<sup>th</sup> Edition.
4. Cay S. Horstmann, Gary Cornell, "*Core Java Volume I—Fundamentals*", Prentice Hall, 9<sup>th</sup> Edition.



#### UNIT-IV

Applet Programming: How Applets differs from Java Application, Applet Life Cycle, APPLET Tag, Running an Applet, Passing Parameters to Applet.

Event Handling: Mechanism, The Delegation Event Model, Event Classes, Event Listener Interfaces, Adapter and inner classes.

GUI Programming: Working with Frame Window, Graphics and Text, AWT Controls and classes.

#### Suggested Readings:

1. Balagurusamy, E., "*Programming with Java : A Primer*", McGraw Hill, 3<sup>rd</sup> edition.
2. Herbert Schildt, "*Java: The Complete Reference*", McGraw Hill, 7<sup>th</sup> edition.
3. Eckel, Bruce, "*Thinking in Java*", Prentice Hall, 4<sup>th</sup> Edition.
4. Cay S. Horstmann, Gary Cornell, "*Core Java Volume I—Fundamentals*", Prentice Hall, 9<sup>th</sup> Edition.



## BCA-19-42 Computer Oriented Statistical Methods

**Maximum marks:** 100

**Time:** 3 hours

**External:** 80

**Internal:** 20

### **Course Objectives:**

1. To understand the concept of various statistical methods.
2. To know about the Linear Regression and Data Sampling and Collection techniques.
3. To acquire the knowledge about Statistical Interference, Point and Interval Estimation
4. To provide the idea of Hypothesis Testing.

**Examiner's Note:** All Question are compulsory. The Question Paper is divided into four sections A, B, C, and D. Section A is compulsory and comprises of 12 questions of one mark each, 3 from each unit of the syllabus. The question shall be asked in such a manner that there are no direct answers including one word answer, fill in the blanks or multiple choice questions. Section B comprises of 4 questions of 3 marks each, one from each unit. Section C comprises of 4 questions of 6 marks each, one from each unit. Each question shall have two alternatives, out of which student will be required to attempt one. Section D comprises of 4 questions of 8 marks each, one from each unit. Each question shall have two alternatives, out of which student will be required to attempt one.

### **UNIT-I**

Probability: Probability Rules, Random Variables and Probability Functions, Expected Values, Bivariate Expected Values.

Data, Data Types, Sources of Data, Data Summarization, Central Tendency, Variance, Standard Deviation, Correlation Analysis : Correlation Coefficient and Rank Correlation, Linear Regression, Weighted Least Square Regression, Log Linear Regression.

### **UNIT-II**

Sampling : Simple Random Sampling, Systematic Sampling, Stratified Sampling, Cluster Sampling, Quota Sampling, Minimax Sampling, Line Intercept Sampling, Panel Sampling, Snowball Sampling, Methods of Producing Random Samples, Random Walk Monte Carlo Methods, Training Based Markov Chain Monte Carlo Methods, Sample Size Determination, Sampling and Data Collection, Sampling Errors and Biases, Non Sampling Errors.

### **UNIT-III**

Statistical Interference: Parameters and Likelihoods

Point Estimation: Bias, Method of Moment, Least Square, Weighted Least Square, Maximum Likelihood,

Interval Estimation: Confidence Intervals, Single Sample Interval for Gaussian Parameters, Two Sample Interval for Gaussian Parameters, Wald Intervals, Likelihood Intervals, Delta Method Intervals, Bootstrap Intervals.

### **UNIT-IV**

Testing Hypothesis: T-Test, F-Test, Chi-Square Test, One-Way Anova, Two-Way Anova, Single Sample Test for Gaussian Parameters, Two Samples Test for Gaussian Parameters, Wald Test, Likelihood Ratio Test.

**Suggested Readings:**

1. Levin, Richard, David S. Rubin, Sanjay Rastogi and H. M. Sidiqqi, "*Statistics for Management*", 7<sup>th</sup> Edition, Pearson Education, 2015.
2. Anderson, David R., Sweeny, Dennis J., Williams, Thomas A., "*Statistics for Business and Economics*", Cengage Learning, 11<sup>th</sup> Edition.
3. Vohra, N. D., "*Business Statistics*", McGraw Hill Education, 2015.
4. David M Levine, Mark L Berenson, Timothy C Krehbiel, P K Viswanathan, "*Business Statistics: A First Course*", Pearson Education, 2016
5. Siegel, Andrew F, "*Practical Business Statistics*", McGraw Hill Education, 2015



## BCA-19-43 Computer Networks

Maximum marks: 100

Time: 3 hours

External: 80

Internal: 20

### Course Objectives:

1. To understand the concept of Networking.
1. To get familiar with various Network Reference model and Communication Model.
2. To understand the basics of Switching and Multiplexing
3. To know about the Data Link and Network Layer.

**Examiner's Note:** All Question are compulsory. The Question Paper is divided into four sections A, B, C, and D. Section A is compulsory and comprises of 12 questions of one mark each, 3 from each unit of the syllabus. The question shall be asked in such a manner that there are no direct answers including one word answer, fill in the blanks or multiple choice questions. Section B comprises of 4 questions of 3 marks each, one from each unit. Section C comprises of 4 questions of 6 marks each, one from each unit. Each question shall have two alternatives, out of which student will be required to attempt one. Section D comprises of 4 questions of 8 marks each, one from each unit. Each question shall have two alternatives, out of which student will be required to attempt one.

### UNIT - I

Introduction to Computer Networks and its uses, Network categorization and Hardware: Broadcast and point-to-point networks, LAN, MAN, WAN, Internetworks, Topologies, Wireless networks, Network Software: Protocols, Services, network architecture, design issues, OSI Reference model, TCP/IP Reference model, Introduction to Example Networks: Internet, Connection-Oriented Networks – X.25, Frame Relay, ATM

### UNIT - II

Data Communication Model, Digital and Analog data and signals, Bit rate, Baud, Bandwidth, Guided Transmission Media : Twisted Pair, Coaxial cable, Optical fiber; Wireless transmission : Radio waves, microwaves, infrared waves; satellite communication. Switching: Circuit Switching, Packet Switching; Multiplexing: Frequency Division Multiplexing Time Division Multiplexing

### UNIT - III

Data Link Layer Design issues: Framing, error control, Flow Control, Error Detection and correction; Elementary Data Link Protocols, Sliding Window Protocols; Medium Access Control: Aloha, CSMA protocols, Collision free protocols, Limited Contention Protocols; Wavelength division Multiple access protocol, Wireless LAN Protocol: MACA; IEEE 802.3 Ethernet, IEEE 802.4 Token Bus; IEEE 802.5 Token ring, Digital Cellular, Radio: GSM, CDMA, FDDI

### UNIT - IV

Network Layer, Design issues, Virtual Circuit and Datagram Subnet, Routing Algorithms, Optimality principle, Shortest path Routing, Flooding , Distance Vector Routing, Link State Routing, Hierarchical Routing, Broadcast and Multi Cast Routing, Routing for Mobile hosts, Routing in Adhoc Networks, Leaky bucket token bucket, choke packets, Load Shedding.



**Suggested Readings:**

1. Tanenbaum, Andrew. S., "*Computer Networks*", PHI, 4th Edition.
2. Forouzan, Behrouz A., "*Introduction to Data communications and Networking*", McGraw Hill, 5th Edition
3. Shay, William A., "*Understanding Data Communications and Networks*", Cengage Learning, 3rd Edition.
4. Stallings William, "*Data and Computer Communication*", Pearson Education, 8th Edition.

*Ashutosh*

## BCA-19-44 Client Side Scripting

**Maximum marks:** 100

**Time:** 3 hours

**External:** 80

**Internal:** 20

### **Course Objectives:**

1. To understand the concept of Client Side Scripting
2. To get familiar with basic Java Script techniques.
2. To understand the functions and programming constructs of Java Script.
3. To know about the Java Script Document Object Model, Forms and Error handling.

**Examiner's Note:** All Question are compulsory. The Question Paper is divided into four sections A, B, C, and D. Section A is compulsory and comprises of 12 questions of one mark each, 3 from each unit of the syllabus. The question shall be asked in such a manner that there are no direct answers including one word answer, fill in the blanks or multiple choice questions. Section B comprises of 4 questions of 3 marks each, one from each unit. Section C comprises of 4 questions of 6 marks each, one from each unit. Each question shall have two alternatives, out of which student will be required to attempt one. Section D comprises of 4 questions of 8 marks each, one from each unit. Each question shall have two alternatives, out of which student will be required to attempt one.

### **UNIT-I**

**Introduction to scripting:** overview of Java Script, advantages, client side java Script, capturing user input, writing JavaScript into HTML

**Basic JavaScript Techniques:** Data types, literals, variables and operators, Java Script arrays, dense array, operators, expressions

### **UNIT-II**

**Java Script Programming Construct:** Assignment, data declaration, if, switch, while, for, do while, label, break, Continue, function call, return, with, delete, method invocation.

**JavaScript Functions:** Types of functions in Java Script-Built in functions, User defined functions, function declaration, passing parameters, variable scope, return values, recursive functions.

### **UNIT-III**

**Dialog boxes:** Alert dialog box, prompt dialog box, confirm dialog box, window objects

**JavaScript Document Object Model:** Understanding JDOM

**Forms:** Form object, properties and methods, elements: text, password, button, submit, reset, checkbox, Radio, Text Area, select & option, Other built-in Object-String object, math object, date object

### **UNIT-IV**

**User defined objects:** creation, instances, and objects within objects **Cookies:** Concept of cookies, setting a cookie, supply values to cookies.

**Errors and Debugging:** Error, Error Handling and Debugging



**Suggested Readings:**

1. David Flanagan, "*JavaScript: The Definitive Guide: Activate Your Web Pages*", O' Reilly,, 6th edition, 2011.
2. Thomas Powell, "*Javascript: the Complete Reference*", McGraw Hill, 3<sup>rd</sup> edition, 2012.
3. Douglas Crockford, "*JavaScript: The Good Parts*", O' Reilly, 1<sup>st</sup> edition, 2008.
4. Deitel, Deitel, Goldberg, "*Internet & World Wide Web How To Program*", 4th Edition, Pearson Education, 2009.
5. Robert. W. Sebesta, "*Programming the World Wide Web*", 4th Edition, Pearson Education, 2011.



## BCA-19-45 Internet Technologies

**Maximum marks:** 100

**Time:** 3 hours

**External:** 80

**Internal:** 20

### **Course Objectives:**

1. To understand the .NET internet technology.
2. To know about handling Database connections, Files and E-mails..
3. To get familiar with Security, Authentication and State management.

**Examiner's Note:** All Question are compulsory. The Question Paper is divided into four sections A, B, C, and D. Section A is compulsory and comprises of 12 questions of one mark each, 3 from each unit of the syllabus. The question shall be asked in such a manner that there are no direct answers including one word answer, fill in the blanks or multiple choice questions. Section B comprises of 4 questions of 3 marks each, one from each unit. Section C comprises of 4 questions of 6 marks each, one from each unit. Each question shall have two alternatives, out of which student will be required to attempt one. Section D comprises of 4 questions of 8 marks each, one from each unit. Each question shall have two alternatives, out of which student will be required to attempt one.

### **UNIT-I**

**Introduction to ASP.NET:** .NET Framework(CLR,CLI,BCL), ASP.NETBasics, ASP.NET PageStructure, PageLifeCycle.

**Controls:** HTML Server Controls, WebServer Controls, WebUser Controls, Validation Controls, Custom Web Controls.

### **UNIT-II**

**State Management:** View State, Control State, Hidden Fields, Cookies, QueryStrings, Application State, Session State, Profile Properties, Master Pages, Themes, Site Navigation.

**Security and User Authentication:** Basic Security Guidelines, Securing ASP.NET Applications, ASP.NET Memberships and Roles

### **UNIT-III**

Introduction to ADO.NET, DataBinding, Importing the SQLClient Namespace, Defining the Database Connection, Managing Content Using Grid View and Details View

### **UNIT-IV**

**Working with Files and Email:** Writing and Reading Text Files, Uploading Files, Sending Email with ASP.NET. Introduction to Web Services, Ajax, Silverlight

**Suggested Readings:**

1. Greg Buczek, "*ASP.NET Developer's Guide*", McGraw-Hill, 2002.
2. Chris Ullman, John Kauffman, "*Beginning ASP.NET 1.1 with VB.NET 2003*", Wrox Publication, 2004.
3. Matt J. Crouch, "*ASP.NET and VB.NET Web Programming*", Pearson Education, 2002.
4. Anne Boehm, Murach's, "*ASP.NET 4.6 Web Programming with C#*", 6th edition, 2015



## BCA-19-46 Artificial Intelligence

Maximum marks: 100

Time: 3 hours

External: 80

Internal: 20

### Course Objectives:

1. To understand the concept of Artificial Intelligence and Knowledge representation.
2. To get familiar with Search strategies.
3. To know about Production system and Expert System.
4. To understand the Genetic Algorithms and Natural Language Processing.

**Examiner's Note:** All Question are compulsory. The Question Paper is divided into four sections A, B, C, and D. Section A is compulsory and comprises of 12 questions of one mark each, 3 from each unit of the syllabus. The question shall be asked in such a manner that there are no direct answers including one word answer, fill in the blanks or multiple choice questions. Section B comprises of 4 questions of 3 marks each, one from each unit. Section C comprises of 4 questions of 6 marks each, one from each unit. Each question shall have two alternatives, out of which student will be required to attempt one. Section D comprises of 4 questions of 8 marks each, one from each unit, Each question shall have two alternatives, out of which student will be required to attempt one.

### UNIT-I

Introduction: Background, Overview of AI applications, The predicate calculus: Syntax and semantic for propositional logic and FOPL, Clausal form, inference rules, resolution and unification.

Knowledge representation: Network representation through Associative network & conceptual graphs, Structured representation- Frames & Scripts.

### UNIT-II

Search strategies: Strategies for state space search-data driven and goal driven search; Search algorithms- uninformed search (Depth first search, Breadth first search) and informed search ( Hill climbing, Best first, A\* algorithm, mini-max), computational complexity, Properties of search algorithms (Admissibility, Monotonicity, Optimality, Dominance).

### UNIT-III

Production system: Definition, Types of production system (Commutative, Non-commutative, Decomposable, Non-decomposable), Control of search in production systems. Expert System: Definition, Concept, Types of expert system, Rule based expert system: Architecture, Development, Managing uncertainty in expert systems - Bayesian probability theory, Stanford certainty factor algebra, Non-monotonic logic and reasoning with beliefs, Fuzzy logic, Dempster/Shaffer and other approaches to uncertainty.

### UNIT-IV

Knowledge acquisition: Definition of Knowledge, Types of learning (Learning by automata, Genetic algorithms, Intelligent editors, Learning by induction). Natural Language Processing (NLP): Problems in understanding natural languages, Different stages of language analysis,

Chomsky Hierarchy of formal languages, Transition network parsers (TNP), Augmented Transition Network Parsers (ATNP).

**Suggested Readings:**

1. George F. Luger, "*Artificial Intelligence*", Pearson Education, 5<sup>th</sup> Edition.
2. Dan W. Patterson, "*Introduction to Artificial Intelligence and Expert system*", PHI, 1<sup>st</sup> Edition.
3. Ben Coppin, "*Artificial Intelligence Illuminated*", Narosa Publishing House, 1<sup>st</sup> Edition.
4. Eugene Charniak, Drew McDermott, "*Introduction to Artificial Intelligence*", Pearson Education, 2016.
5. Nils J. Nilsson, "*Principles of Artificial Intelligence*", Narosa Publishing House, 1<sup>st</sup> Edition.



**BCA-19-47 Software Laboratory - VII**

**Maximum marks: 100**

**Time: 3 hours**

**External: 80**

**Internal: 20**

The students have to implement at least 15 programs during the course in accordance with paper BCA-19-41

The examiner has to set two programs with internal choice on the spot covering the concepts covered in paper BCA-19-41





**BCA-19-48 Software Laboratory - VIII**

**Maximum marks:** 100

**Time:** 3 hours

**External:** 80

**Internal:** 20

The students have to implement at least 15 programs during the course in accordance with paper BCA-19-44 and BCA-19-45

The examiner has to set two programs with internal choice on the spot covering the concepts covered in paper BCA-19-44 and BCA-19-45



**BCA-19-49 Student Seminar**

**Maximum marks:** 100  
**Time:** 3 hours

**External:**  
**Internal:** 20

The students have to deliver a Seminar on the latest development in the field of Computer Science. The Teacher concerned will assign the different topics to all the students.



## BCA-19-51 Computer Graphics

Maximum marks: 100

Time: 3 hours

External: 80

Internal: 20

### Course Objectives:

1. To understand the concept of Computer Graphics and its Applications.
2. To know about various Graphics Devices.
3. To get familiar with Graphics Algorithms.
4. To know about 2D Transformation and 2D Viewing.

**Examiner's Note:** All Question are compulsory. The Question Paper is divided into four sections A, B, C, and D. Section A is compulsory and comprises of 12 questions of one mark each, 3 from each unit of the syllabus. The question shall be asked in such a manner that there are no direct answers including one word answer, fill in the blanks or multiple choice questions. Section B comprises of 4 questions of 3 marks each, one from each unit. Section C comprises of 4 questions of 6 marks each, one from each unit. Each question shall have two alternatives, out of which student will be required to attempt one. Section D comprises of 4 questions of 8 marks each, one from each unit. Each question shall have two alternatives, out of which student will be required to attempt one.

### UNIT – I

Introduction: Survey of Computer Graphics and its applications, Components and working of Interactive Graphics, Display Processors;

Graphic Devices: Raster scan and Random Scan displays, Resolution, Aspect Ratio, Refresh CRT, Color CRT monitors, LookUp tables, Plasma Panel and LCD monitors, interlacing, grey shades; Interactive Input Devices: keyboard, mouse, trackball, joystick, light pen, digitizing tablet, image scanners, voice system; Hard Copy Devices: printers, plotters;

### UNIT – II

Drawing Geometry: Coordinate Systems; Output Primitives: symmetrical and simple DDA line drawing algorithm, Bresenham's line drawing, loading frame buffer; symmetrical DDA for drawing circle, Polynomial method for circle drawing; circle drawing using polar coordinates, Bresenham's circle drawing; generation of ellipse;

### UNIT – III

2-D Transformations: translation, rotation, scaling, matrix representations and homogeneous coordinates, composite transformations, general pivot point rotation, general fixed point scaling, shearing; reflection about X Axis and Y Axis; Reflection about Straight lines; Reflection through an Arbitrary Line

### UNIT – IV

2-D Viewing: window, viewport; 2-D viewing transformation, zooming, panning; Clipping operations: point and line clipping, Cohen-Sutherland line clipping, mid-point subdivision line clipping, Liang-Barsky line clipping, Sutherland-Hodgman polygon clipping.



**Suggested Readings:**

1. Hearn, Donald D., Baker, M. P., "*Computer Graphics*", Pearson, 2nd Edition.
2. D.P. Mukherjee, "*Fundamentals of Computer Graphics and Multimedia*", PHI, 1st Edition.
3. Newmann W., Sproull R., "*Principles of Interactive Computer Graphics*", McGraw Hill., 2001
4. Foley, Van Dam, Feiner, Hughes, "*Computer Graphics Principles & Practice*", Pearson, 3rd Edition.

## BCA-19-52 Introduction to Cloud Computing

Maximum marks: 100

Time: 3 hours

External: 80

Internal: 20

### Course Objectives:

1. To understand the concept of Clouding Computing.
2. To know about Seven step Model of Migration into a Cloud.
3. To get familiar with SaaS Paradigm.
4. To know about Virtual Machine infrastructure and Security in Cloud.
5. To understand the Integration of Private and Public Cloud

**Examiner's Note:** All Question are compulsory. The Question Paper is divided into four sections A, B, C, and D. Section A is compulsory and comprises of 12 questions of one mark each, 3 from each unit of the syllabus. The question shall be asked in such a manner that there are no direct answers including one word answer, fill in the blanks or multiple choice questions. Section B comprises of 4 questions of 3 marks each, one from each unit. Section C comprises of 4 questions of 6 marks each, one from each unit. Each question shall have two alternatives, out of which student will be required to attempt one. Section D comprises of 4 questions of 8 marks each, one from each unit. Each question shall have two alternatives, out of which student will be required to attempt one.

### UNIT-I

Introduction, Layers and Types of Cloud, Features of Cloud, Infrastructure as a Service, Platform as a Service, Software as a Service.

Broad Approaches of Migrating to a Cloud, Seven Step Model of Migration into a Cloud.

### UNIT-II

The Onset of Knowledge Era, Evolution of SaaS, Challenges of SaaS Paradigm, Approaching the SaaS integration Enigma, New Integration Scenarios, Integration Methodologies, SaaS Integration Products and Platforms, SaaS Integration Services, Business to Business Integration Services.

Issues of Enterprise Applications on Cloud, Transition Challenges, Enterprise Cloud Technology and Market Evolution, Business Drivers towards marketplace for Enterprise Cloud Computing, Cloud Supply Chain.

### UNIT-III

Virtual Machine, Provisioning and Manageability, Virtual Machine Migration Services, Anatomy of Cloud Infrastructure, Distributed Management of Virtual Infrastructure, Scheduling Techniques of Advanced Reservation of Capacity, Capacity Management to meet SLA Commitments.

Logical Design of Cluster as a Service, Cloud Storage from LAN to WAN, Technologies for Data Security in Cloud.

### UNIT-IV

Integration of Private and Public Cloud, Resource Provisioning Service, Hybrid Cloud Implementation, Importance of Quality and Security in Cloud, Business Ready Dynamic Data Centre, Dynamic ICT Services.

Workflow Management System and Clouds, Utilizing Clouds for Workflow Execution,

**Suggested Readings:**

1. Rajkumar Buyya, James Broberg and Andrzej Goscinski, "*Cloud Computing : Principles and Paradigms*", Wiley, 2010.
2. Lizhe Wang, Rajiv Ranjan, Jinjun Chen and Baualem Benatallah, "*Cloud Computing : Methodology Systems and Applications*", CRC Press, 2012.
3. Kris Jamsa, "*Cloud Computing*", Jones and Bartlett Learning, 2013.
4. Nayan Ruparelia, "*Cloud Computing*", MIT Press, 2015



## BCA-19-53 Data Warehousing

**Maximum marks:** 100

**Time:** 3 hours

**External:** 80

**Internal:** 20

### **Course Objectives:**

1. To understand the concept of Data Warehousing, System and Process architecture.
2. To know about Database Schema, Partitioning Strategy, and Aggregations.
3. To get familiar with Data Marting, Metadata, and Process Managers.
4. To know about Hardware Architecture, Backup and Recovery, and Operating Datawarehouse.

**Examiner's Note:** All Question are compulsory. The Question Paper is divided into four sections A, B, C, and D. Section A is compulsory and comprises of 12 questions of one mark each, 3 from each unit of the syllabus. The question shall be asked in such a manner that there are no direct answers including one word answer, fill in the blanks or multiple choice questions. Section B comprises of 4 questions of 3 marks each, one from each unit. Section C comprises of 4 questions of 6 marks each, one from each unit. Each question shall have two alternatives, out of which student will be required to attempt one. Section D comprises of 4 questions of 8 marks each, one from each unit. Each question shall have two alternatives, out of which student will be required to attempt one.

### **UNIT-I**

Introduction to Data Warehouse, Data Warehouse Delivery Methods

System Process : Typical Process Flow within a Data Warehouse, Extract and Load Process, Clean and Transform Data, Backup and Archive Process, Query Management Process.

Process Architecture: Load Manager, Warehouse Manager, Query Manager, Detailed Information, Summary Information, Metadata, Data Marting

### **UNIT-II**

Database Schema: Starflake Schema, Snowflake Schema, Fact Constellation Schema, Identifying facts and dimensions, Designing Fact Tables, Designing Dimension Table, Designing various schema, Query Redirection

Partitioning Strategy: Horizontal Partitioning, Vertical Partitioning, Hardware Partitioning, Sizing the partition.

Aggregations: Need of Aggregation, designing summary tables

### **UNIT-III**

Data Marting: Introduction, Need of Data Mart, Design of Data Mart, Cost of Data Mart.

Metadata: Data Transformation and Load, Data management, Query Generation, Metadata and tools.

Process Managers: Need of tools to manage data warehouse, system managers, data warehouse process managers, load manager, warehouse manager, query manager.

#### **UNIT-IV**

Hardware Architecture: Process, Server Hardware, Network Hardware, Client Hardware.

Physical Layout: Parallel Technology, Disk Technology, Database Layout, Filesystems.

Backup and Recovery: Backup Strategies, Testing the Strategy, Disaster Recovery.

Operating Datawarehouse: Introduction, Day to Day Operations of Data Warehouse, Overnight Processing.

#### **Suggested Readings:**

1. Berson Alex, Smith Stephen J., "*Data Warehousing, Data Mining and OLAP*", Tata McGraw Hill, 2008.
2. Anahory Sam, Murray Dennis, "*Data Warehousing in the Real Word*", Pearson Education, 2009.





## BCA-19-54 Software Project Management

**Maximum marks:** 100

**Time:** 3 hours

**External:** 80

**Internal:** 20

### **Course Objectives:**

1. To understand the concept of Software Project Management.
2. To know about Software reliability measures and models.
3. To get familiar with Role of TQM in software project management.
4. To know about Quality and Risk management.
5. To understand the Project tracking, Process monitoring and audit

**Examiner's Note:** All Question are compulsory. The Question Paper is divided into four sections A, B, C, and D. Section A is compulsory and comprises of 12 questions of one mark each, 3 from each unit of the syllabus. The question shall be asked in such a manner that there are no direct answers including one word answer, fill in the blanks or multiple choice questions. Section B comprises of 4 questions of 3 marks each, one from each unit. Section C comprises of 4 questions of 6 marks each, one from each unit. Each question shall have two alternatives, out of which student will be required to attempt one. Section D comprises of 4 questions of 8 marks each, one from each unit. Each question shall have two alternatives, out of which student will be required to attempt one.

### **UNIT-I**

Theoretical foundations for software metrics, Introduction to the measurement theory, Data collection and analysis, Classification of software measures, Application of software metrics Software reliability measures and models, Measuring the software development and maintenance processes, Experimental design and analysis, Software metrics validation, Predication systems

### **UNIT-II**

Calibration and validation of prediction systems, Overview of mature software processes and project management, Role of TQM in software project management, cost and effort estimates, Overall and detailed scheduling

### **UNIT-III**

Quality management, Defect estimation and prevention, Risk management , logging and tracking defects, project management plans, configuration management, project reviews for better project execution, Overcoming the Not Around Here (NAH) syndrome

### **UNIT-IV**

Project tracking (including defect tracking, status reports, milestone analysis), defect analysis and prevention (plus Pareto and causal analysis), Process monitoring and audit, Project closure analysis

### **Suggested Readings:**

1. Jalote, Pankaj, "Software Project Management in Practice", Addison-Wesley, 2002

*Dhoke*

2. N. E. Fenton, James Bieman , "*Software Metrics: A Rigorous and Practical Approach*", CRC Press, 2015
3. Bob Hughes, Mike Cotterell , "*Software Project Management*", McGraw-Hill, 2009
4. Gray, Clifford F., Lawson , Erik W. , "*Project Management: The Managerial Process*", McGraw-Hill , Fifth Edition, 2010



## BCA 19-55-1 ANGULAR JS

**Maximum marks:** 100

**Time:** 3 hours

**External:** 80

**Internal:** 20

**Credit :** 5

### **Course Objectives:**

1. To understand the concept of Angular JS technology.
2. To know about Filters and Directives.
3. To get familiar with Controllers and Module.
4. To understand the Scope and SPA.

**Examiner's Note:** Examiner will be required to set NINE questions in all. Question Number 1 will consist of total 8 parts (objective type/short-answer type questions) covering the entire syllabus and will carry 24 marks. In addition to the compulsory question there will be four units i.e. Unit-I to Unit-IV. Examiner will set two questions from each Unit of the syllabus and each question will carry 14 marks.

Student will be required to attempt FIVE questions in all. Question Number 1 will be compulsory. In addition to compulsory question, student will have to attempt four more questions selecting One question from each Unit.

### **UNIT-I**

Need of Angular JS, MVC, Angular Expressions, Built in Filters, Using Angular JS Filters  
Directives, Directive Lifecycle, Binding Controls to Data, Matching Directives,

### **UNIT-II**

Role of Controller, Controllers and Modules, Nested Controllers, Using Filters in Controllers

Introduction to Angular JS Modules, Working with Angular forms, Model Binding Forms, Updating Models with a twist.

### **UNIT-III**

Scope, Scope Lifecycle, Scope Inheritance, Scope and Controllers, Rootscope, Scope Broadcasting.

Dependency Injection, Creating Services, Factory Service and Provider.

### **UNIT-IV**

SPA, Pros and Cons of SPA, Passing Parameters, Changing Location.

ngAnimate module, CSS Transforms.

### **Suggested Readings:**

1. Seshadri S., Green B., "Angular JS Up and Running", O'Reilly, 2014.
2. Ruebelke L., "Angular JS in Action", Manning Publications, 2015.

## BCA 19-55-2 Node JS

**Maximum marks:** 100

**Time:** 3 hours

**External:** 80

**Internal:** 20

### **Course Objectives:**

1. To understand the concept of Node JS technology.
2. To know about Modules and Node Packet Manager.
3. To get familiar with handling Files and Events.
4. To use express framework to create web applications.
5. To know about how to handle the Database connections.

**Examiner's Note:** All Question are compulsory. The Question Paper is divided into four sections A, B, C, and D. Section A is compulsory and comprises of 12 questions of one mark each, 3 from each unit of the syllabus. The question shall be asked in such a manner that there are no direct answers including one word answer, fill in the blanks or multiple choice questions. Section B comprises of 4 questions of 3 marks each, one from each unit. Section C comprises of 4 questions of 6 marks each, one from each unit. Each question shall have two alternatives, out of which student will be required to attempt one. Section D comprises of 4 questions of 8 marks each, one from each unit. Each question shall have two alternatives, out of which student will be required to attempt one.

### **UNIT-I**

Functions, Buffer, Module, Module Types, Core Modules, Local Modules, Module Experts Node Packet Manager, Installing Packages Locally, Adding dependency in Packages, Installing Packages Globally, Updating packages. Creating Web Server, Handling http requests, sending requests.

### **UNIT-II**

Files, reading, writing, updating files, and the concept of chunks, buffers, and uploading files synchronously and asynchronously. debug Node JS application, events in Node JS, and the significance of the events, writing own events, event emitter class, inhering events.

### **UNIT-III**

To use express framework to create web applications: Configuring Routes, Working with Express. How to serve Static HTML pages to the browser, and serving other file formats and restricting certain files.

### **UNIT-IV**

Database Connectivity: Connection String, Configuring, Working with Select command, Updating and Deleting the Records.  
Template Engines: How to use template engines to perform two way data binding and appending dynamic data to the webpage and different view engines and their syntax

### **Suggested Readings:**

1. Sandro Pasquali, Kevin Faaborg, "Mastering Node.js", Packt Publishing Limited, 2017.
2. Jim R. Wilson, "Node.js the Right Way", O'Reilly, 2013.

3. Alex Young, Bradley Meck, Mike Cantelon, Tim Oxley, Marc Harter, T.J. Holowaychuk, Nathan Rajlich , "*Node.js in Action*", Dreamtech Press; 2nd edition,2017
4. Dhruvi Shah, "*Node .Js*", BPB Publications, 1st edition, 2018.



## BCA 19-56-1 Big Data Tools

**Maximum marks:** 100

**Time:** 3 hours

**External:** 80

**Internal:** 20

### **Course Objectives:**

1. To understand Big Data Platform and its usage.
2. To provide an overview of Apache Hadoop.
3. To provide HDFS concepts and interfacing with HDFS.
4. To understand MapReduce jobs.
5. To provide Hands on Hadoop Ecosystem.

**Note:** All Question are compulsory. The Question Paper is divided into four sections A, B, C, and D. Section A is compulsory and comprises of 12 questions of one mark each, 3 from each unit of the syllabus. The question shall be asked in such a manner that there are no direct answers including one word answer, fill in the blanks or multiple choice questions. Section B comprises of 4 questions of 3 marks each, one from each unit. Section C comprises of 4 questions of 6 marks each, one from each unit. Each question shall have two alternatives, out of which student will be required to attempt one. Section D comprises of 4 questions of 8 marks each, one from each unit. Each question shall have two alternatives, out of which student will be required to attempt one.

### **UNIT-I**

Types of Digital Data, Introduction to Big Data, Big Data Analytics, Apache Hadoop, Analysing data with UNIX/ LINUX tools, Analysing data with Hadoop, Hadoop Ecosystem

### **UNIT-II**

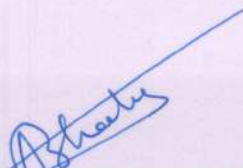
The concept and design of Hadoop Distributed File System, Command Line Interface, Data Flow, Data ingest with Floom and Scoop and Hadoop archives, Hadoop I/O: Compression, Serialization, Avro and File Based Data Structure

### **UNIT-III**

Anatomy of MapReduce job run, failures, Job Scheduling, Shuffle and Sort, Task Execution, MapReduce types and formats, MapReduce features.  
Introduction to PIG, Execution modes of PIG, Comparison of PIG with databases, Grunt, PIG Latin, User Defined Functions, Database Processing Operators

### **UNIT-IV**

Hive Shell, Hive Services, Hive Metastore, Comparison with traditional databases, HiveQL, Tables, Querying data and user defined functions.  
Hbase concepts, Clients, Hbase versus RDBMS, Introduction to BigSQL.



**Suggested Readings:**

1. DT Editorial Services. *"Big Data, Black Book"*, Dreamtech Press, 1st edition, 2016.
2. Tom White, *"Hadoop: The Definitive Guide"*, Shroff Publishers, 4th edition, 2015
3. Srinath Perera, Thilina Gunarathne, *"Hadoop MapReduce Cookbook"*, Packt Publishing Limited, 2013.
4. Michele Chambers, Ambiga Dhiraj Michael Minelli, *"Big Data, Big Analytics"*, Wiley, 2013.
5. Nathan Marz, James Warren, *"Big Data: Principles and Best Practices of Scalable Real-Time Data Systems"*, Dreamtech Press, 2015.

*Ashwini*

## BCA 19-56-2 Android Programming

Maximum marks: 100

Time: 3 hours

External: 80

Internal: 20

### Course Objectives:

1. To understand the concept of Mobile Apps development using Android Programming.
2. To know about Mobile OS architectures of Android, iOS and Windows.
3. To understand the concept of Activity, Services, Notifications, Broadcast receivers.
4. To handle Flat Files, SQLite Database, Graphics, animation, Multimedia, and Sensors.
5. To know about Testing and Distributing Mobile Applications.

**Examiner's Note:** All Question are compulsory. The Question Paper is divided into four sections A, B, C, and D. Section A is compulsory and comprises of 12 questions of one mark each, 3 from each unit of the syllabus. The question shall be asked in such a manner that there are no direct answers including one word answer, fill in the blanks or multiple choice questions. Section B comprises of 4 questions of 3 marks each, one from each unit. Section C comprises of 4 questions of 6 marks each, one from each unit. Each question shall have two alternatives, out of which student will be required to attempt one. Section D comprises of 4 questions of 8 marks each, one from each unit. Each question shall have two alternatives, out of which student will be required to attempt one.

### UNIT-I

Introduction: mobility and mobile platforms, Android overview, Setting up Development environment, Mobile OS architectures of android, iOS and Windows, Android App project structure, Setting up an Android Virtual Device (AVD) or Emulator, Logical components of an Android App., Tool repository, installing and running App devices.

### UNIT-II

Building Blocks: Activity- states and life cycle of an Activity, User Interface resources, events, interaction among Activities, working with Threads, Services- states and life cycle, Notifications, Broadcast receivers, Telephony and SMS APIs,

### UNIT-III

App data handling - Flat Files, shared preferences, Relational data- SQLiteDatabase, Graphics and animations- custom views, canvas, animation APIs, Multimedia- audio/video playback and record, location services and maps, Sensors.

### UNIT-IV

Testing Mobile Application: debugging mobile application, White box testing, black box testing, and test automation of mobile apps using JUnit for android, Signing and packaging mobile apps, Distributing apps on market place.

### Suggested Readings:

1. Anubhav Pradhan and Anil V. Deshpande, "Composing Mobile Apps: Learn, Explore, Apply using Android", Wiley India, 1st Edition.
2. Valentino Lee, Heather Schneider, Robbie Schell, "Mobile Applications: Architecture, Design, and Development", Hewlett-Packard Professional Books, 2004.



3. Barry A Burd, "*Android Application Development All-in-one for Dummies*", John Wiley & Sons Inc., 1st Edition.
4. Jeff McWherter , Scott Gowell , "*Professional Mobile Application Development*", 1st Edition, WROX Publishing.



**BCA-19-57 Software Laboratory - IX**

**Maximum marks:** 100

**Time:** 3 hours

**External:** 80

**Internal:** 20

The students have to implement at least 15 programs during the course in accordance with paper BCA-19-55.

The examiner has to set two programs with internal choice on the spot covering the concepts covered in paper BCA-19-55.



**BCA-19-58 Software Laboratory - X**

**Maximum marks:** 100

**Time:** 3 hours

**External:** 80

**Internal:** 20

The students have to implement at least 15 programs during the course in accordance with paper BCA-19-56.

The examiner has to set two programs with internal choice on the spot covering the concepts covered in paper BCA-19-56.

*Ashu*

**BCA-19-59 Student Seminar**

**Maximum marks:** 100

**Time:** 3 hours

**External:**

**Internal:** 20

The students have to deliver a Seminar on the latest development in the field of Computer Science. The Teacher concerned will assign the different topics to all the students.

