

**MAHARSHI DAYANAND SARASWATI UNIVERSITY
AJMER**

NOTICE

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**MAHARSHI DAYANAND SARASWATI UNIVERSITY
AJMER**

पाठ्यक्रम

SYLLABUS

**SCHEME OF EXAMINATION AND
COURSES OF STUDY**

FACULTY OF SCIENCE

B.Sc. Computer Science

I Year Examination

(w.e.f. 2017-18)

II Year Examination

(w.e.f. 2018-19)

III Year Examination

(w.e.f. 2019-20)

Qat



मूल्य : 10/-

महर्षि दयानन्द सरस्वती विश्वविद्यालय, अजमेर

MAHARSHI DAYANAND SARASWATI UNIVERSITY,
AJMER

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NOTICE

1. Change in Statutes/Ordinances/Rules/Regulations Syllabus and Books may, from time to time, be made by amendment or remaking, and a candidate shall, except in so far as the University determines otherwise comply with any change that applies to years he has not completed at the time of change. **The decision taken by the Academic Council shall be final.**

सूचना

1. समय-समय पर संशोधन या पुनः निर्माण कर परिनियमों/अध्यादेशों/नियमों / विनियमों / पाठ्यक्रमों व पुस्तकों में परिवर्तन किया जा सकता है, तथा किसी भी परिवर्तन को छात्र को मानना होगा बशर्ते कि विश्वविद्यालय ने अन्यथा प्रकार से उनको छूट न दी हो और छात्र ने उस परिवर्तन के पूर्व वर्ष पाठ्यक्रम को पूरा न किया हो। विद्या परिषद द्वारा लिये गये निर्णय अन्तिम होंगे।

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for Maharshi Dayanand Saraswati University, Ajmer

B.Sc. (Computer Science) Scheme of Examination

Theory:

Part A:

1. 10 Question of 1.5 mark each - 15 marks
2. Answer should not exceed more than 50 words
3. All questions are compulsory

Part B:

1. 5 Questions of 3 marks each - 15 marks
2. Answer should not exceed more than 50 words
3. All questions are compulsory

Part C:

1. 3 Questions of 7 + 7 + 6 marks - 20 marks.
2. There will be an internal choice in each question.
3. Answer should not exceed 400 words

Practical & Projects:

Practical exams shall be conducted by one internal and one external examiner of a batch of 40 students in a day.

Duration of Practical exam in 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.

The number of paper and the maximum marks for each paper are shown against each subject separately. It will be necessary for a candidate to pass in the theory part as well as the practical part of a subject/paper, wherever prescribed, separately.

Classification of successful candidates shall be as follows:

First Division 60% } of the aggregate marks prescribed at (a) Part I Examination, (b) Part II Examination,
Second Division 48% } (c) Part III Examination, taken together

All the rest shall be declared to have passed the examination, if they obtain the minimum pass marks in each subject viz. 36% no division shall be awarded at the Part I and Part II examination.

Note:

Eligibility for admission in First Year of B.Sc. (CS) is 10+2 with Science examination of any board with at least 50% marks. As regards admission on reserved category seats government rules will be applicable.

4 / B.Sc. Computer Science

TEACHING AND EXAMINATION SCHEME
B. Sc. Computer Science - I Year

Paper Name (Theory)	Lec	Exam Hours	Marks	
			Min	Max
bcs-101 Computer Programming Fundamental	3	3	18	50
bcs-102 Digital Logic	3	3	18	50
bcs-103 Electronics	3	3	18	50
bcs-104 Data Structure	3	3	18	50
bcs-105 Relational Database Management Systems	3	3	18	50
bcs-106 Data Communications	3	3	18	50
Total of Theory Marks			300	

Paper Name (Practical)	Pract Hours	Exam Hours	MARKS	
			Min	Max
bcs-107 Digital Electronics Computer Lab	3	3	18	50
bcs-108 RDBMS	3	3	18	50
bcs-109 Programming Data Structure Lab	3	3	18	50
Total of Practical Marks			150	
Total of Theory & Practical Marks			450	

TEACHING AND EXAMINATION SCHEME
B. Sc. Computer Science - II Year

Paper Name (Theory)	Lec	Exam Hours	Marks	
			Min	Max
bcs-201 Computer Oriented Numerical Methods	3	3	18	50
bcs-202 Object Oriented Programming in C++	3	3	18	50
bcs-203 Computer Organization	3	3	18	50
bcs-204 Computer Networks	3	3	18	50
bcs-205 Operating Systems	3	3	18	50
bcs-206 Microprocessor Interfacing & Computer Hardware	3	3	18	50
Total of Theory Marks			300	

Paper Name (Practical)	Pract Hours	Exam Hours	MARKS	
			Min	Max
bcs-207 Operating System Lab	3	3	18	50
bcs-208 Electronics Practical Lab	3	3	18	50
bcs-209 C++ Programming & Data Structures	3	3	18	50
Total of Practical Marks			150	
Total of Theory & Practical Marks			450	

TEACHING AND EXAMINATION SCHEME
B. Sc. Computer Science - III Year

Paper Name (Theory)	Lec	Exam Hours	Marks	
			Min	Max
bcs-301 Java Programming	3	3	18	50
bcs-302 Discrete Mathematics	3	3	18	50
bcs-303 Software Engineering & Project Management	3	3	18	50
bcs-304 Web Technologies	3	3	18	50
bcs-305 Digital Design Using VHDL	3	3	18	50
bcs-306 Internet of Things	3	3	18	50
Total of Theory Marks			300	

Paper Name (Practical)	Pract Hours	Exam Hours	MARKS	
			Min	Max
bcs-307 Java Programming Lab	3	3	18	50
bcs-308 Electronics Practical Lab	3	3	18	50
bcs-309 Digital Design Using VHDL Lab	3	3	18	50
bcs-310 Project	6	3	18	50
Total of Practical Marks			200	
Total of Theory & Practical Marks			500	

Duration: 3 hours

Max Marks: 50

bcs-101 Computer Programming Fundamental

C Programming Practical Laboratory

Different data types and sizes, variable names, constants, Declaration, Type conversion,

Arithmetic, operations, Relation and Logical operators, Increment and Decrement operators, Bitwise and Logical operators, Assignment operators and Expressions, Precedence and order of Evaluation.

Statement and Blocks, if-else, else, switch, while, for, do-while loops, break, continue, go to and labels, function and Program structures, function structures, Function Arguments, External, Static, Register variables, Scope rules, structure, initialization, Recursion.

Pointer and Addresses, Pointers and Function arguments, Pointer and Arrays, address arithmetic, character Pointers and functions, Multidimensional Arrays Pointer arrays, Pointers to Pointers, Initialization of pointer arrays, pointers v/s Multidimensional arrays, compound literals, arguments, Pointer to functions. Structure and function, Arrays of structures Pointers to Structures, Self-Referential structures, Table lookup, Fields, Union, Typedef.

Standard input and Output Formatting input & output, in memory format conversion, File access, Error Handling, Line I/O.

Duration: 3 hours

Max Marks: 50

bcs-102 Digital Logic

Representation of Information: Numeric and Nonnumeric, Number Integer and Real Binary, Octal, Hexadecimal, Positive and Negative Numbers Arithmetic in Number systems. Ten's complements, 1's and 2's complements, Binary multiplication and Division. characters: ASCII and EBCDIC codes, Error detection and Correction Codes: concept, Minimum Distance 3code, Hamming Code.

Basic Logic Design; Logic Gates; AND, OR, Not, BNOR, NAND, EXOR, Introduction to TL Gates, Truth Table, Boolean Algebra; Boolean Relational, Sums, Algebraic, Simplification and Minimization of Boolean Full Adder, Decoder, Demultiplexer Encoder, Multiplexers.

Sequential Logic Circuit: Flip-flop: RS Clocked, D, JK, Master Slave Flip flop, Shift register, Shift Left, Shift Right, Bidirectional Shift, Counter: Ripple, Synchronous, Ring Up, Down, Memory, type of memory, RAM, Rom, and their Specifications, Secondary Memory Device: Tape, Dist, Floppy, drum, Optical, CD ROM, Magnetic Bubble Memory and charge coupled Devices.

ALU, Register Unit, Control and Timing unit, System Bus, Address bus, Data Bus, Control Bus and utility lines, Accumulator, General purpose registers, Special purpose register program counter (PC), stack Pointer (SP) Status register, Instruction register, index register, memory Address register (MAR) and Memory Buffer Register (MBR).

Input devices: Keyboard, Mouse, Light pen, Joystick, Trackball, Scanner, Voice Input System Output devices: CRT, Printer, Dot matrix, Letter quality, Nonimpact, Inkjet, Laser, Line and Page printers, plotter, Microfilm and microfiche, voice output system. IO Architecture: properties of simple IO devices and their controller. Transfer of information between IO device, CPU and Memory, Program controlled and interrupts controlled information transfer.

Duration: 3 hours

Max Marks: 50

bcs-103 Electronics

Passive component: Resistors: Symbol, types: carbon, metal filament, wire wound, thin film, Fixed and variable, potentiometers and presets, log and linear type specifications, color code, testing of resistors area of applications problems related to joule heating tolerance temperature coefficient applications in potential dividers coarsse AND FINE PRESETS ETC. Inductors Symbol, type air core iron core, ferrite core frequency response of an inductor specifications measurement of inductance choke AF and RF, their uses and area of applications nagaoka formula for fabrication a single layer coil inductance multi-layer coil

formula Problems related to a. C. impedance angle between current and voltages power factor. Transformers Principle types (single phase) auto and main transformers Design of mains and step down transformers Simple Idea of AF, IF, RF driver transformers.

Basics of Semiconductors and p-n junction: Conductor, Semiconductors and Insulators, their classification on the basis of Band theory, Intrinsic and extrinsic semiconductors, Fermi level in semiconductors N-type and P-type, current in semiconductors, drift and diffusion-N junction, forward and reverse of diode, concept of recombination of carriers temperature variation of forward current and reverse current through the p-n junction. The Rectifier equation, the temperature coefficients, dynamic and junction, the Rectifier equation, the temperature coefficients, dynamic and static resistances, voltage dependent junction capacitance of a p-n junction.

Capacitors: Symbol, code, types: mica, paper, ceramic tantalum poly styrene their construction, working and uses, specifications, testing of condenser, area of applications, problems related to electrical en energy stored design of capacitors phase lag resonance in series and parallel to inductor, leakage effects Relays their types Microphones Loudspeakers their types combinations specifications testing and uses in various field problems and exercises related to lout speakers outputs relay currents phase lag maximum switching rates etc.

A.C. Circuits: A.C. current and voltages. RMS and mean value, operator LR, CR, LCR Circuits series and parallel resonance circuits, factor band with coupling circuits coefficients of coupling choke coils, problems and numerical related to power factor, phase relationship between I and through band across L at different frequency B, W and Q calculations; variation of I, V and as a function of frequency.

Circuit Theory: Thevenin's Norton's and Millman's theorems maximum power transfer theorem, reciprocity theorem, problem related to theorems idea of clipper and voltage doubler.

Single stage RC couple amplifier, frequency response class A, class B, class AB, class C, push-pull amplifier, efficiency of class A, B, AB and C amplifier. Applications of these input V/S output waveform analysis in this amplifier, related problems cascading of the amplifier.

Introduction to Silicon Controlled Rectifier (SCR) SCR characteristics and ratings, SCR construction and terminal identification's application, Silicon controlled switch, gate turn off, light activated SCR, shockley diode, DIAC, TRIAC, injunction transistor, its construction and characteristics, symbol and its uses as relaxation oscillator

Duration: 3 hours

Max Marks: 50

bcS-104 Data Structure

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

Brute force and greedy algorithms, Divide and Conquer Strategy: Merge sort, quick sort, integer multiplication, matrix multiplication, exponentiation problem, convex hull problem, dynamic programming

Complexity theory: Decidability of problems: Halting problem, NP-class of problem, P class of problem, NP=P question, Polynomial reduction problem, Cook's theorem, NP hardness and NP completeness.

Control structures-Variables – Data types- Arrays- String processing – Sorting and Searching- Insertion-Selection-Merge- Radix-Binary Search- Linear Search- Hashing

Binary tree- Representation – Traversing – Threaded Binary tree- Binary Search tree- Insertion deletion into a binary search tree- Heap sort

Graph- Representation of Graph- Shortest path – Operation on Graphs- Traversing a Graph- Topological Sorting – Files

Duration: 3 hours

Max Marks: 50

bcS-105 Relational Database Management System

Object of database systems, data abstraction, data definition language, data manipulation language, database administrator database model, database system architecture, Entity relationship model, entities and entity sets their relationship, mapping constraints, generalization, aggregation, use of ER model for the design of databases, sequential, random, index sequential file organization, relational algebra, normalization up to DKNF.

Object Oriented modeling, class, different types of attributes, generalization, inheritance, aggregation, encapsulation, distributed database design, architecture of distributed processing system, data communication concept, data placement, placement of DDBMS, and other components, concurrency control techniques, recovery, transaction management, need of recovery, recovery techniques, serializability, two-phase locking.

Query optimization and processing, algorithm for external sorting, select and join, object and set operations, heuristics in query optimization, temporal database concept, multi-media database, data-mining, association rule, classification, application, data-warehousing, need, architecture, characteristics, data layer, XML tree data model, document, DTD schema, query, database, data-warehousing verses view

Security and integrity of databases, security specifications in SQL, access control, flow control, encryption of public key infrastructure, cryptography and

types. SQL*PLUS Data types, Constraints, Operators, DDL, DML, PL/SQL syntax; Data types, PL/SQL functions, Error handling in PL/SQL, package functions, package procedures, Oracle transactions. Stored procedures & functions, creation and execution of procedures, triggers

Duration: 3 hours

Max Marks: 50

bcS-106 Data Communications

Introduction to Data communications and networking, protocols, standards and architecture, topology, transmission mode, OSI model, analog and digital signals, periodic and aperiodic signals, time and frequency domain, Fourier analysis concept.

Encoding digital to digital conversion, analog to digital conversion, digital to analog conversion, analog to analog conversion, transmission of digital data, DTE-DCE interface, EIA-232, EIA-449, X.21, modem, cable modem, guided and unguided, transmission media

Multiplexing, TDM, FDM, WDM, DSL, HDLC, error classification, types of errors, error detection, error correction, virtual redundancy check, longitudinal redundancy check, cyclic redundancy check.

Asynchronous transfer mode, protocol architecture, ATM cells, ATM layers, switches, circuit switching network and concepts, routing, packet switching, X.25, virtual circuit approach, point-to-point layers, link control protocol, network control protocol.

Duration: 3 hours

Max Marks: 50

bcS-201 Computer Oriented Numerical Methods

Frequency distribution measures of central tendency, mean, mode, partition values (quartiles); measures of dispersion, range, interquartile range, mean deviation, standard deviation, moments, skewness and kurtosis.

Probability; event, sample space, probability of an event, addition and multiplication theorems. Random variable, mathematical expectations, expectation of sum and product of random variables, moment generating function.

Theoretical distribution, binomial, geometric, negative binomial, uniform, poisson, normal, rectangular and exponential, and gamma distribution, their properties and uses.

Methods of least squares, curve fitting correlation and regression. Introduction of multiple and partial correlation (up to three variable only).

Elementary theory of testing of hypothesis. Errors of first and second kinds critical region, level of significance based on Chi-square t and f statistics.

Duration: 3 hours**Max Marks: 50****bcs-202 Object Oriented Programming in C++**

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.

Duration: 3 hours**Max Marks: 50****bcs-204 Computer Organization**

Evolution of computer system, current trend in computing, Von Reumann stored programmed concept, functional components of computer with the case study of casting computing facilities.

Architectural classification schemes like SISD, SIMD, MISD, MIMD models, memory and input output subsystems like I/O Channels and peripherals processors.

Instruction formats and addressing modes - direct, indirect, register indirect, relative and indexed, Microprogramming concepts.

Hierarchical memory structures and concept of virtual memory, characteristics

of cache memories, operations design aspects and cache bandwidths. Interrupt mechanism and interrupt controllers.

An Introductory overview of architecture of 8088 microprocessor, Instruction set and timing cycles of 8088, machine language program development.

Duration: 3 hours**Max Marks: 50****bcs-203 Computer Networks**

Introduction to wireless technologies: WAP services, Serial and Parallel Communication, Asynchronous and synchronous Communication, FDM, TDM, TFM, Spread spectrum technology Introduction to Bluetooth: Specification, Core protocols, Cable replacement protocol

Bluetooth Radio: Type of Antenna, Antenna Parameters, Frequency hopping Bluetooth Networking: Wireless networking, wireless network types, devices roles and states, adhoc network, scatternet Connection establishment procedure, notable aspects of connection establishment, Mode of connection, Bluetooth security, Security architecture, Security level of services, Profile and usage model: Generic access profile (GAP), SDA, Serial port profile, Secondary Bluetooth profile

Hardware: Bluetooth Implementation, Baseband overview, packet format, Transmission buffers, Protocol Implementation: Link Manager Protocol, Logical Link Control Adaptation Protocol, Host control Interface, Protocol Interaction with layers

Duration: 3 hours**Max Marks: 50****bcs-205 Operating Systems**

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, 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, Architecture of Distributed system, inter-process communication protocol,

Duration: 3 hours**Max Marks: 50****bcs-202 Object Oriented Programming in C++**

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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

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Instruction formats and addressing modes - direct, indirect, register indirect, relative and indexed, Microprogramming concepts.

Hierarchical memory structures and concept of virtual memory, characteristics

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An Introductory overview of architecture of 8088 microprocessor, Instruction set and timing cycles of 8088, machine language program development.

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Introduction to wireless technologies: WAP services, Serial and Parallel Communication, Asynchronous and synchronous Communication, FDM, TDM, TFM, Spread spectrum technology Introduction to Bluetooth: Specification, Core protocols, Cable replacement protocol

Bluetooth Radio: Type of Antenna, Antenna Parameters, Frequency hopping Bluetooth Networking: Wireless networking, wireless network types, devices roles and states, adhoc network, scatternet Connection establishment procedure, notable aspects of connection establishment, Mode of connection, Bluetooth security, Security architecture, Security level of services, Profile and usage model: Generic access profile (GAP), SDA, Serial port profile, Secondary Bluetooth profile

Hardware: Bluetooth Implementation, Baseband overview, packet format, Transmission buffers, Protocol Implementation: Link Manager Protocol, Logical Link Control Adaptation Protocol, Host control Interface, Protocol Interaction with layers

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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, Architecture of Distributed system, inter-process communication protocol,

network OS, issues in distributed design, issues of distributed file system, network structure, distributed system structure, file system, coordination. History of Linux, Linux architecture, Linux file System, file naming, types of files, directory command, file command, vi editor, locating files in Linux, filter pipe, shell variables, local and global variables, command substitution, if, while, for, shift, tar, basic networking commands in Linux.

Duration: 3 hours

Max Marks: 50

bcs-206 Microprocessor Interfacing & Computer Hardware

Display Adapter:

CRT display, display adapters MGA, CGA, EGA, PGA, VGA, SVGA, color Monitor, CRT interface, composite video. CTT controller interface, Principal character generator, video process logic, screen memory arbitration, interfaced. Memory access, video attributes, timing chain, CRTC, CGA circuit blocks Hard Disk Controller:

Overview of HDC organization, HDC specifications and features, disk drives and interfaces, HDC connectors, controller Port specifications, HDC commands and command block and commands summary, commands completion and status Hardware Components and ICs in PC:

Discrete Components, ICs Pulse circuits wave forms, positive and negative logic, special Gates, Comparison of TTL, and CMOS logic, IC families, MOA ICs in a PC, CMOS to TTL, TTL to CMOS interfacing.

Support chips in Motherboard:

Dumb & Smart chips, Bus controller interrupt controllers, Programmable interval Timers.

Programmable Peripheral Interface DMA Controller.

Installation and preventing Maintenance and Pre installation Planning, installation practice, Removing a Motherboard, Removing and Replacing daughter board, Removing and FDD Mounting on FDD, Routine, check, special configuration memory up gradation, HDC & HDD models, DOS & software, Preventive maintenance, General Precaution systems usage

Duration: 3 hours

Max Marks: 50

bcs-301 Java Programming

Introduction to Java, history, characteristics, Object Oriented Programming, data types, variables, arrays, difference between Java and C++

Control statements: Selection, iteration, jump statements

Introduction to classes, class fundamentals, constructor, methods, stack class, inheritance, creating multilevel hierarchy, method over riding

Packages and interfaces, exception handling, multi-threaded programming, //

O applets

Java Library, string handling, string comparison, string buffer, utility classes, vector stack dictionary, applet class, introduction to AWT, working with frame windows.

Java Beans, beans architecture, AWT components, advantage of Java Beans, beans serialization, JDBC, class and methods, API components, JDBC components, driver, connectivity to database processing result and interfaces, RMI, comparison of distributed and non-distributed Java programs, interfaces, RMI architecture layer, ODBC, CORBA, CORBA services and products, CGI, structure of CGI.

Duration: 3 hours

Max Marks: 50

bcs-302 Discrete Mathematics

Groups & Rings: Introduction to semi-groups, monoids, groups, generators, cosets, normal subgroups, Lagrange's Theorem, homomorphism, rings, polynomial rings, and fields.

Lattices: Introduction to partial orders, semi-lattices, and lattices.

Vector spaces: vector spaces, linear combinations, convex sets, linear independence, dimension, the column rank and row rank of a matrix.

Linear Mappings: linear mappings and vector space of linear maps, the kernel and the image of a linear map, orthogonal complement of a subspace, the vector space of homogeneous system of linear equations, set of solutions of a non-homogeneous system of linear equations, matrix associated with a linear map, change of bases, composition of linear maps, inverse of a linear map.

Scalar products on vector spaces, norm, Schwartz's inequality, Bessel's inequality, orthogonal bases, bilinear maps and matrices, determinants, the rank of a matrix and sub-determinant, Cramer's rule, determinants as areas and volumes, Eigen vectors and Eigenvalues, Eigen space, The characteristic polynomial, Eigen values and Eigen vectors of asymmetric matrix, diagonalisation of a symmetric linear map

Classification of conic sections and quadric surfaces

Duration: 3 hours

Max Marks: 50

bcs-303 Software Engineering & Project Management

Concepts of Software Engineering, Software Characteristics, components applications, software Metrics and Models; Process and Product Metrics, Size metric, Complexity metric, McCabe's Cyclomatic Complexity, Halsted Theory, Function Point Analysis.

System Development Life Cycle (SDLC) Steps, Water fall model, Prototypes, Spiral model. Planning and Software Project: Cost Estimation, Project

Scheduling, Quality Assurance Plans, project Monitoring Plans.
Software Development & Software Design : System design, detailed design, function oriented design, object oriented design user Interface design, Design level metrics: Phases, Process Models, Role of Management, Role of Metrics and Measurement, Software Quality factors,
Coding and Testing: Programming Practices, verification, Monitoring and Control. Testing level metrics Software quality and reliability Clean room approach, software reengineering.
Testing & Reliability: Testing Fundamentals, Test case design, Functional Testing, Structural Testing, Test Plan activities during testing, Unit System, Integration Testing. Concept of Software Reliability, Software Repair and Availability, Software Errors and Faults Reliability Models (JM, GO, MUSA Markov) Limitations of Reliability Models

Duration: 3 hours

Max Marks: 50

bcs-304 Web Technologies

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, hypertext transfer protocol

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

Duration: 3 hours

Max Marks: 50

bcs-305 Digital Design Using VHDL

Introduction & Behavioural Modelling

Introduction to HDLs: Difference between HDL and other software languages – Different HDLs in vogue. Overview of digital system design using HDL Basic VHDL Language Elements: Identifiers, Data objects, scalar and composite data types, Operators

Behavioural Modeling with examples: Entity declaration, Architecture body, Process statement and sequential statements. Inertial and transport delay models, creating signal waveforms, signal drivers, effect of transport and inertial delays on signal drivers.

Data Flow and Structural Modeling

Data Flow Modeling with examples: Concurrent signal assignment statement, Concurrent versus sequential signal assignment, Delta delays, Multiple drivers, Conditional signal assignment statement, selected signal assignment statement, concurrent assertion statement.

Structural Modeling with examples: Component declaration, Component instantiation and examples, direct instantiation of component.

Subprograms and Packages

Subprograms and Overloading: Functions and procedures with simple examples –subprogram overloading, Operator overloading.

Packages and Libraries: Package declaration, package body, design file, design libraries,

order of analysis, implicit visibility, explicit visibility, library clause and use clause.

Advanced Features: Entity statements, Generate statements, Attributes, Aggregate targets, ports and their behaviour.

Simulation and Hardware modeling

Model Simulation: Simulation – Writing a Test Bench for a Half and a Full adder.

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Hardware Modeling Examples: Modeling entity interfaces, Modeling simple elements,
Different styles of modeling, Modeling regular structures, Modeling delays, Modeling
conditional operations, Modeling a clock divider and a pulse counter.

Duration: 3 hours

Max Marks: 50

bcs-306 Internet of Things

The 8051 Microcontroller

Introduction to microcontrollers and embedded systems: Overview and block diagram of 8051. Architecture of 8051, Program counter and memory organisation, Data types and directives, Flag bits and PSW Register, Register banks and Stack; Pin diagram, Port organisation, I/O Programming, Bit manipulation. Interrupts and timer.

Addressing modes, instruction set and assembly language programming of 8051
Addressing modes and accessing memory using various addressing modes.
Instruction set

Arithmetic, Logical, Single Bit, Jump, Loop and Call Instructions and their usage. Time Delay Generation and Calculation; Timer/Counter Programming. Programming examples: Addition, multiplication, subtraction, division, arranging a given set of numbers in ascending / descending order, picking the smallest / largest number among a given set of numbers, Accessing a specified port terminal and generating a rectangular waveform.

Interfacing of peripherals to Microcontroller

Interfacing of - PPI 8255, DAC, ADC, Serial communication- modes and protocols

Applications of Embedded Systems

Temperature measurement, displaying information on a LCD, Control of a Stepper Motor, Interfacing a keyboard and generation different types of waveforms.