University of Rajasthan Jaipur

SYLLABUS

Bachelor of Computer Application

B.C.A. Part-I Examination	**2023**
B.C.A. Part-II Examination	**2024**
B.C.A. Part-III Examination	**2025**

Bachelor of Computer Applications (BCA)

Eligibility for Admission to BCA course Session 2022-23 "A candidate must have passed 10+2 examination (Arts/Science/Commerce) or equivalent with securing 48% or more (minimum pass mark for SC/ST/OBC/SBC candidates) in aggregate without any approximations".

In regard to reservation of Seats for admission to BCA Part I, the reservation policy of Govt. of Rajasthan/University of Rajasthan will be followed.

Admission Procedure: Admission to BCA Part I course will be made on the basis of merit list (10+2 level).

Attendance: A candidate shall be required to put in a minimum of 75% attendance at the lectures and 75% attendance at the practical separately in each paper, as per university norms.

Scheme of Examination for Bachelor of Computer Applications (BCA):

The Bachelor of Computer Applications will be a **Three Part Course in Faculty of Science** extending over **three academic sessions.** Medium of instructions and examination will be **English** only. There shall be an examination at the end of each part. Each theory paper examination will be of **three hour** duration and shall carry **100 marks.** Theory paper shall contain three parts. All questions are compulsory.

Part – I (very short answer) consists 10 questions of **two marks** each with two questions from each unit. Maximum limit for each question is up to 40 words.
Part – II (short answer) consists 5 questions of **four marks** each with one question from each unit. Maximum limit for each question is up to 80 words.
Part – III (Long answer) consists 5 questions of **twelve marks** each with one question from each unit with internal choice.

Each practical examination (Maximum marks 100) will be of **three hours** duration on one day and carry **60 marks for exercises**(3 exercises) assigned in the examination, 25 marks for **viva-voce** and 15 marks for **practical records and regularity** of the candidate. Other rules and procedures of examinations will be common to those for B.Sc. course.

Passing of Examination and Promotion to next Part: A candidate must secure at least 40% marks in each paper and 50% marks in aggregate for passing a part examination.

A candidate will be promoted to part II if he/she has secured at least 40% in **three theory** and **two practical papers** of part I examination and with at least 50% in aggregate of these papers.

A candidate will be promoted to Part III if he/she passed with 40% in **three theory and two practical papers** of Part II examination and with at least 50% in aggregate of these papers. However, if the candidate has not passed Part I Examination then also he/she be

promoted to part III if the number of due papers (part I & Part II together) does not exceed **four theory papers** and **two practical papers**.

Division and Honors: On successful passing out of all three part examinations (in first attempt), those securing 75% and above in aggregate of all the three parts will be awarded **First division with Honors**, and those securing 60% or more but less than 75% will be awarded **First division** and rest will be awarded **Second division**.

Course Structure: Each part of BCA course consist of 6 theory papers and 4 practical papers. Four theory and three practical papers are core courses and two theory and one practical as elective courses.

BCA Part - I 2022-23 Onwards

Code	Subject	Course	Hours / Week	Max. Marks
	Theory			
BCA-101	Computer Fundamentals and Office Management Tools	CCC	4	100
BCA-102	Computer Architecture	CCC	4	100
BCA-103	Operating Systems	CCC	4	100
BCA-104	Principles of Programming Language Through C	CCC	4	100
BCA-105	Web Application Development	CCC	4	100
BCA-106	Mathematics	CCC	4	100
	Practical			
BCA-107	Office Management Tools Lab	CCC	3	100
BCA-108	C Programming Lab	CCC	3	100
BCA-109	Web Application Development Lab	CCC	3	100
BCA-110	Communication and Soft Skills Lab	CCC	3	100
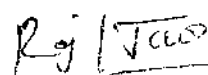
BCA Part - II 2023-24 Onwards

Code	Subject	Course	Hours / Week	Max. Marks
	Theory			
BCA-201	Object Oriented Programming Through C++	CCC	4	100
BCA-202	Database Management Systems	CCC	4	100
BCA-203	Software Engineering	CCC	4	100
BCA-204	Data Structures and Algorithms	CCC	4	100
BCA-205	Cloud Computing	CCC	4	100
	Elective-I	ECC	4	100
	Practical			
BCA-207	OOP Lab	CCC	3	100
BCA-208	DBMS Lab	CCC	3	100
BCA-209	Data Structures Lab (Using C/C++)	CCC	3	100
	Elective-II Lab	ECC	3	100

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Code	Subject	Course	Hours / Week	Max. Marks
	Elective Group-I (Any One)			
BCA-A01	.NET Programming With C#	ECC	4	100
BCA-A02	PHP Programming	ECC	4	100
BCA-A03	Data Science	ECC	4	100
	Elective Group-II (Any One)			
BCA-B01	.NET Lab	ECC	3	100
BCA-B02	PHP Lab	ECC	3	100
BCA-B03	Data Science Lab	ECC	3	100

BCA Part - III 2024-25 Onwards

Code	Subject	Course	Hours / Week	Max. Marks
	Theory			
BCA-301	Java Programming	CCC	4	100
BCA-302	Python Programming	CCC	4	100
BCA-303	Data Communication & Computer Networks	CCC	4	100
BCA-304	Artificial Intelligence	CCC	4	100
BCA-305	Digital Marketing	CCC	4	100
	Elective-III	ECC		
	Practical			
BCA-307	Java Lab	CCC	3	100
BCA-308	Python Lab	CCC	3	100
BCA-309	Digital Marketing Lab	CCC	3	100
BCA-310	Project	CCC	3	100
	Elective Group-III (Any One)			
BCA-C01	Data Warehousing and Data Mining	ECC	4	100
BCA-C02	Network Security & Cryptography	ECC	4	100
BCA-C03	Machine Learning	ECC	4	100

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Syllabus of BCA Part I 2022-23 Onwards

BCA-101: Computer Fundamentals and Office Management Tools

Question Paper pattern for Main University Examination   *Max Marks: 100*

Part – I (very short answer) consists 10 questions of two marks each with two questions from each unit. Maximum limit for each question is up to 40 words.
Part – II (short answer) consists 5 questions of four marks each with one question from each unit. Maximum limit for each question is up to 80 words.
Part – III (Long answer) consists 5 questions of twelve marks each with one question from each unit with internal choice.

UNIT- I

Introduction to Computers: Characteristics of computers, Evolution of computers, generation of computers, Block diagram of computer & role of each block, classification of computers, applications of computers.

Input and Output Devices: Keyboard, pointing devices, speech recognition, digital camera, scanners, optical scanners. Classification of output devices, printers, plotters, computer output microfilm (COM), Classification of output devices, devices- monitors, audio output, projectors, and terminals.

Primary and Secondary Memory: Memory hierarchy, Random access memory (RAM), types of RAM, Read only memory (ROM), types of ROM. Classification of secondary storage devices, magnetic tape, magnetic disk, optical disk.

UNIT- II

Number Systems: Introduction to number system, Binary, Octal, Hexadecimal, conversion between number bases, Arithmetic operations on binary numbers, Alphanumeric- BCD, EBCDIC, ASCII, Unicode.

Computer Software: Software definition, relationship between software and hardware, software categories, system software, application software, utility software.

Computer Languages: Introduction, classification of programming languages, generations of programming languages, features of a good programming language.

UNIT- III

MS Word: Word processing, MS-Word features, creating saving and opening documents in Word, interface, toolbars, ruler, menus, keyboard shortcut, editing, previewing, printing & formatting a document, advance features of MS Word, find & replace, using thesaurus, mail merge, handling graphics, tables, converting a Word document into various formats like-text, rich text format, Word perfect, etc.

UNIT- IV

MS Excel: Worksheet basics, creating worksheet, entering data into worksheet, data, text, dates, alphanumeric values saving & quitting worksheet, opening and moving around in an existing worksheet, Toolbars and menus, Keyboard shortcuts, working with single and multiple workbook, working with formula & cell referencing, Auto sum, coping formulas, absolute and relative addressing, formatting of worksheet, previewing & printing worksheet, Graphs and Charts, Database, macros, multiple worksheets-concepts.

UNIT- V

Power Point: Creating and viewing a presentation, managing Slide Shows, navigating through a presentation, using hyperlinks, advanced navigation with action setting and action buttons, organizing formats with Master Slides, applying and modifying designs, adding graphics, multimedia and special effects.

Microsoft Access: Planning a database (tables, queries, forms, reports), creating and editing database, customizing tables, linking tables, designing and using forms, modifying database structure, Sorting and Indexing database, querying a database and generating reports.

Reference Books:
1. Microsoft; 2007/2010 Microsoft Office System; PHI.
2. Microsoft; Microsoft Office 2007/2010: Plain & Simple; PHI.
3. Sanjay Saxena; A First Course in Computers 2003 Edition; Vikas Pub.
4. Computer Fundamentals by P.K. Sinha, BPB Publication.
5. Computer Fundamentals and Programming in C,Reema Thareja,OXFORD University Press.
6. Introduction to Computer,Peter Norton's, Tata McGraw Hill Publication.
7. MS-Office , Dr. S.S. Shrivastava, Published by Laxmi Publication.
8. Office 2019:In Easy Steps,Michal Price ,BPB Publication.

BCA-102: Computer Architecture

Question Paper pattern for Main University Examination   *Max Marks: 100*

Part – I (very short answer) consists 10 questions of two marks each with two questions from each unit. Maximum limit for each question is up to 40 words.
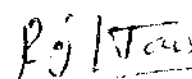**Part – II (short answer)** consists 5 questions of four marks each with one question from each unit. Maximum limit for each question is up to 80 words.
Part – III (Long answer) consists 5 questions of twelve marks each with one question from each unit with internal choice.

UNIT- I

Boolean Algebra and Logic Gates: Logic Gates, Basic laws of Boolean algebra, Simplification of Boolean algebra.
Data Representation: Number systems-Binary, Octal, Hexadecimal, Complements, Arithmetic operations, floating point representation.

UNIT-II

Sequential Logic: Sequential circuits: Flip-flops, S-R, D, J-K, T, Clocked Flip-flop. Race around condition, Master slave Flip-Flop.

Arithmetic Circuits: Half Adder, Full Adder, Half Subtractor, Full Subtractor, Parallel Binary Adder, Parallel binary Subtractor.

UNIT-III

Register Transfer and Micro Operations: Register Transfer Language, Register transfer, Bus and Memory transfer, Arithmetic Micro-operations, Logic Micro-operations, Shift Micro-operations, Arithmetic Logic Shift Unit.

CPU Design: Specifying a CPU, design and implementation of a simple CPU (fetching instructions from memory, decoding and executing instructions, establishing required data paths).

UNIT-IV

Basic Computer Organization and Design: Instruction Codes, Computer Registers; Common bus system; Computer Instructions; Instruction formats; Instruction Cycle; Fetch and Decode, Flowchart for Instruction cycle; Register reference instructions. Addressing Modes.

UNIT- V

Memory Organization: Memory Hierarchy, Main Memory, Auxiliary Memory, Associative Memory, Cache Memory, Virtual Memory. I/O Interrupt, types of Interrupts. Priority Interrupts, Direct Memory Access(DMA).

Recommended Books
1. M, Morris Mano; Computer System Architectures; III Edition, Prentice Hall of India,2008
2. Andrew S. Tanenbaum , Structured Computer Organization,Printice Hall
3. William Stallings, Computer Organization and Architecture , Sixth Edition, Pearson
4. John D. Carpinelli: Computer Systems Organization & Architecture; 3rd Edition: Person Education Asia,2008
5. Malvino B ; Digital Computer Electronics III Edition; TMHL

BCA-103 : Operating Systems

Question Paper pattern for Main University Examination *Max Marks: 100*

Part – I (very short answer) consists 10 questions of two marks each with two questions from each unit. Maximum limit for each question is up to 40 words.
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Part – III (Long answer) consists 5 questions of twelve marks each with one question from each unit with internal choice.

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Unit – I

Concepts: Operation System & its need, functions of OS, Types of OS : Simple Batch Systems, Multiprogrammed Batched Systems, Time-Sharing Systems, Parallel Systems, Distributed Systems and Real-Time Systems.

Operating-System Structures: System Components, Operating System Services, System Calls, System Structure, Virtual Machines.

Unit – II

Process Management: Process Concept, Process Scheduling, Operation on Processes.

CPU Scheduling Algorithms : Basic Concepts, Scheduling Criteria, FCFS, SJF, Priority, Round-Robin, Multilevel Queue, Multilevel Feedback Queue, Multiple-Processor Scheduling, Process Synchronization, Critical-Section Problem, Introduction to Semaphores.

Unit-III

Deadlocks: System Model, Deadlock Characterization, Methods for Handling Deadlocks, Deadlock Prevention, Deadlock Avoidance, Deadlock Detection and Recovery from Deadlock.

Memory Management: Background, Logical versus Physical Address space, Swapping, Contiguous allocation (fragmentation), Paging, Segmentation, Virtual Memory, Demand Paging, Page-replacement Algorithms (FIFO, Optimal, LRU, Counting).

Unit-IV

File Management: File Concepts (Operations & Attributes), Access Methods, Directory Structure, File System Structure, Allocation Methods (Contiguous Allocation, Linked Allocation, Indexed Allocation).

Device Management: General device characteristics, device controllers, device drivers, Interrupts Driven I/O, Memory Mapped I/O, Direct Memory.

Unit-V

Introduction of different Operating systems (Linux, Unix, Windows Server), Linux: History, design principles, kernel modules, process management, scheduling, memory management, file systems, input and output, inter process communication, network structure, security.

Recommended reference books:
1. A. Silbersachatz and P.Galvin, "Operating System Concepts", Addison-Wesley, 5th Ed., 2001.
2. Gary Nutt: Operating Systems-A Modern Perspective (Second Edition), Pearson Education, 2000.
3. Tanenbaum A.S., Modern Operating Systems, PHI Publ.
4. Peterson Richard, " The Complete Reference Linux " Tata McGraw Hill.
5. Simitabha Das, "Unix/Linux Concepts & Applications". Tata McGraw Hill
6. Achyut S. Godbole: Operating Systems, Tata Mc-Graw Hill Publishing Company Limited, 2000.
7. Harvey M. Deitel, Operating Systems, Pearson Education, 2001.

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BCA-104: Principles of Programming Through C

Question Paper pattern for Main University Examination   *Max Marks: 100*

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Part – II (short answer) consists 5 questions of four marks each with one question from each unit. Maximum limit for each question is up to 80 words.

Part – III (Long answer) consists 5 questions of twelve marks each with one question from each unit with internal choice.

UNIT- I

Basic concepts of Programming languages, Programming Domains, Language Evaluation criteria and language categories, Evolution of major programming languages. Describing syntax and semantics, formal methods of describing syntax, Pseudo code, Design of Algorithm & Flowchart

UNIT- II

Fundamentals of C: History and importance of C, basic structure and execution of C programs, constants, variables, and data types, Various type of declarations, operators types and expressions, evaluation of expressions, operator precedence and associability. Managing input and output operations, decision making and branching.

UNIT- III

Iteration: while, do…while, for loop, nested loops, break & continue, goto statements.

Array and String: One-dimensional array and their declaration and initialization, two-dimensional arrays and their initializations, character arrays (One and Two dimensional). reading and writing strings, string - handling functions.

UNIT-IV

Functions: Need and elements for user –defined functions, definition of functions, return values and their types, function calls and declaration, recursion, parameter passing. passing arrays and strings to functions, the scope, visibility and life time of variables.

Understanding Pointers: Accessing the address of a variable, declaration and initialization of pointer variables, accessing a variable through its pointer, pointers and arrays, pointers and function arguments, functions returning pointers.

UNIT –V

Structures and Unions: Defining structure, declaring structure variable and accessing structure members, initialization of structure, operation on individual members, and array of structures, union, size of structure.

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I/O in C: Formatted and Un-formatted I/O, File handling (Random, Binary and Sequential).

Recommended Books:

1. Balagurusamy E; Programming in ANSI C;Fifth Edn; Mc Graw Hill,2011.
2. Kanetkar Y.; LET US C; X Edition, BPB,2010.
3. Deitel HM & Deitel JP; C How to program; 5th Edn; Pearson Pub
4. Gottfried B; Programming with C: Schaum Qutlines; Mc Graw Hill Edition.

BCA-105 : Web Application Development

Question Paper pattern for Main University Examination   *Max Marks: 100*

Part – I (very short answer) consists 10 questions of two marks each with two questions from each unit. Maximum limit for each question is up to 40 words.
Part – II (short answer) consists 5 questions of four marks each with one question from each unit. Maximum limit for each question is up to 80 words.
Part – III (Long answer) consists 5 questions of twelve marks each with one question from each unit with internal choice.

Unit – I

The Internet – Basic of internet, file transfer, telnet, usenet, gopher, wais, Archie and veronica. Introduction to Internet Protocols-, HTTP, FTP, SMTP protocols.
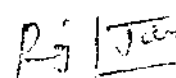
World Wide Web : Elements of the Web, Web browser and its architecture, The web server, the proxy server, Microsoft internet explorer, viewing pages with a browser, using a browser for Mail, News and chat, Security and Privacy issues (cookies, firewalls, Data Security, executable Applets and scripts, blocking system).

Unit – II

HTML Fundamentals: Introduction to HTML, HTML Elements, HTML Semantics, HTML 5 Doc Types, New Structure Tags, Section, Nav, Article, Aside, Header, Footer, HTML Attributes, Headings, Paragraphs, Styles, Quotations, Blocks, Classes, Layout, Iframes, Creating HTML Pages, incorporating Horizontal Rules and Graphical Elements, Hyper-links, Creating HTML Tables, Creating HTML Forms, HTML and Image Techniques, HTML and Page, Development of Website and Webpage (Planning, Navigation and Themes, Elements of a Web page, steps of creating a site, publishing and publicizing site structuring web site.

Unit–III

Cascading Style Sheets: Understanding Style Sheets, CSS Syntax and Applying Style Sheets to HTML document, Developing Style Sheets: inline, internal and external. CSS Selectors, <DIV> tag, Using class and ID, Styling Backgrounds, Styling borders, Styling Text, Styling Fonts, Styling Links, Styling Lists, Styling Tables, Margin, Flex and Grids. **Bootstrap & Web page design** : CMS, Banks of CMS, Joomla/wordpress-Installation, Design and development of websites.

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Unit–IV

Java script: Introduction to scripting language, Client Side Scripting, memory concepts, arithmetic decision making, Java script control structures, Java script functions, JS Popup Boxes, events, program modules in java script, function definitions duration of identifiers, scope rules, Controlling Programming Flow, recursion java script global functions.

Unit – V

Java script arrays: introduction, array declaring and allocating memory, passing arrays to functions, multiple subscripted arrays. The Java Script Object Model, Java Script language Objects, Developing Interactive Forms, Validation of Forms, Cookies and Java Script Security, Controlling Frames in Java Script, Client – Side Java Script Custom, JavaScript Objects

References :
1. The Colete eference: HTML & XHTML; Thomas A. Powel, 4th Edn.
2. Mastering HTML 4.0 by Deborah S.Ray an Eric J. Ray From BPB
3. Mastering Java Script, BPB publication.
4. Internet and web technology by Raj Kamal, TMH Publication 2. Steven Holzner,
5. The Complete Reference Java Scripts,, Tata McGraw – Hill,3rd Edn.
6. Java Script, Don Gosselin,Vikas publications

BCA-106: Mathematics

Question Paper pattern for Main University Examination   *Max Marks: 100*

Part – I (very short answer) consists 10 questions of two marks each with two questions from each unit. Maximum limit for each question is up to 40 words.
Part – II (short answer) consists 5 questions of four marks each with one question from each unit. Maximum limit for each question is up to 80 words.
Part – III (Long answer) consists 5 questions of twelve marks each with one question from each unit with internal choice.

UNIT – I

Sets : Definition of sets, representation of sets, type of sets, Operations on sets, Sub sets, Power set, Universal set, Complement of a set, Union and Intersection of two sets, Venn diagrams, Principles of Inclusion and Exclusion.

Relations: Cartesian product of sets, Definition of relation, Types of relations- reflexive, symmetric, anti-symmetric, transitive , equivalence.

UNIT – II

Functions : Definition, Domain & Range of a functions, one to one and onto functions, Bijective functions, composite functions, inverse of functions. Types of functions-constant, identity, polynomial, exponential, logarithmic.

Logic and Proofs : Proposition, Conjunction, Disjunction, Negation, Compound proposition, De Morgan's laws, Tautolity and Contradiction.

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UNIT - II

Matrices: Definition and Types of Matrices, Addition , Subtraction and Multiplication of Matrices, Non-commutatively of multiplication of matrices, Scalar Multiplication. Transpose of a Matrix.

Determinant: Determinant of a square matrix (up to 3x3 matrices), properties of determinants, minors , cofactors, expansion of determinants, application of determinants in finding the area of a triangle. Adjoint and Inverse of a matrix. Solution of system of linear equations by inverse matrix method and Cramer's Rule.

UNIT –IV

Statistics : Data collection methods, Data classification, Frequency Distribution. Graphical representation of frequency distribution. **Measures of Central Tendency-** Mean, Median, Mode, Measures of Dispersion- Mean Deviations, Standard Deviations. Variance and Skewness.
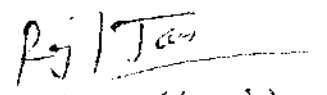
UNIT –V

Correlation Analysis : Correlation, Types of Correlations, Methods of Studying Correlations, Measure of Karl Pearson's coefficient of correlation. Rank Correlation Coefficient.

Regression Analysis: Regression, Use of regression analysis,, Difference between Correlation and Regression Analysis, Regression Lines Equations, Properties of regression lines.

Reference Books:

1. C.L. Liu: Elements of Discrete Mathematics, Tata Mc-Graw Hill Publishing Company Ltd., 2000
2. Seymour Lipschutz; Discrete Mathematics;TMH.
3. Kenneth H Rosen; Discrete Mathemtics & Its Applications; 6 Edition,MGH;
4. Richard Johnsonbaugh: Discrete Mathematics, Pearson Education, Asia, 2001
5. John Truss: Discrete Mathematics for Computer Scientists, Pearson Education, Asia. 2001.
6. Basic Mathematics, R.D. Sharma
7. B.L. Agrawal; Basic Statistics; Khanna Pub.
8. S.P.Gupta; Statistical Methods; Sultan Chand & Sons
9. S.C.Gupta, V.K. Kapoor ; fundamental of statics; Sultan Chand & Sons

Practical:

BCA-107 : Office Management Tools Lab

Practical Lab Exercises based on Theory Paper BCA 101.

BCA-108 : C Programming Lab

Practical Lab Exercises based on Theory Paper BCA 104.
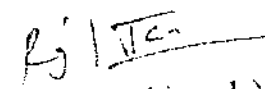
BCA-109 : WebApplication Development Lab

Practical Lab Exercises based on Theory Paper BCA 105.

BCA-110 : Communication and Soft Skills Lab

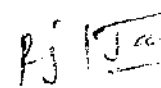Practical Lab : Examination : Practical Examination

Contents:

1. **Communication** :Objectives & Process of Communication, Essential components of the Process of Communication, Importance and Objectives of Communication. Differences between general and technical communication. Types of Communication (Extrapersonal, Intrapersonal, Interpersonal, Organisational & Mass communications).

2. **Verbal & Non-verbal Communication** :Listening, Speaking, Reading and Writing. Verbal and Non-verbal Communication. Intra, inter-personal and group communication skills. Gestures, postures, Proxemics, Kinesics. Listening to Lectures, Discussions, Talk Shows, News Programs.

3. **Writing Skills** :Formal & Informal writings, report writing, creative writing. Composition, Resume Writing, Cover letters, Business Letter Writing, Persuasive Letters, Job Applications and Official Correspondence, E-Mail etiquette, Precise writing.

4. **Presentation Skills** :Elements of effective presentation, structure of presentation. external factors and content, Seminar, Speeches, Lectures, Interviews, Mock Interviews.

5. **Group Discussion** : Structure of GD, Moderator led and other GDs, Strategies in GD, Team work body language, Mock GD, Problem solving, Reflective thinking, Critical thinking, Negotiation skills.

6. **Career Skills** : Goal setting, Work ethics, Problem solving skills. Active listening. Dressing etiquette and office etiquettes. SWOT Analysis, IQ, EQ and SQ, Art of giving feedback, Decision making, Time Management, Team Management and Leadership Skills, Habits of successful people.

Syllabus of BCA Part II 2022-23 Onwards

BCA Part - II 2023-24 Onwards

Code	Subject	Course	Hours / Week	Max. Marks
	Theory			
BCA-201	Object Oriented Programming Through C++	CCC	4	100
BCA-202	Database Management Systems	CCC	4	100
BCA-203	Software Engineering	CCC	4	100
BCA-204	Data Structures and Algorithms	CCC	4	100
BCA-205	Cloud Computing	CCC	4	100
	Elective-I	ECC	4	100
	Practical			
BCA-207	OOP Lab	CCC	3	100
BCA-208	DBMS Lab	CCC	3	100
BCA-209	Data Structures Lab (Using C/C++)	CCC	3	100
BCA-210	Elective-II Lab	ECC	3	100
	Elective Group-I (Any One)			
BCA-A01	.NET Programming With C#	ECC	4	100
BCA-A02	PHP Programming	ECC	4	100
BCA-A03	Data Science	ECC	4	100
	Elective Group-II (Any One)			
BCA-B01	.NET Lab	ECC	3	100
BCA-B02	PHP Lab	ECC	3	100
BCA-B03	Data Science Lab	ECC	3	100

BCA-201 : Object Oriented Programming Through C++

Question Paper pattern for Main University Examination   *Max Marks: 100*

Part – I (very short answer) consists 10 questions of two marks each with two questions from each unit. Maximum limit for each question is up to 40 words.
Part – II (short answer) consists 5 questions of four marks each with one question from each unit. Maximum limit for each question is up to 80 words.
Part – III (Long answer) consists 5 questions of twelve marks each with one question from each unit with internal choice.

UNIT – I

Introduction to Object Oriented Concepts: Evolution of OOP, OOP Paradigm. advantages of OOP, comparison between functional programming and OOP approach. characteristics of object oriented language – objects, classes, inheritance, reusability. user defined data types, polymorphism, overloading.

UNIT – II

Introduction to C++: C++ tokens, data types, C++ operators, type conversion, variable declaration, arrays, statements, expressions, conditional statements, Jumping statements. loops, functions, pointers, structures.

UNIT – III

Classes and Objects: Classes, objects, defining member functions, arrays of class objects, pointers and classes, passing objects, constructors, types of constructors. destructors, this pointer, access specifiers, friend functions, inline functions.

Unit – IV

Inheritance: Introduction, Importance of Inheritance, types of inheritance, Constructor and Destructor in derived classes.
Polymorphism: Function overloading, operator overloading, virtual functions, pure virtual functions

Unit – V

File Management: Handling Data files (sequential and random), Opening and closing of files, stream state member functions, Operations on Files. Templates. Exception Handling.

Recommended Books:

- Deitel HM & Deitel JP; C/C++ How to program; 5th Edn; Pearson Pub.
- Balagurusamy ; Object Oriented Programming in C++; 4th Edition TMH.
- Venugopal, Rajkumar; Mastering C++; Tata Mcgrow Hill,.
- Kanetkar Y.: LET US C++; BPB;
- Byron Gottfried; Programming with C;TMH;

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BCA-202 : Data base Management Systems

Question Paper pattern for Main University Examination *Max Marks: 100*

Part – I (very short answer) consists 10 questions of **two marks** each with two questions from each unit. Maximum limit for each question is up to 40 words.
Part – II (short answer) consists 5 questions of **four marks** each with one question from each unit. Maximum limit for each question is up to 80 words.
Part – III (Long answer) consists 5 questions of **twelve marks** each with one question from each unit with internal choice.

UNIT- I

Database System Concepts & Architecture: Overview of DBMS, Basic DBMS terminology, data base system v/s file system, Advantages and dis-advantages of DBMS. Coded rules, data independence. Architecture of a DBMS, Schemas, Instances, Database Languages, Database Administrator, Data Models.

UNIT- II

Data Modeling: Data modeling using the Entity Relationship Model: ER model concepts. notation for ER diagram, mapping constraints, keys, Concepts of Super Key, candidate key, primary key, Generalization, aggregation.

Relational Model : Concepts, Constraints, Languages, Relational database design by ER & EER mapping, Relational algebra relational calculus. Relational Algebra. Fundamental operations of Relational Algebra.

UNIT –III

Database Design: Functional dependencies, loss less decomposition, Normalization : 1-NF, 2-NF,3-NF and BCNF.

Transaction Management : Transactions: Concepts, ACID Properties. States Of Transaction, Serializaibility, Isolation, Checkpoints, Deadlock Handling.

UNIT- IV

Introduction to SQL: Characteristics of SQL, Advantages of SQL, SQL data types and literals, Types of SQL commands, SQL operators and their procedure, Tables, views and indexes, Queries and sub queries, Aggregate functions, insert, update and delete operations, Joins, Unions, Intersection, Minus in SQL.

UNIT- V

Recovery System & Security : Failure Classifications, Recovery & Atomicity, Log Base Recovery, Recovery with Concurrent Transactions, Shadow Paging, Failure with Loss of Non-Volatile Storage, Introduction to Security & Authorization.

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Recommended Books:

1. Korth H F and Silberschataz A, System Concepts, Sixth Edition; McGraw Hill,2010
2. Leon, and Leon, SQL Tata McGraw Hill Pub. Co. Ltd.
3. Ivan Bayross; SQL/PL 4th Edn: BPB,2009
4. Navathe S.B. Elmasri R,; Fundamentals of Database Systems, Fifth Edition. Pearson 2011.
5. Ramakrishan and Gharke, Database Management Systems, 3rd Ed, Tata McGraw Hill, 2007.
6. Singh S.K.; Database Systems; I Edition; Pearson, 2006.

BCA-203 : Software Engineering

Question Paper pattern for Main University Examination   *Max Marks: 100*

Part – I (very short answer) consists 10 questions of two marks each with two questions from each unit. Maximum limit for each question is up to 40 words.

Part – II (short answer) consists 5 questions of four marks each with one question from each unit. Maximum limit for each question is up to 80 words.

Part – III (Long answer) consists 5 questions of twelve marks each with one question from each unit with internal choice.

Unit-I

Software Engineering Fundamentals: Software, Problem Domain, Software Engineering Challenges, Software Processes (processes, projects & products. component). **Software Development Process Models**: Waterfall Model, Prototyping. Iterative Enhancement Model, Spiral Model. Introduction to Agile Model: Principles, Steps. Various Agile Process Models.

Software Requirement Analysis & Specification: Need, Characteristics & Components. Introduction to Requirements Modeling: Data Flow Diagram and Use Cases.

Unit-II

Introduction to Metrics: Function Point, Line of Code (LOC) and KLOC.

Software Project Planning: Cost Estimation- Uncertainties in Cost Estimation. Building Cost Estimation Models, On Size Estimation, COCOMO Model. **Project Scheduling**: Average Duration Estimation, Project Scheduling & Milestones. Quality Assurance Plans: Verification & Validation, Inspection & Reviews.

Unit-III

Design Engineering: Design Process & Design Quality, Design Concepts (abstraction. architecture, patterns, modularity, information hiding, functional independence. refinement, refactoring, and design classes), The Design Model (data design elements. architectural design elements, interface design elements, component-level design elements, deployment-level design elements).

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Unit-IV

Testing Strategies & Tactics: A strategic approach to software testing, Strategic issues. Software testing fundamentals, Test characteristics, Test Strategies for conventional software: Unit Testing, Integration testing, Validation Testing, System testing, Black-Box testing, White Box testing.

Unit-V

Risk Management: Overview, Assessment, Control.
Software Reliability: Measures of Reliability & Availability, Software Safety.
Maintenance and Reengineering: Introduction to: Software Maintenance. Software Supportability, Reengineering, Reverse Engineering, Restructuring, and Forward Engineering.

Reference /Text Books

Pressman, Roger (2001) Software Engineering; A Practitioner's Approach, 8th ed. M Graw-Hill,2014.

Sommerville Lan; Software Engineering, 9th Ed. Pearson Education,2014

Jalote, Pankaj (7) An integrated Approach to Software Engineering 2nd Ed.

James Rumbaugh. MichealBlaha, "Object oriented Modeling and Design with UML", 2nd Edition, 2007.

Simon Bennett, Steve McRobb and Ray Farmer, " Object-Oriented Systems Analysis and Design Using UML" 4th Edition,McGraw Hill Education, 2010

BCA 204: Data Structures and Algorithms

Question Paper pattern for Main University Examination   *Max Marks: 100*

Part – I (very short answer) consists 10 questions of **two marks** each with two questions from each unit. Maximum limit for each question is up to 40 words.
Part – II (short answer) consists 5 questions of **four marks** each with one question from each unit. Maximum limit for each question is up to 80 words.
Part – III (Long answer) consists 5 questions of **twelve marks** each with one question from each unit with internal choice.

UNIT – I

Introduction to Algorithm Design: Algorithm, its characteristics, efficiency of algorithms, analyzing Algorithms and problems.
Linear Structure: Arrays, records, stack, operation on stack, implementation of stack as an array, queue, types of queues, operations on queue, implementation of queue.

UNIT – II

Linked Structure : List representation, Polish notations, operations on linked list - get node and free node operation, implementing the list operation, inserting into an ordered linked list, deleting, circular linked list, doubly linked list.

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UNIT – III

Tree Structure : Concept and terminology, Types of trees, Binary search tree, inserting. deleting and searching into binary search tree, implementing the insert, search and delete algorithms, tree traversals , Huffman's algorithm.

UNIT – IV

Graph Structure : Graph representation - Adjacency matrix, adjacency list, Warshall's algorithm , adjacency multilist representation. Orthogonal representation of graph . Graph traversals - BFS and DFS. Shortest path, all pairs of shortest paths, transitive closure.

UNIT – V

Searching and sorting : Searching - sequential searching, binary searching. hashing. **Sorting** - selection sort, bubble sort, quick sort, heap sort, merge sort, and insertion sort. efficiency considerations.

Recommended reference books
1. S. Lioschutz: Data Structures, Mc Graw Hill International Edition.
2. A.V. Aho., J.E. Hopcroft, and J.D. Ullman, Data Structures and Algorithms. Pearson Education Asia.
3. A. Michael Berman: Data Structures via C++, Oxford University Press.
4. Sara Baase and Allen Van Gelder: Computer Algorithms, Pearson Education Asia.

BCA-205: Cloud Computing

Question Paper pattern for Main University Examination   *Max Marks: 100*

Part – I (very short answer) consists 10 questions of two marks each with two questions from each unit. Maximum limit for each question is up to 40 words.
Part – II (short answer) consists 5 questions of four marks each with one question from each unit. Maximum limit for each question is up to 80 words.
Part – III (Long answer) consists 5 questions of twelve marks each with one question from each unit with internal choice.

Unit-I

Introduction of Cloud Computing: Definition, Historical Developments, Enabling Technology, Vision, Essential Characteristics of Cloud Computing , Components of Cloud Computing. Challenges and Approaches of Migration into Cloud, Cloud Applications: Applications – Health care, CRM and ERP, Social Networking. Media Applications and Multiplayer Online Gaming. Banefits: For the Market. Enterprise. End user and Individuals.

Unit-II

Cloud Computing Architecture : Introduction, Cloud Reference Model, Architecture. Infrastructure / Hardware as a Service, Platform as a Service, Software as a Service. Types of Clouds, Public Clouds, Private Clouds, Hybrid Clouds, Community Clouds. Economics of the Cloud, Open Challenges, Cloud Interoperability and Standards. Scalability and Fault Tolerance. Parallel and distributed Computing-MapReduce. . Hadoop, High level Language for Cloud, Service Oriented Computing.

Unit-III

Virtualization: Introduction, Characteristics of Virtualized Environment, Taxonomy of Virtualization Techniques, Virtualization and Cloud computing, Virtualization: of CPU, Memory, I/O Devices, Server , Desktop, Network, and data-center. Pros and Cons of Virtualization, Technology Examples- VMware and Microsoft Hyper-V,KVM, Xen.

Unit-IV

Introduction of Cloud security services, Design Principles, Policy Implementation. Cloud Computing Security Challenges, Cloud Computing Security Architecture. Cloud Security Tools and technologies to secure the data in Private and Public Cloud Architecture. Security Concerns, Legal issues and Aspects, Multi-tenancy issues. **Risk area of Cloud computing, Data Security in Cloud:** Risk Mitigation, Understanding and Identification of Threats in Cloud, SLA-Service Level Agreements, Trust Management.

Unit-V

Cloud Platforms in Industry: Amazon Web Services- Compute Services, Storage Services, Communication Services and Additional Services. Google AppEngine-Architecture and Core Concepts, Application Life-Cycle, cost model. Microsoft Azure-Azure Core Concepts, SQL **Azure.** Integration of Private and Public Clouds Cloud applications: Protein structure prediction, Data Analysis, Satellite Image Processing. CRM and ERP, Social networking.

Recommended Books:

1. Cloud Computing ,Principle and Paradigms, Edited By RajkumarBuyya, JemesBroberg, A. Goscinski, Pub.- Wiley-2016
2. Kumar Saurabh, "Cloud Computing" , Wiley Pub 2016
3. Mastering Cloud Computing by Rajkumar Buyya, Christian Vecchiola, S.Thamarai Selvi from TMH 2013.
4. Distributed and Cloud Computing, Kai Hawang , GeofreyC.Fox, Jack J. Dongarra Pub: Elservier, 2013
5. Krutz , Vines, "Cloud Security " , Wiley Pub,2010
6. Velte, "Cloud Computing- A Practical Approach" ,TMH Pub,2009
7. Katarina Stanoevska-Slabeva, Thomas Wozniak, SantiRistol, "Grid and Cloud Computing – A Business Perspective on Technology and Applications", Springer,2010

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Practical:

BCA-207 : OOP Lab

Practical Lab Exercises based on Theory Paper BCA 201.
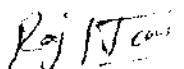
BCA-208 : DBMS Lab

Practical Lab Exercises based on Theory Paper BCA 202.

BCA-209 : Data Structures Lab (Using C/C++)

Practical Lab Exercises based on Theory Paper BCA 204.

BCA-*** : Elective-II lab

Practical Lab Exercises based on Elective –I Theory Paper.

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Elective Theory papers for Elective Group-1 of BCA Part-II

BCA-A01: .NET Programming With C#

Question Paper pattern for Main University Examination   *Max Marks: 100*

Part – I (very short answer) consists 10 questions of two marks each with two questions from each unit. Maximum limit for each question is up to 40 words.
Part – II (short answer) consists 5 questions of four marks each with one question from each unit. Maximum limit for each question is up to 80 words.
Part – III (Long answer) consists 5 questions of twelve marks each with one question from each unit with internal choice.

Unit-I

Introduction to .Net framework: Managed Code and the CLR Intermediate Language. Metadata and JIT Compilation Automatic Memory Management
The Framework Class Library: .Net objects- ASP .NET, NET web services. Windows Forms.
Elements : Variable and constants data types, declaration. Operators, types precedence, Expressions Program flow, Decision statements, if then if. Then.else.select.case, Loop statements while and while, do.loop. for next for each.next

Unit-II

Types: Value data types Structures, Enumerations, Reference data types, arrays.
Windows Programming: Creating windows forms windows controls, Button, Check box, Combo box, Label, List box Radio Button, Text box, Events, Click, close deactivate. Load, mousemove, mousedown, mouseup.
Menus and Dialog Boxes : Creating menus, menu items, context menu, Using dialog boxes, show dialog() method.
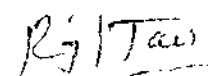
Unit – III

ADO.NET : Architecture of ADO.NET, ADO.NET providers, Connection, Command, Data Adapter, Dataset, Connecting to Data Source, Accessing Data with Data set and Data reader, Create an ADO.NET application, Using Stored Procedures.

Unit-IV

ASP.NET Features: Application of States and Structure; Change the Home Directory in IIS- Add a Virtual Directory in IIS- Set a Default Document for IIS – Change Log File Properties for IIS-Stop, Start, or Pause a Web Site.

Unit-V

Creating Web Controls: Web Controls, HTML Controls, Using Internist Control, Using Input Validation Controls, Selecting Controls for Applications, Data Controls and Adding web controls to a page.

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Creating Web Forms: Server Controls, Types of Server Controls, Adding ASP.NET Code to a page.

Web Services and WCF : Web Services protocol and standards – WSDL Documents-Visual Studio.NET Architecture of WCF, WCF Client

Recommended Books :

- Mathew Mac Donald: Beginning ASP.NET 4.0 in C# 2010, 3rd Edition, A Pres.
- Bill Evjen Scott Hanselman, Devin Rader: Professional ASP.NET4, 2010, Willey.
- George Shepherd: Microsoft ASP.NET Step by step, 2010 Microsoft Press.
- Imar Spaanjaars: Beginning ASP.NET 4: in C# and VB (Wrox Programming to Programmer) , 2010 Wiely Publishing.
- Steven Holzner; ASP.NET 4.0 (Cover C# & VB) Black Book; Dreamtech Press.
- Steven Holzner; .NET Programming Black Book; Dreamtech Press.

BCA-A02: PHP Programming

Question Paper pattern for Main University Examination   *Max Marks: 100*

Part – I (very short answer) consists 10 questions of two marks each with two questions from each unit. Maximum limit for each question is up to 40 words.
Part – II (short answer) consists 5 questions of four marks each with one question from each unit. Maximum limit for each question is up to 80 words.
Part – III (Long answer) consists 5 questions of twelve marks each with one question from each unit with internal choice.

UNIT-I

Introduction to PHP: Installation of PHP and MySQL, PHP configuration in IIS & Apache Web Server. Features of PHP, Writing PHP, Parsing PHP code, Embedding PHP and HTML Executing PHP and viewing in Browser.

Unit - II

Control Structures: Data types, Operators, PHP variables: static and global variables. Comments in PHP, Control Structures, Condition statements, If...Else, Switch, ? operator. Loops, While, Break Statement Continue. Do...While, For, For each, Exit, Die, Return. Arrays: Numeric, Associative and Multidimensional Arrays

UNIT-III

Strings: Creating and accessing String, Searching & Replacing String, Formatting String. String Related Library function, Pattern matching, Replacing text, Splitting a string with a Regular Expression

Functions: Defining a Function, Calling a Function, Parameter passing, Returning value from function

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UNIT-IV

Form Data Handling: $_GET, $_POST, $_REQUEST Variables, Cookies handling, Session Management

Exception Handling: Understanding Exception and error, Try, catch. throw

UNIT-V

File Handling: Opening and closing a file, Copying, renaming and deleting a file

Database Handling: Connection with MySql Database or ODBC, Performing basic database, operation (Insert, Delete, Update, Select, Truncate Alias, Order By), Setting query parameter.

References

1. PHP, The CompleteReference, Steven Holzner, TMH
2. Beginning PHP 5.3, Matt Doyle, John Wiley & Sons
3. Core PHP Programming Leon Atkinson Pearson publishers
4. Beginning PHP 5.0 Database Christopher Scollo, Harish.Rawat, Deepak Thomas,Wrox Press

BCA-A03: Data Science

Question Paper pattern for Main University Examination   *Max Marks: 100*

Part – I (very short answer) consists 10 questions of two marks each with two questions from each unit. Maximum limit for each question is up to 40 words.

Part – II (short answer) consists 5 questions of four marks each with one question from each unit. Maximum limit for each question is up to 80 words.

Part – III (Long answer) consists 5 questions of twelve marks each with one question from each unit with internal choice.

Unit-I

Introduction to Data Science : Concept of Data Science, Need for Data Science. Components of Data Science, Big data, Facets of data: Structured data, Unstructured data. Machine-generated data, Graph-based or network data, Audio, image and video. Streaming data, The need for Business Analytics, Data Science Life Cycle, Applications of data science.

Unit-II

Data Science Process : Overview of data science process, setting the research goal. Retrieving data, Cleansing, integrating and transforming data, Exploratory data analysis. Data Modeling, Presentation and automation

Unit-III

Data Analytics: Types of Analytics, Data Analytics Lifecycle: Overview - Discovery - Data Preparation - Model Planning - Model Building, Regression analysis, Classification techniques, Clustering, Association rules analysis.

Unit-IV

Statistics : Basic terminologies, Population, Sample, Parameter, Estimate, Estimator. Sampling distribution, Standard Error, Properties of Good Estimator, Measures of Centers, Measures of Spread, Probability, Normal Distribution, Binary Distribution. Hypothesis Testing ,Chi-Square Test.

Unit-V

Data Science Tools and Algorithms : Basic Data Science languages- R, Python. Knowledge of Excel, SQL Database, Introduction to Weka, Regression Algorithms - Linear Regression, Logistic Regression, K-Nearest Neighbors Algorithm, K-means algorithm.
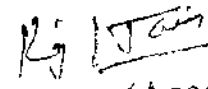
Recommended Books :

1. Samuel Burns, "Fundamentals of Data Science: Take the first Step to Become a Data Scientist" , Amazon KDP Printing and Publishing, First Edition, 2019
2. Davy Cielen, Arno D.B. Meysman, Mohamed Ali, "Introducing Data Science", Manning Publications, 2016
3. Cathy O'Neil and Rachel Schutt, "Doing Data Science, Straight Talk From The Frontline", O'Reilly. 2014.

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Syllabus of BCA Part - III 2024-25 Onwards

Code	Subject	Course	Hours / Week	Max. Marks
	Theory			
BCA-301	Java Programming	CCC	4	100
BCA-302	Python Programming	CCC	4	100
BCA-303	Data Communication & Computer Networks	CCC	4	100
BCA-304	Artificial Intelligence	CCC	4	100
BCA-305	Digital Marketing	CCC	4	100
	Elective-III	ECC	4	
	Practical			
BCA-307	Java Lab	CCC	3	100
BCA-308	Python Lab	CCC	3	100
BCA-309	Digital Marketing Lab	ECC	3	100
BCA-310	Project	CCC	3	100
	Elective Group-I (Any One)			
BCA-C01	Data Warehousing and Data Mining	ECC	4	
BCA-C02	Network Security & Cryptography	ECC	4	
BCA-C03	Machine Learning	ECC	4	

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BCA 301: Java Programming

Question Paper pattern for Main University Examination   *Max Marks: 100*

Part – I (very short answer) consists 10 questions of two marks each with two questions from each unit. Maximum limit for each question is up to 40 words.
Part – II (short answer) consists 5 questions of four marks each with one question from each unit. Maximum limit for each question is up to 80 words.
Part – III (Long answer) consists 5 questions of twelve marks each with one question from each unit with internal choice.

UNIT – I

Java Programming : Basic concepts of object oriented programming(Objects and Classes, Data Abstraction & Encapsulation, Inheritance, Polymorphism, Dynamic binding, Message passing), Java features, JVM, Byte code interpretation, simple java program, command line argument, Data types, type casting, operators (Arithmetic, increment, decrement, relational, logical, bit wise, conditional) and expressions.

UNIT – II

Decision Making and Branching : Decision making and branching (if...else, else if, switch), looping, classes, objects and methods, constructors, wrapper classes, nesting of methods, overriding methods, final class, visibility control, Arrays, strings.

UNIT – III

Inheritance & Multithreaded Programming : Inheritance, Types of Inheritance, Abstract class, interfaces, packages, multithreaded programming, extending thread, life cycle of thread, using thread methods, thread priority, synchronization.

UNIT – IV

Exception Handling : Exception-Handling fundamentals, Exception types, try, catch, throw, finally, creating exception sub classes.
AWT controls (Button, Labels, Combo box, list and other Listeners), Layout and component managers, Event handling, string handling (only main functions), graphic programming (line, rectangles, circle, and ellipses).

UNIT – V

Overview of Networking in Java : URL class and its usage through connection, Sockets based connectivity, TCP/IP Sockets and server sockets, Datagram Sockets. Introduction to Java Beans BDK, JAR files, Servlets Life cycle of servlet, JDBC connectivity.

Recommended Text Books
1. Mastering java 2 ", BPB Publications. Programming with Java A Primer, E.Balaguruswamy Tata McGraw Hill Companies
2. Java Programming John P. Flynt Thomson 2nd
3. The complete reference JAVA2, Herbert schildt. TMH
4. Arnold,Gosling, " The Java Programming Professional 2000", Addison Wesley Publication
5. C.Thomas wu, "An introduction to oop with Java", TMH

BCA-302: Python Programming

Question Paper pattern for Main University Examination   *Max Marks: 100*

Part – I (very short answer) consists 10 questions of **two marks** each with two questions from each unit. Maximum limit for each question is up to 40 words.

Part – II (short answer) consists 5 questions of **four marks** each with one question from each unit. Maximum limit for each question is up to 80 words.

Part – III (Long answer) consists 5 questions of **twelve marks** each with one question from each unit with internal choice.

UNIT-I

Python Concepts: Origin, Comparison, Comments, Variables and Assignment. Identifiers, Basic Style Guidelines, Standard Types, Internal Types, Operators, Built-in Functions, Numbers and Strings. Sequences: Strings, Sequences, String-Operators & functions, Special Features of Strings, Memory Management, programs & examples.

Conditionals and Loops: if statement, else Statement, elif Statement. while Statement. for Statement, break Statement, continue Statement, pass Statement, else Statement

Unit-II

Object and Classes: Classes in Python, Principles of Object Orientation, Creating Classes, Instance Methods, Class variables, Inheritance, Polymorphism, Type Identification, Python libraries(Strings, Data structures & algorithms).

Lists and Sets: Built-in Functions, List type built in Methods, Tuples, Tuple Operators. Special Features of Tuples, Set: Introduction, Accessing, Built-in Methods (Add, Update. Clear, Copy, Discard, Remove), Operations (Union, Intersection, Difference).

Unit-III

Dictionaries : Introduction to.Dictionaries, Built-in Functions, Built-in Methods, Dictionary Keys, Sorting and Looping, Nested Dictionaries.

Files: File Objects, File Built-in Function, File Built-in Methods, File Built-in Attributes. Standard Files, Command-line Arguments, File System, File Execution, Persistent Storage Modules.

Unit-IV

Regular Expression: Regular Expression: Introduction/Motivation, Special Symbols and Characters for REs, REs and Python.

Excetiptons: Concepts of Exceptions, Exceptions in Python, Detecting and Handling Exceptions, Exceptions as Strings, Raising Exceptions, Assertions, Standard Exceptions.

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Unit-V

Database Interaction : SQL Database Connection using Python, Creating and Searching Tables, Reading and storing config information on database, Programming using database connections, **Python Multithreading**: Understanding threads, Forking threads, synchronizing the threads, Programming using multithreading.

Recommended Books:

1. R. Nageswara Rao, "Core Python Programming", Dreamtech Press, 2nd Edition, 2018
2. Dr. M. Suresh Anand, Dr. R. Jothikumar, Dr. N. Vadivelan, "Python Programming", Notion Press, 1stEdition, 2020
3. Martin C. Brown, "The Complete Reference Python", McGraw Hill Education, 4thEdition, 2021.
4. Ashok Namdev Kamthane; "Programming and Problem Solving with Python";2nd Edn, MGH,2020
5. Allen B. Downey, "Think Python", O'Reilly Media, 2016
6. SakisKasampalis, Quan Nguyen, Dr Gabriele Lanaro, Ingram, "Advanced Python Programming", short title, 2019
7. David M. Beazley, "Python Essential Reference", Amazon Books, 2010.
8. M. Lutz, "Programming Python, 4th Edition", O'Reilly Media, 2010

BCA 303: Data Communication & Computer Networks

Question Paper pattern for Main University Examination   *Max Marks: 100*

Part – I (very short answer) consists 10 questions of two marks each with two questions from each unit. Maximum limit for each question is up to 40 words.
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Part – III (Long answer) consists 5 questions of twelve marks each with one question from each unit with internal choice.

UNIT-1

Introduction: Network definition, Network topologies, Types of Network, Layered network architecture, Categories of Network, protocol, Standards and interface.

Network Models : OSI reference model, OSI model architecture and functions of layers. TCP/IP protocol suite.

UNIT-II

Data Communication Fundamentals and Techniques: Analog and digital signal, Data-rate limits, Digital to digital line encoding schemes, Pulse code modulation, Digital to analog modulation- ASK, FSK, PSK, QAM, multiplexing techniques- FDM, TDM,WDM, transmission modes

Transmission Media : Guided media (Twisted Pair Cable, Coaxial Cable & Fiber-Optic Cable) and Unguided media: Radio wave, Infrared, Microwave Communication. Satellite, Geosynchronous Satellites Communication.

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UNIT-III

Networks Switching Techniques: Circuit switching; Packet switching- Connectionless datagram switching, Connection-oriented virtual circuit switching.

Data Link Layer Functions and Protocol: Error detection and error correction techniques, Data-link control- framing and flow control, Error recovery protocols- Stop and wait ARQ, Go-back-n ARQ, Selective repeat ARQ, Point to Point Protocol on Internet.

UNIT-IV

Access mechanisms Multiple Access Protocol and Networks: ALOHA,CSMA/CD protocols, Ethernet LANS, connecting LAN and back-bone networks- Repeaters. Hubs, Switches, Bridges, Router and Gateways.
Networks Layer Functions and Protocols: Routing, Routing algorithms. Network layer protocol of Internet- IP protocol, Internet control protocols.

UNIT-V

Transport Layer Functions and Protocols: Transport services, Berkeley socket interface overview, Transport layer protocol of Internet- UDP and TCP. Overview of Application layer protocol, DNS protocol, WWW & HTTP protocols.

Recommended Books :
1. Behrouz A. Forouzan, "Data Communication and Networking", 4th edition, Tata McGraw Hill, 2006.
2. A. S. Tanenbaum, "Computer Networks", Pearson Education Asia, 4th Ed., 2003.
3. William Stallings, "Data and computer communications", Pearson education Asia, 7th Ed.. 2002.

BCA 304: Artificial Intelligence

Question Paper pattern for Main University Examination   *Max Marks: 100*

Part – I (very short answer) consists 10 questions of two marks each with two questions from each unit. Maximum limit for each question is up to 40 words.
Part – II (short answer) consists 5 questions of four marks each with one question from each unit. Maximum limit for each question is up to 80 words.
Part – III (Long answer) consists 5 questions of twelve marks each with one question from each unit with internal choice.

UNIT – I

General Issues and overview of AI : Concept of Intelligence, Definition of AI   AI intelligent agents: Agents and Environments, Characteristics of AI, Comparison of AI. Machine Learning and Deep Learning. Defining problem as a State Space Search. Search and Control Strategies, Production systems, Problems – Water Jug problem. Missionary Cannibal Problem, Block words Problem, Monkey & Banana problem. Applications of AI.

Unit-II

Searching- Searching for solutions, uniformed search strategies – Breadth first search, depth first Search. Informed search strategies (Heuristic search) Generate-and-test, Hill climbing, Best First Search , Constraint Satisfaction ,A*, AO* Algorithms, Problem reduction, Game Playing-Adversial search, Problem in Game playing.

Unit-III

Knowledge Representation : Definition of Knowledge, Types of knowledge (Procedural and Declarative knowledge),Approaches to Knowledge Representation, Knowledge representation using Propositional and Predicate logic , Conversion to clause form, Resolution in Propositional logic, Resolution in Predicate logic, Introduction to LISP & PROLOG.

Unit-IV
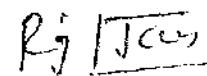
Natural Language Processing: Origins and challenges of NLP , Goals of NLP, Steps of Natural Language Processing , Discourse Knowledge, Pragmatic Knowledge, The Chomsky Hierarchy of Grammars, Transformational Grammar, Case Grammars (FILLMORE's Grammar), Semantic Grammars, Context Free Grammar (CFG), Parsing Process: types of parsing, Transition Network: types of Transition Network , Applications of NLP, Case Studies: Eliza System, Lunar System

Unit-V

Introduction to Expert Systems: Definition , characteristics of an expert system ,The development process of Expert System, Structure of Expert Systems, Human Expert Vs Expert System, types of expert systems ,Shells of Expert System , Benefits of Expert System, Limitations of Expert System, Applications of expert System ,Case Studies : MYCIN, DENDRAL

Recommended Books:
1. Elaine Rich and Kevin Knight, "Artificial Intelligence", Tata McGraw Hill, 3rd edition, 2012.
2. Dan W. Patterson, "Introduction to Artificial Intelligence and Expert Systems", Prentice Hall of India, 1st edition, 2012
3. Winston, Patrick, Henry, "Artificial Intelligence", Pearson Education, 3rd edition, 2014
4. Subhasree Bhattacharjee, "Artificial Intelligence for Student" Shroff Publishers and Distributors Pvt.LTD., 1st Edition, 2016
5. Steven Bird, Ewan Klein and Edward Loper, Natural Language Processing with PythonII, First Edition, OReilly Media, 2009.
6. Nils J. Nilsson, "Principles of Artificial Intelligence (Symbolic Computation / Artificial Intelligence)", reprint edition, 2014.
7. Stuart Russell, Peter Norving, "Artificial Intelligence: A Modern Approach", Pearson Education, 3rd edition, 2010.

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BCA-305 : Digital Marketing

Question Paper pattern for Main University Examination   *Max Marks: 100*

Part – I (very short answer) consists 10 questions of two marks each with two questions from each unit. Maximum limit for each question is up to 40 words.
Part – II (short answer) consists 5 questions of four marks each with one question from each unit. Maximum limit for each question is up to 80 words.
Part – III (Long answer) consists 5 questions of twelve marks each with one question from each unit with internal choice.

Unit-I

Digital Marketing Fundamentals : Define digital marketing, Importance, Marketing v/s Sales, Marketing Mix and 4 Ps, Digital Marketing, CRM platform, CRM models. CRM platform, Marketing Automation, Inbound vs Outbound Marketing, Content Marketing, Understanding Traffic, Understanding Leads, Strategic Flow for Marketing Activities

Unit-II

Website Planning and Structure :WWW, Domains, Buying a Domain, Website Language & Technology, Core Objective of Website and Flow, One Page Website. Google Analytics, Tracking Code, Website Auditing.

Search Engine Optimization: Basic Concepts of SEO,   Search Engine working. Keywords, titles, meta tags, Understating the SERP, Google processing, Indexing , Crawling,On page optimization techniques, Off page Optimization techniques, Web 2.0 Submission, Article Submission, Image Submission, Video Submission,SEO Audit & Future of SEO.

Unit-III

Email Marketing: Content Writing, Email Machine – The Strategy, Email Frequency. Triggers in Email using 4Ps, Sequence of Email Triggers, Email Software and Tools. Importing Email Lists, Planning Email Campaign, Email Templates and Designs. Sending HTML Email Campaigns, WebForms Lead Importing, Integrating Landing Page Forms Campaign Reports and Insights, Segmentation Strategy Segmentation, Lists Auto-Responder Series Triggering Auto – Responder Emails

Unit-IV

Google Adwords : Basics, Google Ad Types, Pricing Models, PPC Cost Formula, Ad Page Rank, Billing and Payments, Adwords User Interface, Keyword Planning. Keywords Control, Creating Ad Campaigns, Creating Text Ads, Creating Ad Groups. Bidding Strategy for CPC.

Unit-V

Social Media Optimization (SMO) : Introduction Social Media Optimization. Introduction to Social Media networks, Types of Social media Websites, Social Media Optimization Concept, Facebook, Google+, LinkedIn, YouTube, Pinterest, Hashtags. image optimization

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Social Media Marketing (SMM) : Facebook Optimization, Fan Page Vs profile Vs Group, Creating Facebook page for Business, Increasing fans and Doing Marketing, Facebook Analytics, Facebook Advertising and Its types, Creating Advertising Campaigns, Payment modes, Introduction to Twitter, Creating Strong profiles on twitter.

Recommended Books:

1. Ian Dodson, "The Art of Digital Marketing ", Wiley, 2018
2. Seema Gupta, "Digital Marketing" Mc-Graw Hill, 1st Edition, 2017
3. **References:** Puneet Singh Bhatia, "Fundamentals of Digital Marketing", Pearson, 1st Edition, 2017
4. Vandana Ahuja, "Digital Marketing", Oxford University Press
5. Philip Kotler, "Marketing 4.0: – Moving from Traditional to Digital", Wiley, 2017

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Practical:

BCA-307 : Java Lab

Practical Lab Exercises based on Theory Paper BCA 301.

BCA-308 : Python Lab

Practical Lab Exercises based on Theory Paper BCA 302.

BCA309 : Digital Marketing Lab

Practical Lab Exercises based on the Theory Paper BCA-305 of BCA Part -III

BCA-310 : Project

OBJECTIVE:
The duration of BCA final year project is one yearr. Students are required to undertake innovative and research oriented projects, which not only reflect their knowledge gained in the earlier courses but also additional knowledge gained from their own effort. They must show the phase wise development of their project submitting the appropriate documents at the end of each phase. The student must put in effort to find answers to questions about the applications, which will also enhance the value of the project report.
Project must be done in a group of 2-3 students.

- Final Evaluation will be done by:
    1. Project Demonstration
    2. Power Point Presentation/Execution of project

General instructions for preparation of project report
1. Introduction
      1.1 Cover Page
      1.2 Title Page
      1.3 Certificate
      1.4 Acknowledgement
      1.5 Table of Contents

2. Project Specifications
      2.1 Project Overview
      2.2 Project Need

3. Specific Requirements
      3.1 External Interface Requirements
      3.2 Hardware Interfaces
      3.3 Software Interfaces
      3.4 Communications Protocols
      3.5 Security / Maintainability / Performance

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4. Software Product Features

      4.1 System Architecture

      4.2 Database Requirements

      4.3 ER Diagram

      4.4 Data Flow Diagram

      4.5 User Interfaces

      4.6 Report Formats

5. Drawbacks and Limitations

6. Proposed Enhancements

7. Conclusion

8. Bibliography

9. Annexure:

      9.1 User Interface Screens (Optional)

      9.2 Output Reports with Data (if any)

      9.3 Program Code

Elective Theory papers for Elective Group-III of BCA Part-III

BCA-C01: Data Warehousing and Data Mining

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Part – III (Long answer) consists 5 questions of twelve marks each with one question from each unit with internal choice.

Unit-I

Introduction to Data Warehousing : Data Warehouse definition, Characteristics. Purpose of Data Warehouse and functions, Data warehouse Architecture, Components. Building a Data warehouse, Implementation.

Unit-II

Data Mining : Data Warehousing to Data Mining, Evolution Analysis, Classification of Data Mining Systems, Architecture of data mining system, Major Issues in Data Mining.

Patterns and models – Data visualization principles, Data Mining functionalities. Major issues in Data Mining.

Unit-III

Data preprocessing : Needs, Data Cleaning, Data Integration and Transformation, Data Reduction, Dieselization and Concept Hierarchy Generation; Analysis of Attributes Relevance. Discriminating between Different Classes.

Data Marts: Data Warehouse Cost-Benefit Analysis/Return on Investment and OLAP Technology for Data Mining.

Unit-IV

Association Rules : Association Rule Mining, Single- Dimensional Boolean Association Rules from Transactional Databases. Apriori algorithm, Use of sampling for frequent item-set, FP tree algorithm, Multi-Level Association Rules from Transaction Databases.

Unit- V

Clustering and Applications of Data Mining : Cluster Analysis, Types of Data Categorization of Major Clustering Methods (Kmeans, Partitioning Methods, Density Based Methods, Grid Based Methods, Model-Based Clustering Methods). Data Mining Applications.

Recommended Books :

Data Warehousing in the Real World – SAM ANAHORY & Dennis MURRAY. Peasrson Edn Asia.

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2. Data Mining – Concepts and Techniques- JIA WEI HAN & MICHELINE KAMBER Hareourt India.
2. Data Warehousing ; Reema Thareja; Oxford
4. Data Mining Introductory and advanced topics MARGARET H DUNHAM PEARSON EDUCATION.
5. Data Warehousing in Real World Anahory, Pearson Education.
5. Data Mining Techniques- ARUN K PUJARI, University Press.
   Bulding the Data Warehouse- W. H. Inmon, 3rd Edition, Wiley, 2003.
6. Data Warehousing Fundamentals- PAULRAJ PONNAIAH WILLEY STUDENT EDN.

BCA C02: Network Security & Cryptography

Question Paper pattern for Main University Examination   *Max Marks: 100*

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Part – III (Long answer) consists 5 questions of twelve marks each with one question from each unit with internal choice.

Unit – I

Introduction to Security Attacks : Cryptography, Security Attacks, Security Services and Mechanism.
Classical Encryption Techniques : Classical Techniques, Conventional Encryption Model, Classical Encryption Techniques.
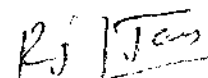
Unit - II

Modern Techniques: Simplified DES, Block Ciphers Principles, DES Standards, DES Strength, Differential & Linear Cryptanalysis, Block Cipher Design Principles, Block cipher Modes of Operation.

Conventional Encryption Algorithms: Triples DES, International Data Encryption Algorithm, RC5, RC2 placement & Encryption Function, Key Distribution, Random Number generation, Placement of Encryption Function.

Unit - III

Public Key Encryption: Public Key Cryptography: Principle of public key Cryptosystems, RSA algorithm, Key Management, Fermat's Theorem & Euler's Theorem.

Message Authentication & Hash Function: Authentication Requirements, Authentication Function, Message Authentication Codes, Hash Function, Birthday Attacks, Security of Hash Function & MAC's, MD5 Message Digest algorithm, Secure Hash Algorithm(SHA).

Unit - IV

Digital Signatures: RSA Based, ElGamal Signatures, Undeniable Signatures. **Authentication:** Model of Authentication Systems, Impersonation, Substitution and spoofing games, Authentication schemes for mutual authentication based on shared secret. two-way public key, one-way public key, Mediated Authentication. One way Authentication.

Unit – V

Network and System Security: Authentication Application- Kerberos x.509, Dictionary Authentication Services, Electronic Mail Security, Pretty Good Privacy (PGP). S/mime. Security: Architecture, Authentication Header, Encapsulation security payloads. combining security association, Key Management.

Web Security: Secure socket layer & Transport layer security, Secure electronic transaction (SET). System Security: Intruders, viruses, firewall Design principle, Trusted Systems.

Reference Books:

1. Willium Stalling; Cryptography and Network Security, Fifth Edn, Pearson.2006:
2. Kaufman Charlie et.al; Network Security: Private Communication in a Public World, 2nd Ed.,PHI/Pearson.
3. Atul Kahate; Cryptography and network Security; Tata McgrawHill.
4. V.K. Pachghare; Cryptography and Information Security; PHI.
5. Matt Bishop, Sathyanarayana; Introduction to Computer Security;Pearson.

BCA C03: Machine Learning

Unit-I

Concepts : Machine Learning, Machine Learning Foundations-Overview, Applications. Types of Machine Learning, Basic Concepts in Machine Learning – Examples of Machine Learning, Perspectives/Issues in Machine Learning, AI vs. Machine Learning.

Unit-II

Supervised Learning : Introduction, Linear Models of Classification – Decision Trees. Naïve Bayes Classification, Linear Regression – Logistic Regression – Bayesian Logistic

Regression – Probabilistic Models Neural Network-Feed Forward Network Functions – Error Back Propagation – Regularization .

Unit-III

Unsupervised Learning : Clustering, Association rule mining, K-Means Clustering, EM (Expectation Maximization), Mixtures of Gaussians, EM algorithm in General, The Curse of Dimensionality, Dimensionality Reduction, Factor Analysis, Principal Component Analysis.

Unit-IV

Probabilistic Graphical Models : Directed Graphical Models, Bayesian Networks. Exploiting Independence Properties, From Distributions to Graphs, Examples – Markov Random Fields – Inference In Graphical Models – Learning - Naïve Bayes Classifiers – Markov Models – Hidden Markov Models.
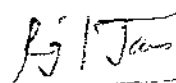
Unit-V

Advanced Learning : Sampling – Basic Sampling Method – Monte Carlo. Reinforcement Learning-The Learning Task, Instance based Learning-Nearest neighbor classification, k-nearest neighbor, Elements of Reinforcement Learning, Difference between Reinforcement Learning and Supervised Learning, Applications of Reinforcement Learning.

Recommended Books:
1. Christopher Bishop, "Pattern Recognition and Machine Learning", Springer 2006
2. EthemAlpaydin, "Introduction to Machine Learning", Prentice Hall of India, 2005
3. S.Sridhar, M.Vijayalakshmi, "Machine Learning", Oxford Publication,2021.
4. Joel Grus, "Data Science from Scratch- First Principles with Python", O'Reilly, 2015
5. Tom Mitchell, " Machine Learning", McGraw-Hill, 1997
6. Stephen MarsLand, "Machine Learning-An Algorithmic Perspective", CRC Press, 2009
7. Kevin P. Murphy, "Machine Learning: A Probabilistic Perspective", MIT Press, 2012
8. M. Gopal, "Applied MACHINE LEARNING", McGraw-Hill, 2018
9. Dr.Mahaveer Kumar Sain, "Introduction to Machine Learning", Akinik Publications-New Delhi, 2021.
10. Mark Summerfield, "Programming in Python 3: A Complete Introduction to the Python Language", Addison Wesley, 2010

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