TEACHING AND EXAMINATION SCHEME
Bachelor of Computer Applications (Honours)
WEF 2020 - 2021
Semester I

Paper Name (Theory)		Lec	Tut	Ex Hrs	Max Marks	
					Sess	Sem Ex
bca-101	Computer Organization	4	1	3	20	80
bca-102	Programming in C Language	4	1	3	20	80
bca-103	Discrete Mathematics	4	1	3	20	80
bca-104	Multimedia Basics	4	1	3	20	80
				TOTAL	80	320

Paper Name (Practical)		Pr Hrs	Ex Hrs	Max Marks
bca-105	Lab-C Programming	4	3	50
bca-106	Lab-Multimedia & Computer Organization	4	3	50
			TOTAL	100

Total of Theory & Practical Marks& Credits	500

Semester II

Paper Name (Theory)		Lec	Tut	Ex Hrs	Max Marks	
					Sess	Sem Ex
bca-201	Data Structures	4	1	3	20	80
bca-202	Programming in C++	4	1	3	20	80
bca-203	Database management Systems	4	1	3	20	80
bca-204	Open Source Operating System	4	1	3	20	80
				TOTAL	80	320

Paper Name (Practical)		Pr Hrs	Ex Hrs	Max Marks
bca-205	Lab-C++ Programming & Data Structure	4	3	50
bca-206	Lab-DBMS & Open Source	4	3	50
			TOTAL	100

Total of Theory & Practical Marks& Credits	500

TEACHING AND EXAMINATION SCHEME
Bachelor of Computer Applications (Honours)
WEF 2021 - 2022

Semester III

Paper Name (Theory)		Lec	Tut	Ex Hrs	Max Marks	
					Sess	Sem Ex
bca-301	Programming in Java	4	1	3	20	80
bca-302	Computer Graphics	4	1	3	20	80
bca-303	Web Programming	4	1	3	20	80
bca-304	Computer Network	4	1	3	20	80
				TOTAL	80	320

Paper Name (Practical)		Pr Hrs	Ex Hrs	Max Marks
bca-305	Lab-Computer Graphics & Java	4	3	50
bca-306	Lab-Web Programming & Computer Network	4	3	50
			TOTAL	100

Total of Theory & Practical Marks& Credits	500

Semester IV

Paper Name (Theory)		Lec	Tut	Ex Hrs	Max Marks	
					Sess	Sem Ex
bca-401	Software Engineering	4	1	3	20	80
bca-402	Advance Java Programming	4	1	3	20	80
bca-403	Web Development	4	1	3	20	80
bca-404	Visual Programming in .NET	4	1	3	20	80
				TOTAL	80	320

Paper Name (Practical)		Pr Hrs	Ex Hrs	Max Marks
bca-405	Lab-Web Development & Advance Java	4	3	50
bca-406	Lab- Visual Programming .NET & Software Engg	4	3	50
			TOTAL	100

Total of Theory & Practical Marks& Credits	500

TEACHING AND EXAMINATION SCHEME
Bachelor of Computer Applications (Honours)
WEF 2022 - 2023
Semester V

Paper Name (Theory)		Lec	Tut	Ex Hrs	Max Marks	
					Sess	Sem Ex
bca-501	Artificial Intelligence	4	1	3	20	80
bca-502	Image Processing	4	1	3	20	80
bca-503	Programming in Python	4	1	3	20	80
bca-504	Data Mining	4	1	3	20	80
				TOTAL	80	320

Paper Name (Practical)		Pr Hrs	Ex Hrs	Max Marks
bca-505	Lab-AI & Python	4	3	50
bca-506	Lab- Data Mining & Image Processing	4	3	50
			TOTAL	100

Total of Theory & Practical Marks& Credits	500

Semester VI

Paper Name (Theory)		Lec	Tut	Ex Hrs	Max Marks	
					Sess	Sem Ex
bca-601	Mobile Application Development	4	1	3	20	80
bca-602	Data Science with R	4	1	3	20	80
bca-603	Cloud Computing	4	1	3	20	80
bca-604	Project	4	1	3	20	80
				TOTAL	80	320

Paper Name (Practical)		Pr Hrs	Ex Hrs	Max Marks
bca-605	Lab-Mobile App Development & Cloud Computing	4	3	50
bca-606	Lab-Data Science with R	4	3	50
			TOTAL	100

Total of Theory & Practical Marks& Credits	500

Scheme of Examination
(For B. C. A.(Hons)– Semester Scheme)

Theory:

Part A:
1. 10 Question of 1 mark each – 10 marks
2. Answer should not exceed more than 20 words
3. All questions are compulsory

Part B:
1. 5 Questions of 2 marks each – 10 marks
2. Answer should not exceed more than 50 words
3. All questions are compulsory

Part C:
1. 3 Questions of 20 marks each – 60 marks. There will be an internal choice in each question.
2. Answer should not exceed 400 words
3. All questions are compulsory.

Sessional:

There will be sessional (internal assessment) of 20 marks conducted by the department.

Practical:

Practical exams shall be conducted by one internal and one external examiner of a batch of 20 students in a day.

Duration of Practical exam is 3 hours.

A Laboratory Exercise File should be prepared by each student for each practical paper and should be submitted during practical examinations.

Practical of 50 marks distribution is as under:

a. 30 marks for practical examination exercise for 3 questions
b. 10 marks for Viva-voce
c. 10 marks for Laboratory Exercise File

Eligibility:

10+2 with 55% marks in aggregate. Admission is strictly on the basis of merit.

Scheme of Examination
(For B. C. A.Hons.)

Reg. 17 (b)

The examination for the Bachelor of Computer Applications (Hons.) will consist of 6 semesters. The examination shall consist of (a) Theory papers (b) Laboratory / Practical work (c) project. Candidates will be required to pursue a regular, full time course of study at the University department for a period of three academic years in order to be eligible for appearing in the examination.

1. Eligibility for BCA (Hons.) is 10+2 with 55% marks in aggregate.

2. Examination:
   i. There shall be 36 papers (24 theory and 12 practical papers including project). Theory paper shall be of 3 hours duration having 100 marks. Out of 100 marks 20 marks shall be considered as internal assessment based on internal test and seminars and 80 marks will be of examination at the end of each semester as determined by the University. The practical shall be of 50 marks assessed by external examiner. The Project work shall be of 100 marks based on project presentation and viva-voce, assessed by external examiner and 20 marks will be assessed by internal examiner.
   ii. To pass a semester a candidate shall have to score 25% marks in each subject (theory and practical) separately and also 36% marks in aggregate of all the papers prescribed for the examination.
   iii. Due paper(s) will be applicable if a candidate obtains 36% marks in aggregate and fails in not more than two (2) papers (theory). Due paper(s) of I semester will be held along with the III semester, the due of III semester will be held along with V semester, the due paper(s) of II semester will be held along with the IV semester and due papers of the IV semester will be held along with the VI semester. The V and VI semester due paper(s) will be held in theI and II semester respectively of the next year. The chance of due paper(s) will be given thrice in each semester.
   iv. Wherever a candidate appears at for a due paper examination he/she will do so according to the syllabus in force.
   v. A candidate not appearing at any examination/absent in any paper of term end examination shall be deemed as fail.

3. A candidate for a pass in the examination shall be required to obtain:
   i. At least 36% marks in the aggregate of all the papers prescribed for the examination and
   ii. At least 36% marks in the practical(s) wherever prescribed at the examination, provided that if a candidate fails to secure at least 25% marks in each individual paper at the examination notwithstanding his/her having obtained the minimum percentage of marks required in the aggregate for that examination.

   No Division will be awarded in the first, to fifth semester examinations. Division shall be awarded at the end of the sixth semester Examination on the combined marks obtained at the first to fifth semester taken together as noted below:

   Passed with First Division   60% of the aggregate marks taken together of all the
                                   Six semester examinations
   Passed with second division   48%
   All the rest will be declared to have passed the examination.

Provided that if a candidate clears any paper after a continuous period of three years since he/she was admitted to the B. C. A. (Hons.) then for the passing marks, i.e. 25% marks, shall be taken into account in the case of such course(s).

Provided further that in case where a candidate requires more than 25% marks in order to reach the requisite minimum aggregate i.e. 36% marks, as many marks, out of those actually secured by him/her will be taken into account as would enable him/her to make up the deficiency in the requisite minimum aggregate marks.

4. The grace marks shall be given up to 1% of the total aggregate marks of theory and practical of that semester in maximum one paper.

5. Candidates reappearing at an examination in a subsequent year shall be examined in accordance with the scheme and syllabi in force and shall be entitled to the award of the degree of year in which they clear the last failing/unclear paper.

Duration: 3 hours	**Max Marks: 80**

bca-101Computer Organization

Number systems: Decimal numbers , Binary numbers : Counting in binary, The weighted structure of binary numbers, Octal numbers, hexadecimal numbers and their mutual conversions ,Binary arithmetic : Addition, subtraction, multiplication and division of binary numbers, 1's and 2's complement, BCD numbers, BCD addition, BCD subtraction, Gray code: Binary to Gray code conversion, Gray to Binary conversion

Boolean algebra:Boolean operations and expressions, Laws and rules of Boolean algebra, Demorgan's Theorem, Boolean expressions, Simplification of Boolean expression.

Logic Gates:AND gate, OR gate, NOT gate, NAND gate , NOR gate , X-OR gate , X-NOR gate, The universal property of NAND gate and NOR gate, Realization of basic gates. Boolean expression for logic circuits, Karnaugh map SOP with examples.

Combinational Circuits: Half adder, Full adder, Halfsubtractor, Full subtractor Decoders, Encoder, Multiplexer, Demultiplexer.

Sequential Circuits: Latches: SR latch, Clocked flip-flops: SR flip-flop, D flip-flop, JK flip-flop. Registers: General purpose and special purpose registers, Shiftregisters

Duration: 3 hours	**Max Marks: 80**

bca-102Programming in C Language

Overview of C Language: Character set, C tokens, Identifiers, Keywords,Data types, Variables, Constants, Symbolic Constants , Operators in C, Hierarchy ofOperators, Expressions

Managing Input and Output Operation: Formatted and Unformatted I/O Functions,Decision making, branching and looping: Decision Making Statements - if Statement, if–else statement, nesting of if-else statements, else–if ladder, switch statement, ternary operator

Looping - while, do-while, for loop, Nested loop, break, continue, and goto statements.Functions: Function Definition, prototyping, types of functions, passing arguments tofunctions, Nested Functions, Recursive functions.

Arrays: Declaring and Initializing, One Dimensional Arrays, Two Dimensional Arrays,Multi-Dimensional Arrays - Passing arrays to functions. Strings: Declaring andInitializing strings, Operations on strings, Arrays of strings, passing strings to functions.Storage Classes - Automatic, External, Static and Register Variables.

Structures-Declaring and Initializing, Nested structure, Array of Structure, PassingStructures to functions, Unions, typedef, enum, Bit fields. Pointers – Declarations,Pointer arithmetic, Pointers and functions, Call by value, Call by reference, Pointers andArrays, Arrays of Pointers, Pointers and Structures. Meaning of static and dynamicmemory allocation, Memory allocation functions, infix, prefix, postfix

Duration: 3 hours	**Max Marks: 80**

bca-103Discrete Mathematics

Sets: definition and types, set operations, partition of set, cardinality, recursive definition of set. Functions: concept, some special functions (polynomial, exponential & Logarithmic, absolute value, floor & ceiling, mod & div functions) properties of functions, cardinality of infinite set, countable and uncountable set, pigeon hole principle, composition of function

Relations: Boolean matrices, binary relation, adjacency matrix of relation, properties of relations, operations of relations, connectivity relation, transitive closure, Warshall Algorithm, equivalence relation, equivalence class

Proof Methods: Vacuous, trivial, direct, indirect by contrapositive and contradiction, constructive & non-constructive proof, counterexample. The division algorithm, divisibility properties (prime numbers & composite numbers) principle of mathematical induction, the second principle of mathematical induction, fundamental theorem of arithmetic. Algorithm correctness: partial correctness, loop invariant, testing the partial correctness of linear and binary search, bubble and selection sorting

Graph theory: Graphs, directed, undirected, simple, adjacency & incidence, degree of vertex, sub-graph, complete graph, cycle & wheel graph, bipartite & complete bipartite graph, weighed graph. Trees: spanning trees – Kruskal'sAlgo, finding spanning tree using depth first search, breadth first search, complexity of graph, minimum spanning tree.

Duration: 3 hours	**Max Marks: 80**

bca-104Multimedia Basics

Introduction to Multimedia Technology – Application areas of Multimedia, Media elements (text, audio, video, image and animation), MM hardware & software requirements(Image , Video, Audio, Sound editing software's). Developing Applications using multimedia, Images: Raster and Vector images. Image compression: Importance and its type (Lossy and Lossless Compression), advantages and disadvantages of image compression, Jpeg image compression standard, mpeg video compression (P,B, I frames).

Flash: Introduction, Features , Advantages ,Concepts of Frame Rate and Resolution, Exploring The Flash Interface ,The Flash stage ,Timeline- Play head/Frames/Key Frames/ Blank frames ,Menus, Tools of Flash (Pen, Pencil, Paint Bucket Tool, spray brush ,Text, 3D rotation, deco tool), Drawing object in flash (line, curve, oval, Rectangle , Polystar tool) , stroke and fill, Layers and its types in flash, Key frames, Object based animation, motion tween, classic tween and shape tween, adding sound.

Photoshop: Introduction, terms: layer, intensity, resolution, opacity, its features ,Opening and Importing images, Creating Documents with different sizes (default, international, custom), Editing images, Marquee, Move tool, Selection Tools: magic wand tool, quick selection tool, lasso tool: polygonal lasso tool, magnetic lasso tool ,Crop tool, slice tool, eyedropper tool, ruler tool: Brush tool: Spot healing brush tool, healing brush tool, patch tool, red eye tool, brush tool, Color: color replacement tool, Pen tool, Text tool: horizontal type tool, vertical type tool, Path selection tool, direct selection tool, invert selection Working with layers & layer styles, duplicate layer, merge layer, set layer visibility, group layers, Free Transformations, Perspective,Eraser tool, background eraser tool magic eraser, gradient tool paint bucket too, curve tools .

Duration: 3 hours	**Max Marks: 80**

bca-201Data Structures

Definitions of Data Structure and Algorithm – Time and Space complexity- Algorithm notations.

Searching:(Linear and Binary), Concept of sorting, Sorting algorithms (Bubble Sort, quick sort, Selection Sort, merge sort). Recursion: Factorial, Fibonacci, Tower of Hanoi.

Linked Lists: Introduction to linked list and double linked list, Representation of linked lists in Memory, Traversing a linked list, Searching linked list, Insertion and deletion into linked list, Doubly linked lists, Traversing a doubly linked lists.

Stacks and Queues: Primitives of stacks, Implementation of stacks using Array & Link List Introduction to queues, properties of queues

Trees: Definition & Basic concepts, linked tree representation, Introduction to Binary Tree, Traversing Binary Trees (Pre order, Post order and In-order), Concept of Binary search tree, algorithm of Searching, inserting and deleting in binary search trees.

Graph: Introduction to graphs, types of graphs, operation of Graph: adjacency Matrix, Graph Traversal: Breadth first search, Depth first search.

Duration: 3 hours	**Max Marks: 80**

bca-202Programming in C++

Introduction to OOP with C++

Classes, Objects, Encapsulation, Polymorphism, Inheritance, Control Structures: Control and Looping Statements. Function: Function Prototyping, Call and Return by Reference, Inline Function, Default and Const Arguments, Friend Functions, Friend Classes, Inline Functions, Static Class Members, Static Data Members, Static Member Functions, The Scope Resolution Operator, Nested Classes, Passing Objects to Functions, Returning Objects, Object Assignment.

Arrays, Pointers, References, and the Dynamic Allocation Operators

Arrays of Objects, Pointers, Pointer Expression, Pointer as function arguments, Functions returning pointers, Pointers to functions, Creating Initialized vs, Pointers to Objects, The this Pointer, References, Reference Parameters, Passing References to Objects, Returning References, C++'s Dynamic Allocation Operators new and delete, Initializing Allocated Memory, Allocating Arrays ,Allocating Objects.

Function Overloading, Copy Constructors and Default Arguments: Function Overloading, Overloading Constructors, Copy Constructors, Default Function Arguments, Function Overloading and Ambiguity.

Operator Overloading: Creating a Member Operator Function, Creating Prefix and Postfix Forms, of the Increment and decrement Operators, Operator Overloading Restrictions, Operator Overloading Using a Friend Function, Using a Friend to Overload ++ or – –, Overloading [ ], Overloading ().

Inheritance: Base-Class Access Control, Inheritance and protected Members, Protected Base-Class Inheritance, Inheriting Multiple Base Classes, Constructors, Destructors, and Inheritance, When Constructors and Destructors Are Executed, Passing Parameters to Base-Class Constructors, Granting Access, Virtual Base Classes.

Duration: 3 hours	**Max Marks: 80**

bca-203Database Management Systems

Conventional file system, object of database systems, data abstraction, data definition language, data manipulation language, database administrator. Database design stages, database model, database system architecture.

Entity-Relationship Model, entity, entity set, attributes, tuples, domains, keys, super and candidate key, overview of hierarchical, network and relational models, comparison of network, hierarchical and relational models, file organization

Relational Model: Storage organization for relations, relational algebra, set operators, relational operators, decomposition of relation schemes, functional dependencies, normalization up to BCNF.

MS-Access: Create a Table in MS Access -Data Types, Field Properties, Fieldsnames, types, properties, default values, format, caption, validationrules Data Entry Add record delete recode and edit text Sort, find/replace,filter/select, re-arrange columns, freeze columns. Edit a Tables- copy, delete, import, modify table structure find replace.

Setting up Relationships- Define relationships, add a relationship, set a rule for Referential Integrity, change the join type, delete a relationship, save relationship Queries & Filter –difference between queries and filter,filter using multiple fields AND,OR,advance filter Queries create Query with one table,fiend record with select query, find duplicate record with query,find unmatched record with query, run query,save and change query.

Introduction to Forms Types of Basic Forms: Columnar, Tabular, Datasheet, Main/Subforms, add headers and footers, add fields to form, add text to form use label option button, check box,combo box, list box Forms Wizard, Create Template.

Introduction to Reports,Types of Basic Reports: Single Column, Tabular Report Groups/Total, single table report multi table report preview report print report, Creating Reports and Labels, Wizard

Duration: 3 hours	**Max Marks: 80**

bca-204Open Source Operating System

Introduction to Operating Systems, goals of OS, operation of OS, resource allocater and related functions, classes of OS, batch processing, multi-processing, time sharing, distributed, real time systems, system calls, system programs

Process concept, interacting process, threads, fundamental of scheduling, scheduling criteria, long medium short term scheduling, scheduling algorithms , structure of concurrent system, critical section, critical region, inter-process communication, monitor and semaphores, implementation and uses.

Logical versus physical address, swapping, contiguous allocation, segmentation, paging, segmentation with paging, kernel memory allocation, page replacement algorithm, virtual memory, virtual memory with paging, demand paging, dead lock, characterization, methods for handling dead locks, prevention, avoidance, thrashing, allocation of frame, virtual memory using segmentation,

Files and Directories – File Concept, File types, File system Structure, file metsdata – Inodes, kernel support for file, system calls for file I/O operations – open, create, read, write, close, Iseek, dup2, file status information – sata family, file and record locking – fcntifuction, file permissions – chmod, fchmod, file ownership – chown, Ichown, fchown, links – soft links and hard links – symlink, link, unlink.

Directories – Creating, removing and changing Directories – mkdir, rmdir,chdir, obtaining current working directory – getcwd, Directory contents, Scanning Directories – opendir, readdir, closedir, rewinddir functions.

Process – process concept, Process environment – environment list, environment variables, getenv, setenv, system call interface for process management – fork, vfork, exit, wait, waitpid, exec family,

Shell programming with Bourne again shell (bash) – Introduction, shell respnsibilites, pipes and Redirection, here documents, running a shell script, the shell as a programming language, shell meta characters, file name substitution, shall variables, command substitutions, shell commands, the environment, quoting, test command, control structures, arithmetic in shell, shell script examples, interrupt processing, fictions, debugging shell scripts.

Duration: 3 hours	**Max Marks: 80**

bca-301Programming in Java

Introducing Data Types and Operators
Java's Primitive Types, Literals, Variables, operators, Type conversion in Assignments, Cast, Operator Precedence, Expressions.

Program Control Statements
Input characters from the Keyword, if statement, Nested ifs, if-else-if Ladder, Switch Statement, Nested switch statements, for Loop, Enhanced for Loop, While Loop, do-while Loop, Use break, Use continue, Nested Loops**.**

Introduction to Classes, Objects and Methods
Class Fundamentals, Reference Variables and Assignment, Methods, Using Parameters, Constructors, Parameterized Constructors, The new operator.

More Data Types and Operators
Arrays, Multidimensional Arrays, Alternative Array Declaration Syntax, Assigning Array References, Using the Length Member, The Bitwise operators.

String Handling
String Fundamentals, The String Constructors, Three String-Related Language Features, The Length() Method, Obtaining the characters within a string, String comparison, using indexOf() and last IndexOf(), Changing the case of characters within a string, String Buffer and String Builder.

Method Overloading, Overloading Constructors, Recursion

Inheritance
Inheritance Basics, Member Access and Inheritance, Constructors and Inheritance, Using super to Call Super class constructors, Using super to Access Super class Members, Creating a Multilevel Hierarchy,

Interfaces
Interface Fundamentals, Creating an Interface, Implementing an Interface, Using Interface References, Implementing Multiple Interfaces, Interfaces can be extended

Packages
Package Fundamentals, Packages and Member Access, Importing Packages, Static Import

Exception Handling
The Exception Hierarchy, Exception Handling Fundamentals, using Multiple catch clauses, Catching subclass Exceptions, try blocks can be nested, Throwing an Exception

Multithreaded Programming
Multithreading fundamentals, The Thread Class and Runnable Interface, Creating Thread, Creating Multiple Threads, Determining When a Thread Ends, Thread Priorities, Synchronization, Thread Communication using notify(), wait()and notifyAll(), suspending, Resuming and stopping Threads.

Duration: 3 hours	**Max Marks: 80**

bca-302Computer Graphics
Note: Practical will be done in MATLAB

Interactive graphics, passive graphics, advantage of interactive graphics, classification of application

Point, line, DDA algorithm, Bresenham's line algorithm, circle generating algorithm, polynomial and spline curves algorithms, clipping operation, point, line, Cohen-Sutherland line clipping

2D transformation, matrix representation of 2D, composite transformation, translation, rotation, scaling, general pivot-point rotation, general fix scaling, reflection, shear, affine transformations and transformation functions

Parallel projection, perspective projection, 3D transformation, rotation, scaling, composite transformation, 3D transformation function.

| **Duration: 3 hours** | **Max Marks: 80** |

bca-303Web Programming

HTML - Concepts of Hypertext, Versions of HTML, Elements of HTML syntax, Head & Body Sections, Building HTML documents, Inserting texts, Images, Hyperlinks, Backgrounds and Color controls, Different HTML tags, Table layout and presentation, Use of font size & Attributes, List types and its tags, Use of Frames and Forms in web pages.

Cascading Style Sheets, introduction, levels of style sheets, style specification formats, selector forms, property value forms, font properties, list properties, color, alignment of text, the box model, background images, the <span> and <div> tags, conflict resolution.

Overview of JavaScript, object orientation and JavaScript, syntactic characteristics, primitives, operations, and expressions, screen output and keyboard input, control statements, object creation and modification, arrays, functions, constructors, pattern matching using regular expressions, errors in scripts.

JavaScript execution environment, the Document Object Model, elements access in JavaScript, events and event handling, handling events from body elements, handling events from text box and password elements, the DOM2 event model, the navigator object, DOM tree traversal and modification, positioning elements, moving elements, element visibility, changing colors and fonts, dynamic content, stacking elements, locating the mouse cursor, reacting to a mouse click, slow movement of elements, dragging and dropping elements.

Duration: 3 hours	**Max Marks: 80**

bca-304Computer Network

Network concept, Introduction to Ethernet, token ring, routers, switch, hub, bridge, gateways, private and public networks,Internet basics, models, OSI reference model, layer model, IPV4 address, subnetting, CISCO 3-layer hierarchical model,

Introduction to IP addressing – Class A/B/C/D/E, Private IP address – First OCTET range etc., Subnetting Default Subnet Mask, Class C Subnetting& Practice no. given, Class B Subnetting& problems, Class A Subnetting& problems

Introduction to IPV6, Host Address Assignment, Unicast, Multicast, and other Special IPV6 Addresses, Configuring IPV6 Routing and Routing Protocols, Translations between IPV4 and IPV6, basic router configuration, different mode of operations and commands, internal components, exec mode, basic commands, advance commands,

IP Routing, Static Routing & Default Routing, dynamic routing, RIP, dynamic routing – EIGRP and OSPF, access list, IP standard access list, IP extended access list

NAT, basic operations, static NAT, dynamic NAT, PAT, trouble shoot NAT issues,

WAN Technologies- Leased Line, Leased line, P to P communication, HDLC & PPP protocol-features, Enabling HDLC & PPP, PPP Link, PPP layer & its explanation/role, PAP/CHAP role, Configuring PAP/CHAP using commands

VPN, benefits, components, frame relay, packet switch network, virtual circuit, enabling frame relay, inverse ARP, switching, switching operations, configurations, functions, redundant paths and its problems, spanning tree protocol, mode of operation of switch, switch and hub – half duplex and full duplex, enabling configuring MAC address, VLAN configuration, VTP purpose, domain, mode of operations

Basics of NS2 - About NS2 and NAM, Purpose and Installation, Background and architecture, OTcl and C++ interfaces, Trace files and formats, Protocol support for NS2, Simulation object, Basic Syntax, Node creation, Finish procedure, Running NS2 and NAM, Invoking external commands within NS2, Nodes & Agents, Working of NS2 commands

Wired networks- Creating links, Sending traffic through NS2 links, Setting link parameters, Routing protocol support, Scenarios

Duration: 3 hours	Max Marks: 80

bca-401Software Engineering

Software Process
Software Process models: waterfall, incremental development, reuses oriented, Process activities; Coping with change, The rational Unified process. Introduction to Agile process

Requirements Engineering
Functional and non-functional requirements, The software requirements document, Requirements specification, Requirements engineering processes, Requirement elicitation and analysis, Requirements validation, Requirements management

Component-based software engineering
Components and component model, CBSE process, Component composition.

Design
Design: Design concepts, Function oriented design, detailed design

Distributed Software engineering
Distributed system issues, Architectural patterns for distributed systems, Software as a service. Web application design and development

Planning a software Project
Process planning, Effort estimation, Project scheduling and staffing, Quality plan, Risk Management, Project monitoring plan.

Software Testing
Testing fundamentals, Black-box testing, White-box testing, Testing process

Duration: 3 hours	Max Marks: 80

bca-402Advance Java Programming

Servlet
Servlet Structure, Servlet packaging, HTML building utilities, Lifecycle, SingleThreadModel interface, Handling Client Request: Form Data, Handling Client Request: HTTP Request Headers. Generating server Response: HTTP Status codes, Generating server Response: HTTP Response Headers, Handling Cookies, Session Tracking.

JSP and Controlling the Structure of generated servlets
Invoking java code with JSP scripting elements, creating Template Text, Invoking java code from JSP, Limiting java code in JSP, using jsp expressions, comparing servlets and jsp, writing scriptlets. For example Using Scriptlets to make parts of jsp conditional, using declarations, declaration example. Controlling the Structure of generated servlets: The JSP page directive, import attribute, session attribute, isElignore attribute, buffer and autoflush attributes, info attribute, errorPage and iserrorPage attributes, isThreadSafe Attribute, extends attribute, language attribute, Including files and applets in jsp Pages, using java beans components in JSP documents

Annotations and Java Beans
Creating Packages, Interfaces, JAR files and Annotations. The core java API package, Newjava.Lang Sub package, Built-in Annotations with examples. Working with Java Beans. Introspection, Customizers, creating java bean, manifest file, Bean Jar file, new bean, adding controls, Bean properties, Simple properties, Design Pattern events, creating bound properties, Bean Methods, Bean an Icon, Bean info class, Persistence, Java Beans API.
Talking to Database, Immediate Solutions, Essential JDBC program, using prepared Statement Object, Interactive SQL tool. JDBC in Action Result sets, Batch updates, Mapping, Basic JDBC data types, Advanced JDBC data types, immediate solutions.
Introduction to EJB: The Problem domain, Breakup responsibilities, Code Smart not hard, the Enterprise java bean specification. Components Types.

Duration: 3 hours	**Max Marks: 80**

bca-403Web Development

MySQL Overview: Introduction, connecting to and disconnecting from the server , Entering queries , Creating and using a database , Creating and selecting a database , creating a table , loading data into a table , Retrieving information from a table , selecting all data , selecting particular rows , selecting particular columns , sorting rows , date calculations , working with NULL values , pattern matching , counting rows , using more than one tables.

Basics of PHP: Introduction to PHP, what does PHP do? ,history of PHP , language basics ,data types , variables , expressions and operators , flow control statements , including code , embedding PHP in web pages.

Functions & Strings: Calling a function, defining a function, variable scope, function parameters, return values, variable functions, anonymous functions. Strings: Accessing individual characters, cleaning strings, encoding and escaping, comparing strings, manipulating and searching strings, regular expressions.

Arrays & Objects: Indexed vs. associative arrays, identifying elements of an array, storing data in arrays, multidimensional arrays, extracting multiple values, converting between arrays and variables, traversing arrays, sorting. Objects: Creating an object, accessing properties and methods, declaring a class, introspection.

MySQL databases in PHP: Introduction, connecting to a MySQL database, querying the database, Retrieving and displaying the results, modifying data, deleting data.

Duration: 3 hours	**Max Marks: 80**

bca-404Visual Programming in .NET

.NET Framework features & architecture, CLR, Common Type System, MSIL, Assemblies and class libraries, variables -Declaring variables, Data Types, Forcing variables declarations, Scope & lifetime of a variable, Control flow statements: conditional statement, loop statement. Constants, Arrays, types of arrays, Collections.

Subroutines, Functions, Passing variable number of arguments,Optional Arguments, Returning value from function, Msgbox&Inputbox, overloading,constructor,inheritance,overriding,interfaces

Working with Forms : Loading, showing and hiding forms, controlling one form within another.Textbox, Label, Button, Listbox, Combobox, Checkbox,PictureBox, RadioButton, Panel, scroll bar, Timer, ListView, TreeView, toolbar, StatusBar.. OpenFileDialog, SaveFileDialog, FontDialog, ColorDialog, PrintDialog.LinkLabel.Designingmenus :ContextMenu, access &shorcut keys.

Database programming with ADO.NET – Overview of ADO, from ADO to ADO.NET, Accessing Data using Server Explorer. Creating Connection, Command, Data Adapter and Data Set with OLEDB and SQLDB.

| **Duration: 3 hours** | **Max Marks: 80** |

bca-501Artificial Intelligence

Definition of AI, Application of AI, knowledge-based systems, representation of knowledge organization and acquisition of knowledge

Syntax, semantics of propositional logic, syntax and semantics of FOPL, conversion to clausal form, inference rule, resolution principles

Bayesian probabilistic inference, possible word representation, Dempster-Shafer Theory, Expert system, natural language processing

Introduction to Deep learning, Backpropagations algorithm, initialization, deep neural network, introduction of generative adversarial network, Markov decision process,RNN Basics, Advance RNN, LSTN, GRU, Bi directional neural network, shallow neural network.

Implementation with MATLAB: Heuristic search 8puzzle problem, missionaries and cannibals problems, water-jug problem, linear problem, block word problem, hill climbing methods and other AI related problems.

Duration: 3 hours	**Max Marks: 80**

bca-502Image Processing

Elements of Visual Perception, A Simple Image Formation Model, Basic Concepts in Sampling and Quantization, Representing Digital Images, Spatial and Gray-level Resolution, Zooming and Shrinking Digital Images,Some Basic Relationships Between Pixels, Linear and Nonlinear Operations.

Image Enhancement in the Spatial Domain: Some Basic Gray Level Transformations, Histogram Processing,Enhancement Using Arithmetic/Logic Operations, Basics of Spatial Filtering, Smoothing Spatial Filters

Image Enhancement in the Frequency Domain: Introduction to the Fourier Transform and the Frequency Domain, Smoothing Frequency-Domain Filters, Sharpening FrequencyDomain, Filters, Homomorphic Filtering.

Image Restoration: A Model of the Image degradation/Restoration process, Noise Models, Restoration in the Presence of Noise Only–Spatial Filtering,

Duration: 3 hours	Max Marks: 80

bca-503Programming in Python

Python Basics: Keywords, Identifiers, Indents, Input Output Basic Syntax, Variable, Dynamic Typing, Data Types (Mutable and Immutable), Built-in Conversion Methods.

Operator: Arithmetic, Comparison, Logical, Identity, Membership.

Control Statements: Conditional (If , If- else, Elsif, Nested if-else), Looping (While, For, Nested loops), Break, Continue, Pass, range().

Array: Introduction, Creation, Traverse, Insertion, Deletion, Search, Update.

String: Introduction, Types, Escape Sequences, Formatting, Built-in Methods :Capitalize, Upper, Lower, Title, Find, Count, isAlpha(), isDigit(), isLower, isUpper, Basic Operations : Accessing, Updating, Concatenation.

List & Tuple: Introduction, Accessing, Operators, Built-in Methods (Len, Max, Min, Append, Insert, Remove, Pop, Reverse, Sort, List), Basic Operations (Updating, Delete, Concatenation, Indexing, Slicing), Regular Expressions, List as a stack, List as a Queue.

Set:Introduction, Accessing, Built-in Methods (Add, Update, Clear, Copy, Discard, Remove), Operations (Union, Intersection, Difference).

Dictionary: (Single Dimensional) Introduction, Accessing, Updating, Deleting, Viewing values in dictionaries, Built-in Methods (Len, Max, Min, Pop, Clear, Items, Keys, Values, Update), Sorting and Looping, Nested Dictionaries.

Function: Defining, Calling, Function Arguments (Required, Keyword, Default, Variable Length) Anonymous Functions, Global and Local Variables, Recursion, lambda function.

Modules: Introduction, Importing Module, Built-in Modules (Math, Statistics, Random), dir (),

Package: Creating, Installing, Importing Modules from the Package.

Errors & Exception: Introduction of Errors & Exceptions, Error Types, Exception Handling - Introduction, Try, Except, Else, Finally, Raising Exceptions, Invoked Functions.

File Input-Output: Opening and Closing files, File Modes, Reading and Writing files, File Types, File Position, Rename, Delete Files, Dictionary methods.

Tuples: Creating, Utility, Accessing values, updating, deleting, basic operations, Assignment, returning multiple values, nested values.

Duration: 3 hours	**Max Marks: 80**

bca-504 Data Mining

Introduction to data mining, DM techniques, issues and challenges in DM, Applications, association rules, Prior, Dynamic Itemset counting, FP-tree growth, Incrementallearning

Clustering Techniques, k-Medoid algorithm, Hierarchical, categorical clustering algorithm, Decision tree, best split, splitting indices and criteria, decision tree construction algorithm, CART, ID3, rain Forest, Pruning Technique

Data mining using NN, web mining, temporal and spatial data mining.

Duration: 3 hours	**Max Marks: 80**

bca–601 Mobile Application Development

Introduction to mobile communication and computing: Introduction to mobile computing, Novel applications, Mobile services, System architecture, protocols, Handover and security.

Fundamentals of Android Development: Introduction to Android., The Android SDK, Understanding the Android Software Stack, Installing the Android SDK, Creating Android Virtual Devices, Creating the First Android Project, Using the Text View Control, Using the Android Emulator, The Android Debug Bridge (ADB), Basic Widgets Understanding the Role of Android Application Components, Event Handling, Displaying Messages Through Toast, Creating and Starting an Activity, Using the EditText Control.

Building Blocks for Android Application Design, Laying Out Controls in Containers, utilizing resources and media

Using Selection Widgets and Debugging Displaying and Fetching Information Using Dialogs and Fragments Advanced, Android Programming: Internet, Implementing drawing and animations, displaying web pages, communicating with SMS and emails, creating and using content providers: creating and consuming services, publishing android applications

Duration: 3 hours	**Max Marks: 80**

bca-602Data Science with R

Introduction to Regression Analysis, types of regression analysis, nonlinear regression, cross validation, principal component analysis, factor analysis, classification its types, linear, logistics , regression, support vector machine, k-nearest neighbour, Naïve Bayes classification, decision tree classification, random forest classification, evaluating classifier model, introduction clustering, clustering methods, association rules, Appriori algorithm

Introduction- Basic elements of R, data input and output, objects, attributes, number , vectors , array, matrix, lists,Reading data from files , controls statements, loops , functions, R scripts, data science overviews, data visualisation using graphics in R, GGplot 2, File format of graphics output, introduction to hypotheses, types of hypothesis, data sampling, confidence and significance level, hypothesis tests, parametric test, non-parametric test,

Duration: 3 hours	**Max Marks: 80**

bca-603Cloud Computing

Introduction: Business and IT perspective, Cloud and virtualization, Cloud services requirements, cloud and dynamic infrastructure, cloud computing characteristics, cloud adoption.

Cloud models: Cloud characteristics, Measured Service, Cloud models, security in a public cloud, public verses private clouds, cloud infrastructure self-service.

Cloud solutions: Cloud ecosystem, cloud business process management, cloud service management, cloud stack, computing on demand, cloud sourcing.

Cloud offerings: Cloud analytics, Testing under cloud, information security, virtual desktop infrastructure, Storage cloud.

Cloud virtualization technology: Virtualization defined, virtualization benefits, server virtualization, Hypervisor management software, Logical partitioning, VIO server, Virtual infrastructure requirements. Storage virtualization, storage area networks, network attached storage, cloud server virtualization, virtualized data center.

MANUAL FOR PREPARATION OF DISSERTATION THESIS

1. **GENERAL**

   The manual is intended to provide broad guidelines to the BCA (Hons.) candidates in the preparation of the thesis. In general, the thesis shall report, in an organized and scholarly fashion, an account of original research work of the candidate leading to the discovery of new facts or techniques or correlation of facts already known (analytical, experimental, hardware oriented, etc.)

2. **NUMBER OF COPIES TO BE PREPARED**

   At least four copies are to be prepared, one each for External Examiner, Guide, Departmental Library and self. The copies should be submitted to the Controller of Examination through the Head of the Department before the due date.

3. **ARRANGEMENT OF CONTENTS OF THESIS**

   The sequence in which the thesis material should be arranged and bound should be as follows:
   1. Title page
   2. Bonafide Certificate
   3. Abstract
   4. Acknowledgement
   5. Table of Contents
   6. List of Tables
   7. List of Figures
   8. List of Symbols, Abbreviations or Nomenclature (Optional)
   9. Chapters
   10. References
   11. Appendices

   The Tables and Figures shall be introduced in the appropriate places.

4. **PAGE DIMENSIONS AND MARGIN**

   The thesis should be prepared on good quality white paper preferably not lower than 80gsm. Standard A4 size paper should be used for preparing the copies. The final thesis should have the following page margins:

Top edge	: 30 to 35 mm
Left side	: 35 to 40 mm
Bottom edge	: 25 to 30 mm
Right side	: 20 to 25 mm

   Tables and figures should conform to the margin specifications. Large size figures should be photographically or otherwise reduced to the appropriate size before insertion.

5. **MANUSCRIPT PREPARATION**

   The headings of all items 2 to 11 listed in section 3 should be typed in capital letters without punctuation and centered 50mm below the top of the page. The text should commence 4 spaces below this heading.

   5.1   Title Page – A specimen copy of the title page is given in Appendix 1.
   5.2   Bonafide Certificate – A specimen copy of the bonafide certificate is given in Appendix 2.

5.3   Abstract – Abstract should be an essay type of narrative not exceeding 600 words, outlining the problem, the methodology used for tackling it and a summary of the findings.

5.4   Acknowledgement – It should be brief and preferably should not exceed one page when typed double spacing.

5.5   Table of Contents – The table of contents should list all material following it as well as any material which precedes it. The title page, bonafide certificate and acknowledgement will not find a place among the items listed in the table of contents. One and a half spacing should be adopted for typing the matter under this head.

5.6   List of Tables – The list should use exactly the same captions as they appear above the tables in the text. One and a half spacing should be adopted for typing the matter under this head.

5.7   List of Figures – The list should use exactly the same captions as they appear below the figures in the text. One and a half spacing should be adopted for typing the matter under this head.

5.8   List of Symbols, Abbreviations and Nomenclature – One and a half spacing should be adopted for typing the matter under this head. Standard symbols and abbreviations should be used.

5.9   Chapters – The chapters may be broadly divided into 3 parts:
       i.   Introductory chapter,
       ii. Chapters developing the main theme of the thesis,
       iii. Results, Discussions and Conclusions.
   The main text will be divided into several chapters and each chapter may be further divided into several divisions and sub-divisions.
   - Each chapter should be given an appropriate title.
   - Tables and figures in a chapter should be placed in the immediate vicinity of the reference where they are cited.
   - Footnotes should be used sparingly. They should be typed single space and placed directly underneath in the very same page which refers to the material
     they annotate.

5.10   List of References – When works of other researchers are used either directly or indirectly the origin of the material thus referred to as appropriate places in the thesis should be indicated. A paper, a monograph or a book may be designated by the name of the first author followed by the year of publication, placed inside brackets at the appropriate place of reference. The citation may assume any one of the following forms:
   Examples of citation
       i.   An improved algorithm has been adopted in literature (Tsychiya 1980)
       ii. Jankins and Walts (1968) have dealt at length with this principle.
       iii. The problem of mechanical manipulators has been studied by Shin et al (1984) and certain limitations of the method used has been pointed out by Shin et al (1984 a)

   The listing should be typed 4 spaces below the heading REFERENCES inalphabeticalorder in single spacing left-justified. The reference material should be listed in the alphabetical order of the first author. The name(s) of the author(s) should beimmediately followed by the year and other details. A typical illustrative list is given below.

REFERENCES

1. Ariponnammal S. and Natarajan S. (1994) 'Transport Phonomena of SmSel-x Asx', Pramana Journal of Physics, Vol. 42, No.5, pp.421-425.
2. Barnard R.W. and Kellogg C. (1980) 'Applications of Convolution Operators to Problems in Univalent Function Theory', Michigan Mach. J., Vol 27, pp 81-94.
3. Jankins G.M. and Walts D.G. (1968) 'Spectral Analysis and its Applications', Holder Day, San Francisco.
4. Shin K.G. and McKay N.D. (1984) 'Open Loop Minimum Time Control of Mechanical Manipulations and its Applications', Proc. Amer. Contr. Conf., San Diego, CA, pp.1231-1236.

5.11   Appendices – Appendices are provided to give supplementary information, which if included in the main text may serve as a distraction and cloud the central theme under discussion.

- Appendices should be numbered using Arabic numerals, e.g. appendix 1, Appendix 2, etc.
- Appendices, tables and references appearing in appendices should be numbered and referred to at appropriate places just as in the case of chapters.

5.12   Tables and Figures – The word table means tabulated data in the body of the thesis as well as in the appendices. All other material used in the body of the thesis and appendices such as charts, graphs, maps, photographs and diagrams may be designated as figures.

- A table or figure including caption should be accommodated within the prescribed margin limits and appear on the page following the page where their first reference is made.
- Tables and figures half page or less in length may appear on the same page along with the text. However, they should be separated from the text both above and below by triple spacing.
- All tables and figures should be prepared on the same paper or material used for the preparation of the rest of the thesis.
- Two or more small tables or figures may be grouped if necessary in a single page.
- Photographs, if any, should be included in colourxerox form or as colour printouts of scanned images. More than one figure can be included in a page.

6. TYPING INSTRUCTIONS

6.1 General Uniformity of the font (say, Times New Roman) in the entire thesis shall be observed. A sub-heading at the bottom of a page must have atleast two full lines below it or else it should be carried over to the next page. The last word of any page should not be split using a hyphen. Double spacing should be used for typing the bonafide certificate and acknowledgement. One and a half spacing should be used for typing the general text. Single spacing should be used for typing:
   i.   Long Tables
   ii. Long quotations
   iii. Foot notes
   iv. Multiline captions
   v.   References All quotations exceeding one line should be typed in an indentedspace - the indentation being 15mm from either margins.

6.2 Chapters:
The format for typing chapter headings, division headings and sub division headings are

explained through the following illustrative examples.
Chapter heading: CHAPTER 1
                        INTRODUCTION
Division heading :   1.1 OUTLINE OF THESIS
Sub-division heading: 1.1.2. Literature review

The word CHAPTER without punctuation should be centered 50mm down from the top of the page. Two lines below, the title of the chapter should be typed centrally in capital letters. The text should commence 4 lines below this title. The division and sub-division captions along with their numberings should be left-justified. The typed material directly below division or sub-division heading should commence 2 spaces below it. Within a division or sub-division paragraphs are permitted. Every paragraph should commence 3 spaces below the last line of the preceding paragraph.

7. NUMBERING INSTRUCTIONS

7.1 Page Numbering
All page numbers (whether Roman or Arabic) should be typed without punctuation on the upper right hand corner 20mm from top with the last digit inline with the right hand margin. The preliminary pages of the thesis (such as title page, acknowledgement, table of contents, etc.) should be numbered in lower case Roman numerals. The title page will be numbered as (i) but this should not be typed. The page immediately following the title page shall be numbered (ii)and it should appear at the top right hand corner as already specified. Pages of main text, starting with Chapter 1 should be consecutively numbered using Arabic numerals.

7.2 Numbering of Chapters, Divisions and Sub-8 Divisions. The numbering of chapters, divisions and sub-divisions should be done using Arabic numerals only and decimal notation should be used for numbering the divisions and sub-divisions within a chapter. For example, sub-division 4 under division 3 belonging to Chapter 2 should be numbered as 2.3.4. The caption for the sub-division should immediately follow the number assigned to it. Every chapter beginning with the first chapter should be serially numbered using Arabic numerals.

7.3   Numbering of Tables and Figures Tables and figures appearing anywhere in the thesis should bear appropriate numbers. The rule for assigning such numbers is illustrated through an example. Thus, if a figure in Chapter 3, happens to be the fourth then assign Fig. 3.4 to that figure. Identical rules apply for tables except that the word Fig. is replaced by the word Table. If figures (or tables) appear in appendices then figure 3 in Appendix 2 will be designated as Fig. A2.3. A table may be continued into the next page, but no line should be drawn underneath an unfinished table. The top line of the table continued into the next page should, for example, read Table 2.1 (continued) placed centrally and underlined.

7.4   Numbering of Equations: Equations appearing in each chapter or appendix should be numbered serially, the numbering commencing afresh for each chapter or appendix. Thus, for example, an equation appearing in Chapter 2, if it happens to be the eighth equation in that chapter should be numbered (2.8) thus: … (2.8) while referring to this equation in the body of the thesis it should be referred to as Eqn. 2.8.

8.   BINDING SPECIFICATIONS

The thesis should be bound using flexible cover of thick white or blue art paper. The cover should be printed in black letters and the text for printing should be identical to what has been prescribed for the title page.

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