

# Bachelor of Computer Applications – I Year

Paper Name (Theory)		Exam. Hours	Marks	
			Min.	Max.
<b>bca-101</b>	Group (I/II/III/IV/V)	3	18	50
<b>bca-102</b>	Group (I/II/III/IV/V)	3	18	50
<b>bca-103</b>	PC Software	3	18	50
<b>bca-104</b>	Programming in C & Data Structure	3	18	50
<b>bca-105</b>	Discrete Mathematics	3	18	50
<b>bca-106</b>	Multimedia Basics	3	18	50

Paper Name (Practical)		Exam. Hours	Marks	
			Min.	Max.
<b>bca-107</b>	PC Software Lab.	3	18	50
<b>bca-108</b>	C Programming & Data Structure Lab.	3	18	50
<b>bca-109</b>	Multimedia	3	18	50

# BCA I Year

## Group -I (Science)

Duration: 3 hours

Max Marks: 50

### bca-101 Physics

#### Physical World and Measurement:

- Physics: Scope and excitement; nature of physical laws; Physics, technology and society. Need for measurement: Units of measurement; systems of units; SI units, fundamental and derived units. Length, mass and time measurements; accuracy and precision of measuring instruments; errors in measurement; significant figures, Dimensions of physical quantities, dimensional analysis and its applications.
- Kinematics, Frame of reference, Motion in a straight line: Position-time graph, speed and velocity. Uniform and non-uniform motion, average speed and instantaneous velocity, Uniformly accelerated motion, velocity time and position-time graphs, relations for uniformly accelerated motion (graphical treatment). Elementary concepts of differentiation and integration for describing motion, Scalar and vector quantities: Position and displacement vectors, general vectors and notation, equality of vectors, multiplication of vectors by a real number; addition and subtraction of vectors. Relative velocity, Unit vectors, Resolution of a vector in a plane – rectangular components, Scalar and Vector products of Vectors, Motion in a plane, Cases of uniform velocity and uniform acceleration – projectile motion, Uniform circular motion.
- Laws of Motion, Intuitive concept of force, Inertia, Newton's first law of motion; momentum and Newton's second law of motion; impulse; Newton's third law of motion, Law of conservation of linear momentum and its applications, Equilibrium of concurrent forces, Static and kinetic friction, laws of friction, rolling friction, lubrication. Dynamics of uniform circular motion: Centripetal force, examples of circular motion (vehicle on level circular road, vehicle on banked road).
- Work, Energy and Power, Work done by a constant force and a variable force; kinetic energy, work-energy theorem, power, Notion of potential energy, potential energy of a spring, conservative forces; conservation of mechanical energy (kinetic and potential energies); non-conservative forces; motion in a vertical circle, elastic and inelastic collisions in one and two dimensions.
- Motion of System of Particles and Rigid Body, Centre of mass of a two-particle system, momentum conservation and centre of mass motion, Centre of mass of a rigid body; centre of mass of uniform rod, Moment of a force, torque, angular momentum, conservation of angular momentum with some examples, Equilibrium of rigid bodies, rigid body rotation and equation of rotational motion, comparison of linear and rotational motions; moment of inertia, radius of gyration. Values of M.I. for simple geometrical objects (no derivation), Statement of parallel and perpendicular axes theorems and their applications.
- Gravitation Kepler's laws of planetary motion, The universal law of gravitation, Acceleration due to gravity and its variation with altitude and depth, Gravitational potential energy; gravitational potential. Escape velocity, orbital velocity of a satellite, Geostationary satellites.

Duration: 3 hours

Max Marks: 50

### bca-102 Mathematics

#### SETS AND FUNCTIONS:

- Sets and their representations, Empty set, Finite and Infinite sets, Equal sets, Subsets, Subsets of the set of real numbers especially intervals (with notations), Power set, Universal set, Venn diagrams. Union and intersection of sets, Difference of sets Complement of a set, Properties of Complement sets.

Relations and Functions:

- Ordered pairs, Cartesian product of sets, Number of elements in the Cartesian product of two finite sets, Cartesian product of the reals with itself (upto  $\mathbb{R} \times \mathbb{R} \times \mathbb{R}$ ) definition of relation, pictorial diagrams, domain, co-domain and range of a relation. Function as a special kind of relation from one set to another, pictorial representation of a function, domain, co-domain and range of a function. Real valued function of the real variable, domain and range of these functions, constant, identity, polynomial, rational, modulus, signum and greatest integer functions with their graphs, sum, difference, product and quotients of functions.
- Trigonometric Functions: Positive and negative angles, measuring angles in radians and in degrees and conversion from one measure to another Definition of trigonometric functions with the help of unit circle. Truth of the identity  $\sin^2 x + \cos^2 x = 1$ , for all  $x$ . Signs of trigonometric functions and sketch of their graphs. Expressing  $\sin(x + y)$  and  $\cos(x + y)$  in terms of  $\sin x$ ,  $\sin y$ ,  $\cos x$  and  $\cos y$ . Identities related to  $\sin 2x$ ,  $\cos 2x$ ,  $\tan 2x$ ,  $\sin 3x$ ,  $\cos 3x$  and  $\tan 3x$ . General solution of trigonometric equations of the type  $\sin \theta = \sin \alpha$ ,  $\cos \theta = \cos \alpha$  and  $\tan \theta = \tan \alpha$ . Proofs and simple applications of sine and cosine formulae.

ALGEBRA :

Principle of Mathematical Induction

- Process of the proof by induction, motivating the application of the method by looking at natural numbers as the least inductive subset of real numbers, the principle of mathematical induction and simple applications.
- Complex Numbers and Quadratic Equations Need for complex numbers, especially  $\sqrt{-1}$ , to be motivated by inability to solve every quadratic equation. Brief description of algebraic properties of complex numbers, Arg and plane and polar representation of complex numbers, Statement of Fundamental Theorem of Algebra, solution of quadratic equations in the complex number system, Square-root of a Complex number.
- Linear Inequalities: Linear inequalities, Algebraic solutions of linear inequalities in one variable and their representation on the number line, graphical solution of linear inequalities in two variables, solution of system of linear inequalities in two variables – graphically.
- Permutations and Combinations Fundamental principle of counting, Factorial  $n$ , Permutations and combinations derivation of formulae and their connections, simple applications.
- Binomial Theorem: History, statement and proof of the binomial theorem for positive integral indices, Pascal's triangle, general and middle term in binomial expansion, simple applications.
- Sequence and Series: Sequence and Series, Arithmetic Progression (A.P.), Arithmetic Mean (A.M.), Geometric Progression (G.P.), general term of a G.P., sum of  $n$  terms of a G.P. Arithmetic and geometric series, infinite G.P. and its sum, geometric mean (G.M.). Relation between A.M. and G.M. Sum to  $n$  terms of the special series:  $\sum n$ ,  $\sum n^2$  and  $\sum n^3$ .

COORDINATE GEOMETRY

- Straight Lines: Brief recall of 2-D from earlier classes, shifting of origin, Slope of a line and angle between two lines Various forms of equations of a line: parallel to axes, point-slope form, slope-intercept form, two-point form, intercepts form and normal form. General equation of a line, Equation of family of lines passing through the point of intersection of two lines, Distance of a point from a line
- Conic Sections: Sections of a cone: Circles, ellipse, parabola, hyperbola, a point, a straight line and pair of intersecting lines as a degenerated case of a conic section. Standard equations and simple properties of parabola, ellipse and hyperbola, Standard equation of a circle.

- Introduction to Three-dimensional Geometry: Coordinate axes and coordinate planes in three dimensions. Coordinates of a point, Distance between two points and section formula.

# BCA I Year

## Group -II (Computer)

Duration: 3 hours

Max Marks: 50

### **bca-101 Computer Practices**

#### **MANAGEMENT AND ACCOUNTING:**

- Introduction to Management thought, functions, skills of a manager. Overview of Management functions with reference to planning process, leadership, motivation-implication for managers, theories of motivation.
- Communication: Process, barriers to communication, role of electronic media and information technology in communication.
- Cross-cultural issues in management, social and environmental responsibility, Organizational culture, individual perception, values, attributes, interpersonal effectiveness, power and politics, conflict management, team and group processes.
- Stress management: Various types of stress, coping mechanism.
- Accounting: Definition, concepts, standards, basic accounting, entries, ledger, triple column cash book, brief understanding of final accounts, Automatic Accounting processes.
- Financial statements, ratio analysis.
- Cost accounting – CVP analysis, BEP and P/V graph.
- Budgeting: Meaning of budgeting, flexible and fixed budgets.

Duration: 3 hours

Max Marks: 50

### **bca-102 Information Practices**

#### **COMPUTER FUNDAMENTALS**

- Introduction to Computer: Definition, Characteristics, Classification of Computers, Analog Computers, Digital Computers, Hybrid Computers, Classifications of computer on the basis of size and speed, different type of computers, generation of computers.
- Computer keyboard, pointing devices, mouse, track ball, touch pad, joystick, touch – sensitive screens, pen – based systems, digitizer, data scanning devices, optical recognition systems, bar code readers, optical mark readers, optical scanners, drum scanners, hand scanner, flatbed scanner, web camera, game pad, digital camera.
- Hard copy devices: Printer, impact printers, daisy wheel, dot matrix printer, line printer, chain printers, comb printers, non-impact printers, DeskJet, inkjet printers, laser printer, thermal transfer printer, barcode printers.
- Computer Display: CRT, LCD, projection displays, plasma display panel, display standard, monochrome display adapter, HGA, CGA, EGA, VGA, MGA, SVGA, XGA, QVGA, SXGA, UXGA.
- Introduction to memory, classifications, random-access memory, volatile memory, non-volatile memory, flash memory, read-only memory, secondary memory, the cache memory, auxiliary storage

memory, memory hierarchy, storage device, magnetic tape, magnetic disk, floppy disk, hard disks, CD, DVD, magneto-optical.

- Number system, binary, octal, hexadecimal, addition, subtraction, multiplications, computer code: BCD, ASCII, EBCDIC code, Excess-3 code, gray code, software, User interface, system software, programming software, application software logic gates and Boolean algebra representation and simplifications by KMap.
- Computer Viruses: Introduction, history, types of computer viruses, classification of viruses ways to catch a computer virus, symptoms of a computer virus.
- Application of computer: Desktop publishing, sports, design and manufacturing research and design, military, robotics, planning and management, marketing, medicine and health care, arts, communications, scientific, education.
- Introduction of internet, history, IP, TCP and UDP, application protocol, world wide web, how the web works, web standards, website, overview, types of websites, electronic mail, internet, e-mail header, saved message file extension, messages and mailboxes, introduction to intranet, uses, advantages, disadvantages.
- Introduction to data warehouse, components of a data warehouse, different methods of storing data in a data warehouse, advantages of using data warehouse.

# BCA I Year

## Group -III (Arts)

**Duration: 3 hours**

**Max Marks: 50**

### **bca-101 Geography**

Geography as a Discipline:

- Geography as an integrating discipline, as a science of spatial attributes. Branches of Geography; Physical Geography and Human Geography. Scope and Career Options.
- The Earth: Origin and evolution of the earth; Interior of the earth. Wegener's continental drift theory and plate tectonics. Earthquakes and volcanoes: causes, types and effects.

Land forms

- Rocks: major types of rocks and their characteristics. Land forms and their evolution.
- Geomorphic processes: weathering, mass wasting, erosion and deposition; soil-formation.

Climate

- Atmosphere: composition and structure; elements of weather and climate. Insolation-angle of incidence and distribution; heat budget of the earth-heating and cooling of atmosphere (conduction, convection, terrestrial radiation and advection); temperature- factors controlling temperature; distribution of temperature-horizontal and vertical; inversion of temperature.
- Pressure: pressure belts; winds-planetary, seasonal and local; air masses and fronts; tropical and extra-tropical cyclones. Precipitation-evaporation; condensation-dew, frost, fog, mist and cloud; rainfall-types and world distribution. World climates-classification (Koeppen and Thornthwaite), Global warming and climatic changes. Climate and Global Concerns.

Hydrosphere

- Basics of Oceanography Oceans – distribution of temperature and salinity. Movements of ocean water-waves, tides and currents; submarine reliefs. Ocean resources and pollution.

Biosphere

- Biosphere – importance of plants and other organisms; biodiversity and conservation; ecosystem and ecological balance. Map work on identification of features based on 1 to 6 units on the outline/Physical/Political map of the world.
- India – Physical Environment : Introduction, Location, space relations, India's place in the world. Physiography Structure and Relief; Physiographic Divisions.
- Drainage systems: Concept of river basins, Watershed; the Himalayan and the Peninsular rivers.

**Duration: 3 hours**

**Max Marks: 50**

### **bca-102 Sociology**

Introducing Sociology :

- Society and Sociology and Relationship with other Social Sciences.
- Introducing Society: Individuals and collectivities. Plural Perspectives.
- Introducing Sociology: Emergence. Nature and Scope. Relationship to other disciplines Social Groups, Status and Role, Social Stratification, Social Control.

- Social Institutions Family, Marriage and Kinship, Political and Economic Institutions, Religion as a Social Institution, Education as a Social Institution.
- Culture and Society Culture, Values and Norms: Shared, Plural, Contested, Socialization: Conformity, Conflict and the Shaping of Personality.
- Practical in Sociology: Methods and Techniques Methods: Participant Observation, Survey, Tools and Techniques: Observation, Interview, Questionnaire, the Significance of Field Work in Sociology Structure, Process and Stratification.
- Social Structure, Social Processes: Cooperation, Competition, Conflict, Social Stratification: Class, Caste, Race, Gender.
- Social Change Social Change: Types and Dimensions; Causes and Consequences.
- Social Order: Domination, Authority and Law; Contestation, Crime and Violence.
- Village, Town and City: Changes in Rural and Urban Society.
- Environment and Society Ecology and Society, Environmental Crises and Social Responses.



# BCA I Year

## Group -IV (Commerce)

**Duration: 3 hours**

**Max Marks: 50**

### **bca-101 Accountancy**

#### FINANCIAL ACCOUNTING

- Introduction to Accounting Accounting -Meaning, Objectives, Types of Accounting Information, Advantages and Limitations. Qualitative Characteristics of Accounting Information: Reliability, Relevance, Understandability and Comparability. Basic Accounting Terms: Business Transaction, Capital, Drawing, Liability, Asset, Revenue, Expenditure, Expense, Income, Losses and Gains, Purchases, Sales, Stock, Debtors, Receivables, Creditors, Payables.
- Theory Base of Accounting Basic Assumptions: Accounting Entity, Money Measurement: Going Concern, Accounting Period. Basic Principles: Duality, Verifiability and Objectivity of Evidence, Historical Cost, Revenue Recognition, Matching, Full Disclosure. Modifying Principles: Materiality, Consistency, Prudence, Timeliness, Substance over Form, Variations in accounting practices. Accounting Standards: Meaning, nature and need.
- Generation of Vouchers and Recording of Transactions Origin of Transactions – Source Documents and Vouchers, Preparation of Vouchers
- Accounting Equation Meaning and Analysis of transactions using Accounting Equation. Rules of Debit and Credit: For Assets, for Liabilities, for Capital, for Revenue, and for Expense. Double Entry Book Keeping, Books of Original Entry, Meaning, Format and Recording of entries; Journal, Special Purpose Books: Meaning, Utility, Cash Book – Simple Cashbook with Bank column and Petty cashbook. Purchase Book, Sales Book, Purchase Returns Book, Sales Returns Book, Bills Receivable Book and Bills Payable Book. Ledger – Meaning, Utility, Format, Posting from Journal, Cashbook and other Special Purpose Books, Balancing of accounts. Bank Reconciliation Statement: Meaning, Need and Preparation with amended cash book.
- Trial Balance and Rectification of Errors Trial Balance: Meaning, Objectives and Preparation. Errors: Types of Errors, Errors affecting Trial Balance and Errors not affecting Trial Balance. Detection and Rectification of Errors, effect on profit and loss A/c, Suspense Account – meaning, Utility, Preparation and Treatment of Suspense Account Balance.
- Depreciation, Provisions and Reserves Depreciation: Meaning and Need for charging depreciation, Factors affecting depreciation, Methods of depreciation – Straight Line method, Written Down Value Method (excluding change in method), Method of recording depreciation: By charging to asset account, By creating provision for depreciation/accumulated depreciation account. Asset Disposal Account. Provisions and Reserves: Meaning and Importance, Need for provision for doubtful debts, provision for discount on debtors, Difference between provisions and Reserves. Types of Reserves: Revenue Reserve, Capital Reserve, General Reserve and Specific Reserve

**Duration: 3 hours**

**Max Marks: 50**

### **bca-102 Business Studies**

## Nature and Purpose of Business

- Concept and characteristics of business. Business, profession and employment – Meaning and their distinctive features. Objectives of business – Economic and social, role of profit in business. Classification of business activities: Industry and Commerce. Industry – types: primary, secondary, tertiary – Meaning and sub types. Commerce – trade: types (internal, external, wholesale and retail; and auxiliaries to trade: banking, insurance, transportation, warehousing, communication, and advertising. Business risks – Meaning, nature and causes.
- Forms of Business organizations Sole Proprietorship – meaning, features, merits and limitations. Partnership – Features, types, merits and limitations of partnership and partners, registration of a partnership firm, partnership deed. Type of partners. Hindu Undivided Family Business: features. Cooperative Societies- features, types, merits and limitations. Company: private and public company -features, merits and limitations. Formation of a company- four stages, important document (MOA, AOA, relevances of certificate of incorporation and certificate of commencement.
- Starting a business – Basic factors. Public, Private and Global Enterprises Private sector and public sector enterprises. Forms of public sector enterprises: features, merits and limitations of departmental undertakings, statutory corporation and Government Company. Changing role of public sector enterprises. Global enterprises, Joint ventures, Public Private Partnership – Features
- Business Services (Banking): Types of bank accounts- savings, current, recurring, fixed deposit and multiple option deposit account. Banking services with particular reference to issue of bank draft, banker's cheque (pay order), RTGS (Real Time Gross Settlement) NEFT (National Electronic Funds Transfer), bank overdraft, cash credits and e- banking. Insurance: principles, concept of life, health, fire and marine insurance. Postal and telecom services: mail (UPC, registered post, parcel, speed post and courier) and other services.
- Emerging Modes of Business (E-business) : scope and benefits, resources required for successful e-business implementation, online transactions, payment mechanism, security and safety of business transactions.
- Outsourcing – concept, need and scope of BPO (business process outsourcing) and KPO (knowledge process outsourcing). Smart cards and ATM's meaning and utility.
- Social Responsibility of Business and Business Ethics Concept of social responsibility, Case for social responsibility, Responsibility towards owners, investors, consumers, employees, government and community. Environment protection and business
- Sources of Business Finance Concept of business finance Owner's funds – equity shares, preference share, GDR, ADR, IDR and retained earnings. Borrowed funds: debentures and bonds, loan from financial institution, loans from commercial banks, public deposits, trade credit, ICD (inter corporate deposits).

# BCA I Year

## Group -V (Skills)

Duration: 3 hours

Max Marks: 50

### bca-101 Fundamentals of Retail

#### Retail:

- Introduction about Retail, Importance of Retailing, service provided by Retailers, overview of Retail Sector, Types of Stores -In store, Non-store retailing and Franchising (including Advantages and Limitations), Online Retailing, Direct Marketing, Retail Strategy- meaning, function, Classification Advantages. Marketing strategies, Technology Strategy.
- **Retail Environment:** Introduction, Parties of Retail Environment (Suppliers, Intermediaries, Competitors, Macro Environment) Forces of Retail Environment (Internal & External Factors).Trends in Indian Retail Industry-Introduction, required skills, Recent Trends in the Indian Retail sector.Factors underlying trends of Modern retail in India.
- **Store Design Elements:** Retail store location & layout-meaning, importance characteristics used in location, trade area selection, consideration. Defining the trade area Reily model, Huff's Model, out shopping, site evaluation & Selection, neighborhood shopping center, community shopping center, Regional shopping center, and super-regional shopping center& fashion center. Store Design and Layout-introduction, comprehensive store planning types of goods, interior Design elements. Planogram & Shelf layout design.

Duration: 3 hours

Max Marks: 50

### bca-102 Introduction of Indian Banking System

- Banking Regulation Act-1949: History; Social Control; Banking Regulation Act as applicable to banking companies and public sector banks. Banking Regulation Act as applicable to Co-operative banks Reserve bank of India: structure and organization of banks; Apex banking institutions; Commercial banks; Regional banks; Development banks; State bank of India there Brief History; objectives, functions ,structure and organization. Working and progress.
- Regional Rural and Co-operative Banks in India; Functions; Roles of regional rural and co-operative banks in rural India.Progress and performance.
- Regional Rural and Co-operative Banks in India; Functions; Roles of regional rural and co-operative banks in rural India.Progress and performance.

# BCA I Year

## bca-103 PC Software

**Duration: 3 hours**

**Max Marks: 50**

- **MS-Windows:** Introduction to MS Windows, concept of GUI, windows explorer, control panel, accessories, running applications under MS Windows.
- **Microsoft Word:** Word Processing Basics , Features of MS Word ,Typing, inserting, selecting and deleting Text ,Format Painter ,Find and Replace, Paragraph Attributes , Moving, Copying and Pasting Text,Columns, Drop Caps, Change Case,Page Setting,Illustration, Picture, Shapes, Smart Art, Screenshot,Create Table,Table Design View, Link, Hyperlink, Bookmark, Table Layout, Comments, Header & Footers, Design Tab, Page Setup & Printing, Table of Contents, Footnotes, Mail Merge, Review Tab, View Tab, Document template.
- **Microsoft Excel:** Introducing Excel ,Recognizing Interface Features Unique to Excel , Understanding Workbook Structure ,Navigating through Workbooks, Making Workbook Selections .The Basics Of Data -Entering Text , Entering Dates & Numbers ,Editing Cell Entries ,Copying & Moving Data, Filling a Series, Managing Workbook Structure – Modifying Workbook & Worksheet Structure, Resizing Worksheet Elements, Hiding Workbook Component , Workbook Protection, Formatting Cells – Applying Basic Formatting, Formatting Numbers ,Exploring the Format Cells Dialog Box ,Creating & Applying Cell Styles ,Conditional Formatting, Working With Formulas – Excel Calculations ,Entering Formulas ,Formula Auditing, The Basics Of Functions – Using Basic Functions , Controlling Calculation Options ,Linking Worksheets ,Working With Graphics -Adding Clip Art ,Add an Image From a file, Image Adjustment, Working With Charts – Creating Charts , Modifying Chart Design ,Working with Chart Layout & Format, Working With Hyperlink – Using Bookmark ,External Link ,Sorting, Filtration And Validation – Sorting Data ,Filtering Data ,Data Validation, Customizing Excel – Customize Tabs, Recording a Macro, Running a Macro.Preparing Files For Distribution – Print Area, Print Titles & Sheet Options, Renaming Sheets & Adding Headers/Footers, Printing Worksheets.
- **Microsoft PowerPoint:** Exploring the PowerPoint Interface, Views, Navigation & Keyboard Shortcuts, Setting Options & Saving Files, PowerPoint Design Essentials, Setting Up a New File, Changing Backgrounds, Placeholders & Bullets, Adjusting Placeholders, Adding Headers & Footers, Saving PowerPoint Templates.

# BCA I Year

## bca-104 C Programming & Data Structures

Duration: 3 hours

Max Marks: 50

- **Overview of C Language:** History of C, Character set, C tokens, Identifiers, Keywords, Data types, Variables, Constants, Symbolic Constants, Operators in C, Hierarchy of Operators, Expressions, Type Conversions and Library Functions.
- **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,?: operator.
- **Looping:** while, do-while, for loop, Nested loop, break, continue, and goto statements. Functions: Function Definition, prototyping, types of functions, passing arguments to functions, Nested Functions, Recursive functions.
- **Arrays:** Declaring and Initializing, One Dimensional Arrays, Two Dimensional Arrays, Multi-Dimensional Arrays – Passing arrays to functions. Strings: Declaring and Initializing 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, Passing Structures to functions, Unions, typedef, enum, Bit fields. Pointers – Declarations, Pointer arithmetic, Pointers and functions, Call by value, Call by reference, Pointers and Arrays, Arrays of Pointers, Pointers and Structures. Meaning of static and dynamic memory allocation, Memory allocation functions.
- **Data Structures::** Arrays, stacks, queues, d-queue, linked lists, single link list, double link list, trees, threaded tree, b-tree, graphs, depth first search, breath first search, kruskal algorithm, prism algorithm, prefix, postfix, infix, in-order, pre-order, post-order, recursive functions.
- **Sorting:** Internal and external sorting, Quick Sort, merge sort, bubble, insertion, selection sorting.
- **Shortest path, travel salesman problem.**
- **Searching techniques and merging algorithms.**

# BCA I Year

## bca-105 Discrete Mathematics

Duration: 3 hours

Max Marks: 50

- **Language of Logic:** Proposition, compound proposition, conjunction, disjunction, implications, converse, inverse and contrapositive, bi-conditional statements, tautology, contradiction, contingency, logical equivalence, quantifiers, arguments.
- **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.
- **Graph theory:** Graphs, directed, undirected, simple, adjacency & incidence, degree of vertex, sub-graph, complete graph, cycle & wheel graph, bipartite & complete bipartite graph, weighed graph, union of simple graphs. Complete graph isomorphic graphs, path, cycles & circuits Eulerian & Hamiltonian graphs. Trees: spanning trees – Kruskal's Algo, finding spanning tree using depth first search, breadth first search.
- **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.

# BCA I Year

## bca-106 Multimedia Basics

**Duration: 3 hours**

**Max Marks: 50**

- Introduction to Multimedia: computer and its peripheral devices, communications and entertainment; framework for multimedia systems: Advantages of MM, system components and the user interface, MM platform, hardware software, commercial tools and standard.
- Images and applications: image capture, compression, standards, audio compression and decompression, audio synthesis, MIDI, speech recognition and synthesis, video capturing, compression and decompression, digital video and image compression; jpeg image compression standards; mpeg motion video compression; DVI technology; time-based media representation and delivery
- Developing Applications: methodology, design, multimedia object sharing multimedia and multimedia and the law.
- Application of Multimedia: Intelligent Multimedia system, training and education, kiosks, multimedia in office and home.
- Photoshop: Fundamentals, Opening and Importing Images, Resolution, Models and Color Spaces, Layers. Painting Pixels: The Painting Tools, Erasing, Fills, Type. Selection And Allied Operations: Marquee selection and cropping, Lasso Selection, Paths, Combining and Transforming Selections.
- Adjustments and Retouching:: Tonal Adjustment, Color Adjustments, Retouching By Hand. Effects and Filters: Blurring and Sharpening, Special Effects and Distortion, Layer Effects and Layer Styles.
- Flash: Animation with Interacting, Basic Concepts, Drawing, Lines and Shapes, Strokes and Fill, Shapes and Brushes, Selection, Transformation and Reshaping, Importing Artwork and Manipulating Images. Animation: Animating One Frame at a Time, Motion Tweening , Symbols and Instances , Shape Tweening , Sound.
- Actions: Buttons, Button action , Frame Action , Action and Movie Clip Symbols, Actions, Browsers and Networks , Beyond the Basic Actions. Flash CS 6: Interface Elements, Panels, Tools, Layer Folders, Accessibility, Video.

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# BCA II Year

## Group -I (Science)

Duration: 3 hours

Max Marks: 50

### bca-201 Physics

#### Properties of Bulk Matter:

- **Elastic behaviour**, Stress-strain relationship, Hooke's law, Young's modulus, bulk modulus, shear modulus of rigidity, poisson's ratio; elastic energy. Pressure due to a fluid column; Pascal's law and its applications (hydraulic lift and hydraulic brakes). Effect of gravity on fluid pressure. Viscosity, Stokes' law, terminal velocity, Reynold's number, streamline and turbulent flow. Critical velocity, Bernoulli's theorem and its applications. Surface energy and surface tension, angle of contact, excess of pressure, application of surface tension ideas to drops, bubbles and capillary rise. Heat, temperature, thermal expansion; thermal expansion of solids, liquids, and gases. Anomalous expansion. Specific heat capacity:  $C_p$ ,  $C_v$  – calorimetry; change of state – latent heat. Heat transfer – conduction and thermal conductivity, convection and radiation. Qualitative ideas of Black Body Radiation, Wein's displacement law, and Green House effect. Newton's law of cooling and Stefan's law.
- **Thermodynamics**, Thermal equilibrium and definition of temperature (zeroth law of Thermodynamics). Heat, work and internal energy. First law of thermodynamics. Isothermal and adiabatic processes.
- **Second law of thermodynamics**: Reversible and irreversible processes. Heat engines and refrigerators.
- **Behaviour of Perfect Gas and Kinetic Theory** Equation of state of a perfect gas, work done on compressing a gas. Kinetic theory of gases: Assumptions, concept of pressure. Kinetic energy and temperature; rms speed of gas molecules; degrees of freedom, law of equipartition of energy (statement only) and application to specific heat capacities of gases; concept of mean free path, Avogadro's number.
- **Oscillations and Waves**: Periodic motion – period, frequency, displacement as a function of time. Periodic functions. Simple harmonic motion (SHM) and its equation; phase; oscillations of a spring – restoring force and force constant; energy in SHM – kinetic and potential energies; simple pendulum – derivation of expression for its time period; free, forced and damped oscillations (qualitative ideas only), resonance. Wave motion. Longitudinal and transverse waves, speed of wave motion. Displacement relation for a progressive wave. Principle of superposition of waves, reflection of waves, standing waves in strings and organ pipes, fundamental mode and harmonics. Beats. Doppler effect.
- **Electrostatics**: Electric charges and their conservation. Coulomb's law – force between two point charges, forces between multiple charges; superposition principle and continuous charge distribution.
- **Electric field**, electric field due to a point charge, electric field lines; electric dipole, electric field due to a dipole; torque on a dipole in a uniform electric field. Electric flux, statement of Gauss's theorem and its applications to find field due to infinitely long straight wire, uniformly charged infinite plane sheet and uniformly charged thin spherical shell (field inside and outside). Electric potential, potential difference, electric potential due to a point charge, a dipole and system of charges; equipotential surfaces, electrical potential energy of a system of two point charges and of electric dipoles in an electrostatic field. Conductors and insulators, free charges and bound charges inside a conductor. Dielectrics and electric polarisation, capacitors and capacitance, combination of capacitors in series and in parallel, capacitance of a parallel plate capacitor with and without dielectric medium between the plates, energy stored in a capacitor, Van de Graaff generator.



- **Current Electricity:** Electric current, flow of electric charges in a metallic conductor, drift velocity and mobility, and their relation with electric current; Ohm's law, electrical resistance, V-I characteristics (linear and non-linear), electrical energy and power, electrical resistivity and conductivity. Carbon resistors, colour code for carbon resistors; series and parallel combinations of resistors; temperature dependence of resistance. Internal resistance of a cell, potential difference and emf of a cell, combination of cells in series and in parallel. Kirchhoff's laws and simple applications. Wheatstone bridge, metre bridge. Potentiometer – principle and applications to measure potential difference, and for comparing emf of two cells; measurement of internal resistance of a cell.

## **bca-202 Mathematics**

### **RELATIONS AND FUNCTIONS:**

#### **Relations and Functions**

- **Types of relations :** Reflexive, symmetric, transitive and equivalence relations. One to one and onto functions, composite functions, inverse of a function. Binary operations.
- **Inverse Trigonometric Functions :** Definition, range, domain, principal value branches. Graphs of inverse trigonometric functions. Elementary properties of inverse trigonometric functions.

#### **ALGEBRA :**

- **Matrices :** Concept, notation, order, equality, types of matrices, zero matrix, transpose of a matrix, symmetric and skew symmetric matrices. Addition, multiplication and scalar multiplication of matrices, simple properties of addition, multiplication and scalar multiplication. Non-commutativity of multiplication of matrices and existence of non-zero matrices whose product is the zero matrix (restrict to square matrices of order 2). Concept of elementary row and column operations. Invertible matrices and proof of the uniqueness of inverse, if it exists; (Here all matrices will have real entries).

#### **Determinants**

- **Determinant of a square matrix** (up to  $3 \times 3$  matrices), properties of determinants, minors, cofactors and applications of determinants in finding the area of a triangle. Adjoint and inverse of a square matrix. Consistency, inconsistency and number of solutions of system of linear equations by examples, solving system of linear equations in two or three variables (having unique solution) using inverse of a matrix.

#### **CALCULUS Limits and Derivatives**

- **Derivative** introduced as rate of change both as that of distance function and geometrically, intuitive idea of limit, Definition of derivative, relate it to slope of tangent of the curve, derivative of sum, difference, product and quotient of functions. Derivatives of polynomial and trigonometric functions.

## **BCA II Year Group -II (Computer)**

**Duration: 3 hours**

**Max Marks: 50**

### **bca-201 Computer Practices**

#### **Communication Skills:**

- **Types of communications:** oral communication, written communication – formal, informal, business letters – types of letter, writing letters, business correspondence, applying for a job, resume writing, filling an employment application.

- **Report writing:** definition and determining reports purpose, report planning, collecting information, developing an outline, sections of report, types of report, making reports writing effective, drafting circulars, notices, agenda and minutes of meetings.

**Duration: 3 hours**

**Max Marks: 50**

## **bca-202 Information Practices**

### **Client Server Technology**

- **Client/server computing** – Evolution of client/server concepts, definition, history, need and motivation for client/server approach, client/server environments, characterization of client/server computing, client/server types and examples.
- **Client/server development tools**, advantages of client/server technology connectivity, user productivity reduction in network traffic, faster delivery of systems.
- **The Role of Client** – Client request for service, dynamic data exchange, OLE, Common Object Request Broker Architecture (CORBA), Components of client/server applications.
- **The Role of Server** – Server functions, network operating systems, Novel Netware, LAN Manager, Server Operating System, System Application Architecture.
- **Architecture** – Components of client-server architecture, application partitioning, the two-layer and three-layer architectures, communication between clients and servers, use of APIs in client/server computing, middleware technology in client/server computing. Open System Interconnectivity (OSI), Inter Process Communication (IPC)
- **Client/Server System Development** – Network Management, Remote System Administrations, LAN Network Management, Privacy and Security Issue, Developing applications on RDBM, GUI design concepts

## **BCA II Year Group -III (Arts)**

**Duration: 3 hours**

**Max Marks: 50**

## **bca-201 Geography**

- **Climate**, Vegetation and Soil, Weather and climate – spatial and temporal distribution of temperature, pressure winds and rainfall, Indian monsoon: mechanism, onset and withdrawal, variability of rainfalls: spatial and temporal; use of weather charts; Climatic types (Koeppen). Natural vegetation-forest types and distribution; wild life; conservation; biosphere reserves. Soils – major types (ICAR’s classification) and their distribution, soil degradation and conservation.
- **Hazards and Disasters** : Causes, Consequences and Management Floods, Cloudbursts, Droughts: types and impact, Earthquakes and Tsunami, Cyclones: features and impact, Landslides
- **People** : Population-distribution, density and growth, Population change-spatial patterns and structure; determinants of population change; Age-sex ratio; rural-urban composition; Human development – concept; selected indicators, international comparisons
- **Human Activities**
- **Primary activities:** concept and changing trends; gathering, pastoral, mining, subsistence agriculture, modern agriculture; people engaged in agricultural and allied activities – some examples from selected countries.
- **Secondary activities** : concept; manufacturing: types – household, small scale, large scale; agro based and mineral based industries; people engaged in secondary activities – some examples from selected countries.

- **Tertiary activities:**concept; trade, transport and tourism; services; people engaged in tertiary activities – some examples from selected countries.
- **Quaternary activities :**concept; people engaged in quaternary activities -case study from selected countries.
- **Transport, Communication & Trade, Land transport :** roads, railways; trans-continental railways, Water transport – inland waterways; major ocean routes, Air transport – Intercontinental air routes, Oil and gas pipelines, Satellite communication and cyber space- Importance and usage for geographical information; use of GPS, International trade-Bases and changing patterns; ports as gateways of international trade, role of WTO in International trade, Ocean: National rights and international treaties.  
**Human settlements**
- **Settlement types :** rural and urban; morphology of cities (case study); distribution of mega cities; problems of human settlements in developing countries.  
**Human settlements**
- **Population :** distribution, density and growth; composition of population – linguistic, religious; sex, rural-urban and occupational-regional variations in growth of population. Migration: international, national-causes and consequences. Human development: selected indicators and regional patterns. Population, environment and development.

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<b>Duration: 3 hours</b>	<b>Max Marks: 50</b>
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## **bca-202 Sociology**

### **Western Social Thinkers**

- Karl Marx on Class Conflict, Emile Durkheim on Division of Labour, Max Weber on Bureaucracy

### **Indian Sociologists**

- G.S. Ghurye on Race and Caste, D.P. Mukherjee on Tradition and Change, A.R. Desai on the State, M.N. Srinivas on the Village.

### **Introducing Indian Society**

- Colonialism, Nationalism, Class and Community, Demographic Structure and Indian Society, Rural-Urban Linkages and Divisions.
- **Social Institutions:** Continuity and Change, Family and Kinship, the Caste System.

### **Market as a Social Institution**

- Pattern of Social Inequality and Exclusion, Caste Prejudice, Scheduled Castes and Other Backward Classes, Marginalization of Tribal Communities, The Struggle for Women's Equality, The Protection of Religious Minorities, Caring for the Differently Abled.

### **The Challenges of Cultural Diversity**

- Problems of Communalism, Regionalism, Casteism and Patriarchy, Role of the State in a Plural and Unequal Society, What We Share? .

# **BCA II Year**

## **Group -IV (Commerce)**

**Duration: 3 hours**

**Max Marks: 50**

## **bca-201 Accountancy**

### **Bills of Exchange**

- **Bills of Exchange and Promissory Note:** Definition, Features, Parties, Specimen, Distinction.
- **Important Terms :** Term of Bill, Days of Grace, Date of Maturity, Bill at Sight, Negotiation, Endorsement, Discounting of bill, Dishonour of bill, Noting of bill, Insolvency of Acceptor, Retirement and Renewal of a bill. Accounting Treatment of bill transactions.

### **Financial Statements**

- **Financial Statements :** Meaning and Users. Profit and Loss Account: Gross profit, Operating profit and Net profit. Balance Sheet: Need, Grouping, Marshalling of Assets and Liabilities.
- Adjustments in preparation off financial statements with respect to closing stock, outstanding expenses, prepaid expenses, accrued income, income received in advance, depreciation, bad debts, provision for bad debts, provision for discount on debtors, managers' commission, abnormal loss, goods sent for approval and in transit. Preparation of Profit and Loss Account and Balance Sheet of sole proprietorship concerns.

### **Financial Statement of Not-for-Profit Organization**

- **Not for profit organization:** Meaning and examples. Receipts and Payments account, Income and Expenditure account: Meaning and Concept of Fund based accounting. Preparation of Income and Expenditure account and Balance Sheet from Receipts and Payments Account with additional information.

### **Computers in Accounting**

- **Introduction to Computers:** Meaning, Capabilities and Components of Computer System.
- Database concepts for Accounting.Retrieval of accounting information-basic queries.

**Duration: 3 hours**

**Max Marks: 50**

## **bca-202 Business Studies**

### **Small Business**

- Small scale enterprise as defined by MSMED Act 2006 (Micro, Small and Medium Enterprise Development Act). Role of small business in India with special reference to rural areas. Government schemes and agencies for small scale industries: (National Small Industries Corporation) and DIC (District Industrial Center) with special reference to rural, backward and hilly areas.

### **Internal Trade**

- Services rendered by a wholesaler and a retailer Types of retail – trade – Itinerant and small scale fixed shops Large scale retailers – Departmental stores, chain stores, mail order business.
- Concept of automatic vending machine Chambers of Commerce and Industry: Basic functions Main documents used in internal trade: Performa invoice, invoice, debit note, credit note. LR (Lorry receipt) and RR (Railway Receipt) Terms of Trade: COD (Cash on Delivery), FOB (Free on Board), CIF (Cost, Insurance and Freight), E&OE (Errors and Omissions Excepted).

### **International Trade**

- Meaning, difference between internal trade and external trade: Meaning and characteristics of international trade. Problems of international trade: Advantages and disadvantages of international trade Export Trade – Meaning, objective and procedure of Export Trade.
- Import Trade – Meaning, objective and procedure: Meaning and functions of import trade; purpose and procedure Documents involved in International Trade; documents involved in export trade,

indent, letter of credit, shipping order, shipping bills, mate's receipt, bill of lading, certificate of origin, consular invoice, documentary bill of exchange (DA/DP), specimen, importance World Trade Organization (WTO) meaning and objective.

#### **Nature and Significance of Management**

- Management – concept, objectives and importance, Management as Science, Art and Profession Levels of management, Management functions – planning, organising, staffing, directing and controlling, Coordination – concept, characteristics and importance.

#### **Principles of Management**

- Principles of Management – concept, nature and significance Fayol's principles of management Taylor's Scientific Management – principles and techniques.

#### **Management and Business Environment**

- Business Environment – concept and importance, Dimensions of Business Environment – Economic, Social, Technological, Political and Legal, Impact of Government policy changes on business with special reference to liberalization, privatization and globalisation in India.

#### **Planning**

- Concept, importance and limitations, Planning process, Single use and Standing Plans – Objectives, Strategy, Policy, Procedure, Method, Rule, Budget and Programme.

## **BCA II Year Group -V (Skills)**

<b>Duration: 3 hours</b>	<b>Max Marks: 50</b>
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### **bca-201 Merchandise Management**

#### **Retail:**

- **Merchandise Management** : Meaning, factors affecting the Merchandising function, function of Merchandise Manager-Planning, organizing, Directing, controlling, coordinating, Merchandise Planning, Process of planning, sales forecast, Identifying the requirement, merchandise control, merchandise buying product line, classification, category management, components of category management, category management process.
- **Strategy Management** : Principals of Strategy Management, Fundamentals and Approaches of retail Strategy Management, Basic criteria's to analyses Strategy Management strategy, Retail pricing and merchandise performance, elements of retail price, developing a pricing strategy, Approaches to a pricing strategy Adjustment to retail price, factors affecting retail price, merchandise allocation, Analyzing Merchandise performance, pare to curve. Importance of strategic Management in this competitive retail market.
- **Store Design Elements** Retail store location & layout-meaning, importance characteristics used in location, trade area selection, consideration. Defining the trade area Reily model, Huff's Model, out shopping, site evaluation & Selection, neighborhood shopping center, community shopping center, Regional shopping center, and super-regional shopping center& fashion center. Store Design and Layout-introduction, comprehensive store planning types of goods, interior Design elements. Planogram & Shelf layout design.

<b>Duration: 3 hours</b>	<b>Max Marks: 50</b>
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## bca-202 Banking Management System

- Definition & Principles of Banking: Present structure of banking System in India.
  - Brief History; Management Principles in Banks; Managerial Functions in banks. Management of Deposits and advances; Deposit mobilization; Classification and nature of Deposit accounts; advances, Lending practices, Types of advances.
- Investment Management system**
- Liquidity and profitability; preparation of cheques, Bills, Endorsement; Government securities, documents of title of goods -receipts, Records, Evaluation of loans application; profit and loss accounts; balance sheet and statutory report regarding cash revenue.

## BCA II Year

### bca-203 Database Management Systems

**Duration: 3 hours**

**Max Marks: 50**

- **Overview of DBMS:** Basic DBMS terminology, DBA and his responsibilities, physical and logical data independence, architecture of DBMS, distributed databases, structure design and Client/server 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
- **Relational Model:** Storage organization for relations, relational algebra, set operators, relational operators, decomposition of relation schemes, functional dependencies, multi-valued dependencies, normalization up to DKNF.
- **Relational Query Language:** DDL, DML, DCL, database integrity, domain integrity, entity integrity, referential integrity, security, authorization, access matrix, concurrency, locks, serializability, recovery.
- **Distributed database design:** architecture of distributed processing system, data communication concept, data placement, placement of DDBMS and other components, concurrency, control and recovery, transaction management, need of recovery, recovery techniques, serializability, blocking, dead locks, introduction to query optimization.
- **MS-Access:** Create a Table in MS Access -Data Types, Field Properties, Fields names, types, properties, default values, format, caption, validation rules Data Entry Add record delete record 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

## BCA II Year

### bca-204 Java Programming

**Duration: 3 hours**

**Max Marks: 50**

- **Introduction to Java**, history, characteristics, Object Oriented Programming, data types, variables, arrays, difference between Java and C++ Control statements: Selection, iteration, jump statements, operators
- **Classes and Methods:** Introducing classes, Class fundamentals, Declaring Objects, Assigning object reference variables. Introducing method, Constructors, The this Keyword, Garbage Collection-Finalize() method, Overloading methods, Using objects as parameters, Argument Passing, Returning Objects, Recursion, static and final keyword, Nested and Inner Classes, String Class, Command Line arguments.
- **Inheritance, Packages, Interfaces:** Inheritance Basics, using super, method overriding, Dynamic method dispatch, abstract classes, Using final with inheritance, Packages, Access Protection, Importing packages, Interfaces.
- **Exception Handling, Multithreading, Applet :** Exception handling fundamentals, Types, Using try, catch, throw, throws and finally, Java thread model, Creating a Thread, Creating multiple threads, Thread priorities, synchronization, Inter-thread communication, Applet Basics, Applet Skeleton, HTML applet tag – Passing parameters to applet.
- **I/O Streams, Utility Classes:** I/O Streams- Byte Streams, Character Streams, Reading and Writing Files, Legacy Classes and Interface: Vector, Stack, The Enumeration Interface, Utility classes: String Tokenizer, Date, Calendar, Random, Scanner.
- **Javax.Swing Package :** JButton, JLabel, JTextField, JPasswordField, JRadioButton, JCheckBox, JComboBox, JList, JToggleButton, JSpinner, JTabbedPane, JTable, JToolBar, JToolTip, JFrame, JPanel, JDialog, JSlider, Introduction to Event Handling: Event Classes – Event Listener interfaces.

## BCA II Year

### bca-205 C++ Programming for Object Oriented Systems

**Duration: 3 hours**

**Max Marks: 50**

- **Object Oriented Concepts**, Tokens, Expressions and Control Structures Introduction: Basic Elements of Programming, Console I/O Operations.
- **>Control Structures: Control and Looping Statements. Function: Function Prototyping, Call and Return by Reference, Inline Function, Default and Const Arguments, Function Overloading, Arrays, Manipulators and Enumeration.**
- **Classes and Object, Object Oriented Methodology: Basic Concepts/Characteristics of OOP. Advantages and Application of OOP's, Procedural Programming Vs OOP.**
- **Classes and Objects: Specifying a Class, Creating Objects, Private & Public Data Members and Member Functions, Defining Inline Member Functions, Static Data Members and Member Functions. Arrays within Class, Arrays of Objects, Objects as Function Arguments, Returning Objects.**

- **Constructors, Destructors, Operators Overloading and Inheritance. Constructors and Destructors: Introduction, Parameterized Constructors, Multiple Constructors in A Class, Constructors With Default Arguments, Dynamic Initialization of Objects, Copy Constructors, Dynamic Constructors, Const Objects, Destructors Operators Overloading: Definition, Unary and Binary Overloading, Rules for Operator Overloading.**
- **Inheritance: Defining Derived Classes, Types of Inheritance, Constructors and Destructors in Derived Classes.**
- **Pointers Virtual & Friend functions and file handling Pointers: Pointer to Objects, this Pointer, New and Delete Operators, Virtual Function, Friend Functions. Opening, Closing a File, File Modes, File Pointers and their Manipulation, Sequential Input and Output Operations: Updating a File, Random Access, and Error Handling During File Operations, Command Line Arguments.**
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## BCA II Year

### bca-206 Computer Graphics

**Duration: 3 hours**

**Max Marks: 50**

- **Graphics hardware:** The functional characteristics of the systems are emphasized.
- **Input devices:** Keyboard, touch panel, light pens, graphic tablets, joysticks, track ball, data glove, digitizer, image scanner, mouse, voice systems.
- **Hard copy devices:** Input and non-impact printers such as line printer, dot matrix, laser, inkjet, electrostatic, flat bed and drum plotters.
- **Video Display Devices:** Refresh cathode ray tube, raster scan displays, random scan displays, color CRT monitors, direct view storage tube, flat panel displays, 3-D view devices, virtual reality, raster scan systems, random scan systems, graphics monitors and work stations.
- **Scan conversion algorithms** for line, circle and ellipse, Bresenham's algorithms, area filling techniques, character generation.
- **2-dimensional graphics:** Cartesian and Homogeneous co-ordinate system, Geometric transformations (translation, scaling rotation, reflection, shearing, 2-dimensional viewing transformation and clipping (line, polygon and text).

**Disclaimer:**

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# BCA III Year

## Group -I (Science)

Duration: 3 hours

Max Marks: 50

### bca-301 Physics

#### Magnetic Effects of Current and Magnetism:

- Concept of magnetic field, Oersted's experiment. Biot – Savart law and its application to current carrying circular loop. Ampere's law and its applications to infinitely long straight wire, straight and toroidal solenoids. Force on a moving charge in uniform magnetic and electric fields. Cyclotron. Force on a current-carrying conductor in a uniform magnetic field. Force between two parallel current carrying conductors – definition of ampere. Torque experienced by a current loop in a magnetic field; moving coil galvanometer – its current sensitivity and conversion to ammeter and voltmeter. Current loop as a magnetic dipole and its magnetic dipole moment. Magnetic dipole moment of a revolving electron. Magnetic field intensity due to a magnetic dipole (bar magnet) along its axis and perpendicular to its axis. Torque on a magnetic dipole (bar magnet) in a uniform magnetic field; bar magnet as an equivalent solenoid, magnetic field lines; Earth's magnetic field and magnetic elements. Para-, dia- and ferro – magnetic substances, with examples. Electromagnets and factors affecting their strengths. Permanent magnets.

#### Electromagnetic Induction and Alternating Currents

- **Electromagnetic induction** : Faraday's law, induced emf and current; Lenz's Law, Eddy currents. Self and mutual inductance. Alternating currents, peak and rms value of alternating current/ voltage; reactance and impedance; LC oscillations (qualitative treatment only), LCR series circuit, resonance; power in AC circuits, wattless current. AC generator and transformer.
- **Electromagnetic Waves** Need for displacement current. Electromagnetic waves and their characteristics (qualitative ideas only). Transverse nature of electromagnetic waves. Electromagnetic spectrum (radio waves, microwaves, infrared, visible, ultraviolet, x-rays, gamma rays) including elementary facts about their uses.
- **Optics:** Reflection of light, spherical mirrors, mirror formula. Refraction of light, total internal reflection and its applications, optical fibres, refraction at spherical surfaces, lenses, thin lens formula, lens-maker's formula. Magnification, power of a lens, combination of thin lenses in contact combination of a lens and a mirror. Refraction and dispersion of light through a prism.
- **Scattering of light:** blue colour of the sky and reddish appearance of the sun at sunrise and sunset. Optical instruments: Human eye, image formation and accommodation, correction of eye defects (myopia and hypermetropia) using lenses. Microscopes and astronomical telescopes (reflecting and refracting) and their magnifying powers. Wave optics: Wavefront and Huygens' principle, reflection and refraction of plane wave at a plane surface using wavefronts. Proof of laws of reflection and refraction using Huygens' principle. Interference, Young's double hole experiment and expression for fringe width, coherent sources and sustained interference of light.
- Diffraction due to a single slit, width of central maximum. Resolving power of microscopes and astronomical telescopes. Polarisation, plane polarised light; Brewster's law, uses of plane polarised light and Polaroids.
- **Dual Nature of Matter and Radiation:** Photoelectric effect, Hertz and Lenard's observations; Einstein's photoelectric equation – particle nature of light. Matter waves – wave nature of particles, de Broglie relation. Davisson-Germer experiment (experimental details should be omitted; only conclusion should be explained.)
- **Atoms and Nuclei** Alpha – particle scattering experiment; Rutherford's model of atom; Bohr model, energy levels, hydrogen spectrum. Composition and size of nucleus, atomic masses, isotopes,

isobars; isotones. Radioactivity – alpha, beta and gamma particles/rays and their properties; radioactive decay law. Mass-energy relation, mass defect; binding energy per nucleon and its variation with mass number; nuclear fission and fusion.

- **Electronic Devices** Energy bands in solids (qualitative ideas only), conductors, insulators and semiconductors;
- semiconductor diode – I-V characteristics in forward and reverse bias, diode as a rectifier; I-V characteristics of LED, photodiode, solar cell, and Zener diode; Zener diode as a voltage regulator. Junction transistor, transistor action, characteristics of a transistor; transistor as an amplifier (common emitter configuration) and oscillator. Logic gates (OR, AND, NOT, NAND and NOR). Transistor as a switch.
- **Communication Systems** Elements of a communication system (block diagram only); bandwidth of signals (speech, TV and digital data); bandwidth of transmission medium. Propagation of electromagnetic waves in the atmosphere, sky and space wave propagation. Need for modulation. Production and detection of an amplitude-modulated wave.

<b>Duration: 3 hours</b>	<b>Max Marks: 50</b>
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## **bca-302 Mathematics**

### **CALCULUS:**

- Continuity and Differentiability, derivative of composite functions, chain rule, derivatives of inverse trigonometric functions, derivative of implicit function. Concepts of exponential, logarithmic functions. Derivatives of  $\log_e x$  and  $e^x$ . Logarithmic differentiation. Derivative of functions expressed in parametric forms. Second order derivatives. Rolle's and Lagrange's Mean Value Theorems (without proof) and their geometric interpretations.
- **Applications of Derivatives:** Rate of change, increasing/decreasing functions, tangents and normals, approximation, maxima and minima (first derivative test motivated geometrically and second derivative test given as a provable tool). Simple problems (that illustrate basic principles and understanding of the subject as well as real-life situations).
- **Integrals:** Integration as inverse process of differentiation. Integration of a variety of functions by substitution, by partial fractions and by parts, only simple integrals to be evaluated. Definite integrals as a limit of a sum. Fundamental Theorem of Calculus (without proof). Basic properties of definite integrals and evaluation of definite integrals.
- **Applications of the Integrals:** Applications in finding the area under simple curves, especially lines, arcs of circles/ parabolas / ellipses (in standard form only), area between the two above said curves (the region should be clearly identifiable).
- **Differential Equations:** Definition, order and degree, general and particular solutions of a differential equation. Formation of differential equation whose general solution is given. Solution of differential equations by method of separation of variables, homogeneous differential equations of first order and first degree.

### **VECTORS AND THREE-DIMENSIONAL GEOMETRY**

- Vectors and scalars, magnitude and direction of a vector. Direction cosines/ratios of vectors. Types of vectors (equal, unit, zero, parallel and colinear vectors), position vector of a point, negative of a vector, components of a vector, addition of vectors, multiplication of a vector by a scalar, position vector of a point dividing a line segment in a given ratio. Scalar (dot) product of vectors, projection of a vector on a line. Vector (cross) product of vectors, scalar triple product.
- **Three-dimensional Geometry:** Direction cosines/ratios of a line joining two points. Cartesian and vector equation of a line, coplanar and skew lines, shortest distance between two lines. Cartesian and vector equation of a plane. Angle between (i) two lines, (ii) two planes, (iii) a line and a plane. Distance of a point from a plane.

- **Linear Programming:** Introduction, related terminology such as constraints, objective function, optimization, different types of linear programming (L.P.) problems, mathematical formulation of L.P. problems, graphical method of solution for problems in two variables, feasible and infeasible regions, feasible and infeasible solutions, optimal feasible solutions (up to three non-trivial constraints).
  - **Probability:** Multiplications theorem on probability. Conditional probability, independent events, total probability, Baye's theorem. Random variable and its probability distribution, mean and variance of haphazard variable. Repeated independent (Bernoulli) trials and Binomial distribution
- STATISTICS AND PROBABILITY**
- **Statistics Measure of dispersion:** mean deviation, variance and standard deviation of ungrouped/grouped data. Analysis of frequency distributions with equal means but different variances.
  - **Probability, Random experiments:** outcomes, sample spaces (set representation). Events: Occurrence of events, 'not', 'and' & 'or' events, exhaustive events, mutually exclusive events. Axiomatic (set theoretic) probability, connections with the theories of earlier classes. Probability of an event, probability of 'not', 'and', & 'or' events.

## BCA III Year Group -II (Computer)

<b>Duration: 3 hours</b>	<b>Max Marks: 50</b>
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### **bca-301 Computer Practices**

#### **E-Commerce:**

- Electronic Commerce Framework, electronic and media convergence, traditional vs electronic business applications, the anatomy of E-commerce applications, overview of mobile computing technology, mobile data internet and mobile computing applications
- Networks – Security and firewalls, client – server network security threads, firewalls and network security, data message security, encrypted documents and electronic mail.
- Architectural Framework for electronic commerce, World Wide Web as architecture, consumer oriented e-commerce, electronic data interchange (EDI), EDI Applications in business, EDI security document management and digital libraries.
- Consumer oriented applications, mercantile process models, mercantile models from the consumer's perspective, mercantile models from the merchant's perspective

<b>Duration: 3 hours</b>	<b>Max Marks: 50</b>
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### **bca-302 Information Practices**

#### **Management Information System**

- **Introduction to Management Information Systems (MIS):** concepts, meaning elements and characteristics of MIS, MIS organization, MIS planning and building a business model.
- Database and communications, definition requirement and user view of database, database software, file structure elements of a communication system and distributed data processing.
- MIS technology definition of computer technology system and application software elements and support services elements.
- Building and installing MIS application, development cycle analysis synthesis and implementation of MIS feasibility of installing MIS

- Management and MIS, MIS aided decision making decision support systems education and training for MIS management's role in system development.

## BCA III Year Group -III (Arts)

**Duration: 3 hours**

**Max Marks: 50**

### **bca-301 Geography**

#### **Human Settlements**

- Rural settlements** : types and distribution. Urban settlements – types, distribution and functional classification.

#### **Resources and Development**

- Land resources** : general land use; agricultural land use, Geographical conditions and distribution of major crops (Wheat, Rice, Tea, Coffee, Cotton, Jute, Sugarcane and Rubber), agricultural development and problems. Water resources – availability and utilization-irrigation, domestic, industrial and other uses; scarcity of water and conservation methods -rain water harvesting and watershed management. Mineral and energy resources – distribution of metallic (Iron ore, Copper, Bauxite, Manganese); non-metallic (Mica, Salt) minerals; conventional (Coal, Petroleum, Natural gas and Hydroelectricity) and non-conventional energy sources (solar, wind, biogas) and conservation. Industries – types, factors of industrial location; distribution and changing pattern of selected industries-iron and steel, cotton textiles, sugar, petrochemicals, and knowledge based industries; impact of liberalization, privatisation and globalisation on industrial location; industrial clusters. Planning in India – target group area planning (case study); idea of sustainable development (case study).
- Transport, Communication and International Trade** : Transport and communication-roads, railways, waterways and airways: oil and gas pipelines; Geographical information and communication networks. International trade – changing pattern of India's foreign trade; sea ports and their hinterland and airports.

#### **Geographical Perspective on selected issues and problems**

- Environmental pollution; urban – waste disposal. Urbanisation, rural-urban migration; problems of slums. Land degradation

**Duration: 3 hours**

**Max Marks: 50**

### **bca-302 Sociology**

#### **Structural Change**

- Colonialism, Industrialization, Urbanization.

#### **Cultural Change**

- Modernization, Westernization, Sanskritisation, Secularization, Social Reform Movements and Laws.

#### **The Story of Democracy**

- The Constitution as an instrument of Social Change, Parties, Pressure Groups and Democratic Politics, Panchayati Raj and the Challenges of Social Transformation.

#### **Change and Development in Rural Society**

- Land Reforms, Green Revolution and Agrarian Society.  
**Change and Development in Industrial Society**
- From Planned Industrialization to Liberalization, Changes in the Class Structure.
- Globalisation and Social Change, Mass Media and Communication Process.  
**Social Movements**
- Class-Based Movements: Workers, Peasants.
- Caste-Based Movements: Dalit Movement, Backward Castes, Trends in Upper Caste, Responses, Women's Movements in Independent India, Tribal Movements, Environmental Movements.

## **BCA III Year Group -IV (Commerce)**

**Duration: 3 hours**

**Max Marks: 50**

### **bca-301 Accountancy**

#### **Accounting for Partnership**

- **Nature of Partnership Firm** : Partnership Deed -Meaning, Impact. Special Aspects of Final Accounts of Partnership : Fixed v/s Fluctuating Capital, Division of Profit among partners, Past adjustments and Guarantee of Profits, Accounting for joint life policy.
- **Reconstitution of Partnership** : Change in Profit Sharing Ratio among the existing partners - Sacrificing Ratio and Gaining Ratio, Accounting for Revaluation of Assets and Liabilities and Distribution of Reserves and Accumulated Profits. Goodwill: Nature, Factors affecting and Methods of valuation: average profit, super profit, capitalization, accounting treatment of goodwill. Admission of a Partner: Effect of Admission of Partner, Change in Profit Sharing Ratio -Sacrificing Ratio, accounting Treatment of Goodwill, Accounting Treatment for Re- valuation of Assets and Liabilities. Accounting Treatment of Reserves and Accumulated Profits, Adjustment of Capital Accounts. Retirement/Death of a Partner: Change in Profit Sharing Ratio -Gaining Ratio, Accounting Treatment of Goodwill. Accounting Treatment for the Revaluation of Assets and Liabilities. Adjustment of Accumulated Profits and Reserves, Adjustment of Joint Life Policy and Capital Accounts.
- **Dissolution of Partnership Firm** : Meaning, Settlement of Accounts: Preparation of Realization account and related accounts (excluding piecemeal distribution, sale to a company and insolvency of a partner).

#### **Accounting for Share Capital**

- **Share and Share Capital:** Meaning, Nature and Types. Accounting for Share Capital: Issue and Allotment of Shares. Private Placement of shares : Meaning of employee stock option plan and Public Subscription of share capital. Over subscription and Under subscription, Issue at par, premium and at discount, Calls in advance, Calls in arrears, Interest on Calls in advance and arrears and Issue of Shares for consideration other than cash. Forfeiture of Shares: Accounting Treatment, Re-Issue of Forfeited Shares. Disclosure of Share Capital in company's balance sheet.

#### **Accounting for Debentures**

- **Issue of Debentures:** Meaning of Debentures. Types of Debentures, Trust Deed concept, Issue of Debentures at par and at a premium, Issue of Debentures for consideration other than cash. Debentures as a collateral security. Redemption of Debentures: Meaning, Sources of funds for redemption of debentures : from the proceeds of fresh issue of share capital and debentures, Out of accumulated profits and Sinking Fund. Methods of redemption of debentures In lump-sum at the end of stipulated period, By draw of lots, By purchasing in the open market, By conversion into new debentures or shares.

#### **Analysis of Financial Statement**

- **Financial Statements of a Company:** Balance Sheet of a Company in the prescribed form with major headings only (Schedule VI). Financial Analysis: Meaning, Significance and Purpose, Limitations. Tools for Financial Analysis: Comparative Statements, Common Size Statements.
- **Accounting Ratios:** Meaning and Objectives, Types of Ratios, Liquidity Ratios: Current Ratio, Liquid Ratio. Solvency Ratio: Debt to equity, Total Assets to Debt, Proprietary Ratio. Activity Ratio, Inventory Turnover, Debtors Turnover, Working Capital Turnover, Profitability Ratio: Gross Profit, Operating Ratio.

<b>Duration: 3 hours</b>	<b>Max Marks: 50</b>
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### **bca-302 Business Studies**

- **Organising:** Concept and importance. Organizing Process. Structure of organization – functional and divisional. Formal and informal organization. Delegation: concept, elements and importance.
  - **Decentralization:** concept and importance.
  - **Staffing:** Concept and importance of staffing Staffing as a part of Human Resource Management
  - **Staffing process:** Recruitment – sources; Selection – process Training and Development – Concept and importance. Methods of training- on the job and off the job- Induction training, vestibule training, apprenticeship training and internship training.
  - **Directing:** Concept and importance, Elements of Directing: – Supervision – concept, functions of a supervisor. Motivation – Concept, Maslow’s hierarchy of needs; Financial and non-financial incentives. Leadership – concept, styles – authoritative, democratic and laissez faire. Communication – concept, formal and informal communication; barriers to effective communication, how to overcome the barriers.
  - **Controlling:** Concept, nature and importance, Relationship between planning and controlling, Steps in the process of control
- Financial Management**
- **Concept and objectives of financial management.** Financial decisions : investment, financing and dividend and factors affecting. Financial planning – concept and importance.
  - **Capital Structure** – concept and factors affecting. Fixed and Working Capital – concept and factors affecting their requirements.
- Financial Markets**
- **Concept and types.** Money market and its instruments. Capital market and its types (primary and secondary). Stock Exchange – functions and trading procedure. Depository Services and D’mat Account. Securities and Exchange Board of India (SEBI) – objectives and functions.
- Marketing Management**
- **Marketing** – concept and functions. Marketing management philosophies. Marketing Mix – concept Product – concept, branding, labeling and packaging. Price – factors determining price. Physical distribution- concept, channels of distribution: types, choice of channels.
  - **Promotion** – concept and elements; advertising- concept, role, objections against advertising, personal selling – concept and qualities of a good salesman, sales promotion – concept and techniques, public relations – concept and role.
- Consumer Protections**
- Concept and importance of consumer protection. Consumer Protection Act 1986, Meaning of consumer and consumer protection, Rights and responsibilities of consumers, Who can file a complaint and against whom, Redressal machinery, Remedies available. Consumer awareness – Role of consumer organizations and Non-Governmental Organizations (NGOs)

## BCA III Year Group -V (Skills)

**Duration: 3 hours**

**Max Marks: 50**

### **bca-301 Retail Communication**

#### **Retail:**

- Communicating with the retail customer, communication process, promotion mix element of advertising, objectives of advertising, functions of advertising, advantages of retailer, advantages to customer, advantages to society, characteristics of good advertisement. Objections of advertisement, advertising Media, factors governing selection of the media types of media, kinds of press advertisement, kinds of magazines, advertising agency, promotions & definition of promotion, importance of promotional activities, purpose of promotion, kinds of promotion, approaches to promotion, types of sales promotion programmes, retail selling process, qualitative & quantitative objectives.
- **Globalization & Retailing** : Globalization & Retailing- Meaning advantages, retail evolution, changing retail formats, product developments, environment and experience, factors underlying modernization in retailing, changes in government policies, retail Industry trends, increased Investment in retailing, emerging new face of retailing, changing retail model , E-retailing, e-commerce, global entry strategy & new customized formats, classification of retail stores, types of franchising, role of retailing in industry. Understanding of Global market scenario, Changing international scenario and trading terms and their policies. Global retail business in the shadow of World Wide Web and it's comparison with the traditional retailing business.

**Duration: 3 hours**

**Max Marks: 50**

### **bca-302 Core Skills/Generic Skills / Professional Skills**

- **Communication:** Processing role of Business Communication, Listening, and Qualities of a good listener essentials of good communication. Promotions; controlling of people & staff, Relationship between morale productivity & objectives.
- **Types of communication:** Formal; Informal, inter-personal intra personal Verbal; on- Verbal; Individual and Group communication network.
- **Business letter;** Memo; Reports Presentations, Legal oriented -proposals, agreements; manuals; forms, notices; telecommunications; Negotiations.

## BCA III Year

### bca-303 Computer Networks & Mobile Computing

**Duration: 3 hours**

**Max Marks: 50**

- OSI Model, significance of layer model, network, topology, network classification, switching and components.
- Introduction to Ethernet, token ring, basic working and cable, bridges, routers, gateways, private and public networks.
- FDMA, TDMA, CDMA, personal communications system architecture, cordless telephony, digital enhanced cordless telecommunication.
- Wireless technology: Land mobile vs satellite vs in building communication system, cellular telephony, personal communication system/networks.
- Wireless architecture for mobile computing, wireless LANs, end user devices, MAC protocols, IEEE 802.11, mobile IP, wireless TCP, hand of adhoc networks, unicast and multicast communication, blue tooth.

## BCA III Year

### bca-304 Programming in .NET with C#

**Duration: 3 hours**

**Max Marks: 50**

- Introduction to .NET, .NET Framework features & architecture, CLR, Common Type System, MSIL, Assemblies and class libraries. Introduction to visual studio, Project basics, types of project in .Net, IDE of VB.NET- Menu bar, Toolbar, Solution Explorer, Toolbox, Properties Window, Form Designer, Output Window, Object Browser. The environment: Editor tab, format tab, general tab, docking tab. visual development.
- 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. Class, overloading, constructor, inheritance, overriding, interfaces
- 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. Display Data on data bound controls, display data on data grid. Generating reports using CrystalReportViewer.
- Introduction to C#, variables, constants, identifiers, data types, expressions and operators, flow control and exception handling, control structures, properties, indexes, namespace, classes, objects, structures.
- Object oriented programming C#, pointers, delegates and events.



## BCA III Year

### bca-305 Internet Tools & Website Development

**Duration: 3 hours**

**Max Marks: 50**

- **Internet** – current state, hardware and software requirement, ISP, an internet account, web home page, URL, browser, security on web, searching tools, search engines, FTP, Gopher, Telnet, emails, TFTP
- **Web browser architecture**, web page and multimedia, static dynamic and active web page, simple mail transfer protocol, simple network management protocol, hyper text transfer protocol
- **Classes and Object, Object Oriented Methodology:** Basic Concepts/Characteristics of OOP. Advantages and Application of OOP's, Procedural Programming Vs OOP.
- **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 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.
- **MySQL databases in PHP:** Introduction, connecting to a MySQL database, querying the database, Retrieving and displaying the results, modifying data, deleting data.
- **JavaScript** – JavaScript Introduction , Variable, If-Else, Switch, Operators, Popups, Functions, Iterator functions, Loops, Forms, Events, and Event Handling, Try-Catch, Introduction to JavaScript Objects, JS Built-in Objects: Array, String, Date, window, document, navigator, status, history, location. Event handling .DOM, dynamically adding, removing and replacing DOM.

## BCA III Year

### bca-306 Open Source Technology & Operating Systems

**Duration: 3 hours**

**Max Marks: 50**

- Introduction to Operating Systems, goals of OS, operation of OS, resource allocator and related functions, classes of OS, batch processing, multi-processing, time sharing, distributed, real time systems
- System calls, system programs, structure of OS, layer design of DOS, Unix, virtual machine OS, kernel based OS, micro-kernel based OS, architecture of Window 2000.
- Process concept, interacting process, threads, process in Unix, process and thread in Windows 2000, process scheduling, fundamental of scheduling, scheduling criteria, long medium short term scheduling, scheduling algorithms upto multi-processor scheduling, algorithm evaluation.

- Structure of concurrent system, critical section, critical region, inter-process communication, monitor and semaphores, implementation and uses.
- Linux: History, programmer interface, file manipulation, process control, kernel, signals, file system, block and inodes, stream editor, character transliteration, ed, vi editor and there commands.
- Shell script, variables, file name expansion, shell commands, looping and making decisions, array, subprogram, C interface with Linux, simple shell programs.

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