

Government Science College, Jabalpur



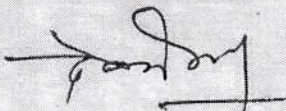
**Syllabus (I,II,III) Year
2022-23**

BCA

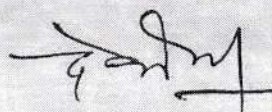
Government Science College, Pachpedi, South Civil Lines, Jabalpur, Madhya Pradesh 482001
email: hegsjab@mp.gov.in, Website: mphighereducation.nic.in/sciencecollege
Phone : 0761-2678737 fax : 0761-2621272

BCA I Year

| PART A: Introduction | | | |
|---|--|--|-------------------------------|
| Program: Certificate | Class: B.C.A. | Year: I Year | Session: 2021-22 |
| 1. | Course Code | SI - BCA1T | |
| 2. | Course Title | Computer Fundamentals, Organization and Architecture | |
| 3. | Course Type (Core Course/Elective/Generic Elective/ Vocational) | Major – Paper I | |
| 4. | Pre-Requisite (if any) | To study this course, a student must have basic knowledge of Computers. | |
| 5. | Course Learning Outcomes (CLO) | <p>After the completion of this course, a successful student will be able to :</p> <ul style="list-style-type: none"> Understand the basic structure, operation and characteristics of digital computer. Design simple combinational digital circuits based on given parameters. Understand the working of arithmetic and logic unit. Know about hierarchical memory system including cache memories and virtual memory. Know the contributions of Indians in the field of computer architecture and related technologies. | |
| 6. | Credit Value | Theory – 4 Credits Practical - 2 Credits | |
| 7. | Total Marks | Max. Marks : 25+75 | Min. Passing Marks: 33 |
| PART B: Content of the Course | | | |
| No. of Lectures (in hours per week): 2 Hrs. per week | | | |
| Total No. of Lectures: 60 Hrs. | | | |
| Module | Topics | No. of Lectures | |
| I | <p>Fundamentals of computers: Definition, Characteristics, capabilities and limitations.</p> <p>Types of Computers: Analog, Digital, Micro, Mini, Mainframe & Super Computers, Work Station, Server computers. Generations of Computers.</p> <p>Smart Systems: definition, characteristics and applications.</p> <p>Definition of Embedded system, GIS, GPS, Cloud Computing.</p> <p>Uses of computers in e-governance and various public domains and services.</p> | 8 | |
| II | <p>Block diagram of computer and its functional units. Concept of hardware, software and firmware. Types of software.</p> <p>Input devices - keyboard, scanner, mouse, light pen, bar code reader, OMR, OCR, MICR, track ball, joystick, touch screen camera, mic etc.</p> <p>Output devices: monitors – classification of monitors based on technology -CRT & flat panel, LCD, LED monitors, speakers, printers – dot matrix printer, ink jet printer, laser printer, 3D Printers, Wi-Fi enabled printers, plotters and their types , LCD/LED projectors.</p> | 10 | |



| | | |
|---|--|----|
| | Computer memory and its types, Storage devices: Magnetic tapes, Floppy Disks, Hard Disks, Compact Disc – CD-ROM, CD-RW, VCD, DVD, DVD-RW, usb drives, Blue Ray Disc, SD/MMC Memory cards. | |
| III | Fundamentals of Digital Electronics: Data Types, Complements, Fixed-Point Representation, Floating-Point Representation, Binary and other Codes, Error Detection Codes. Logic Gates, Boolean Algebra, Map Simplification, Combinational Circuits, Sequential Circuits, simple combinational circuit design problems. Combinational Circuits- Adder- Subtractor, Multiplexer, Demultiplexer, Decoders, Encoders Sequential Circuits - Flip - Flops, Registers, Counters. | 10 |
| IV | Basic Computer Organization: Instruction codes, Computer Registers, Computer Instructions, Timing & Control, Instruction Cycles, Memory Reference Instruction, Input - Output & Interrupts Instruction formats, Addressing modes, Instruction codes, Machine language, Assembly language. Register Transfer and Micro operations: Register Transfer Language, Register Transfer, Bus & Memory Transfer, Arithmetic Micro-operations, Logic Micro-operations, Shift Micro-operations. | 10 |
| V | Processor and Control Unit: Hardwired vs. Micro programmed Control Unit, General Register Organization, Stack Organization, Instruction Format, Data Transfer & Manipulation, Program Control, Introductory concept of RISC, CISC, advantages and disadvantages of both. Pipelining – concept of pipelining, introduction to Pipelined data path and control – Handling Data hazards & Control hazards. | 10 |
| VI | Memory and I/O Systems - Peripheral Devices, I/O Interface, Data Transfer Schemes - Program Control, Interrupt, DMA Transfer. I/O Processor. Memory Hierarchy, Processor vs. Memory Speed, High-Speed Memories, Main memory & its types, Auxiliary memory, Cache Memory, Associative Memory, Interleaving, concept of Virtual Memory, Hardware support for Memory Management. | 10 |
| VII | Indian contribution to the field – Contributions of reputed scientists of Indian origin - like - Dr. Vinod Dham – Father of Intel Pentium Processor, Dr. Ajay Bhat – Co-Inventor of USB Technology, Dr. Vinod Khosla- co-founder of Sun Microsystems, Dr. Vijay P Bhatkar - architect of India's national initiative in supercomputing, and many others. Parallel Computing projects of India – PARAM, ANUPAM, FLOSOLVER, CHIPPS etc. Other relevant contributors and contributions. | 2 |
| PART C: Learning Resources | | |
| Textbooks, Reference Books, Other Resources | | |
| Suggested Readings | | |
| Textbooks: | | |



1. M.Morris Mano, "Computer System Architecture", PHI.
2. Heuring Jordan , "Computer System Design & Architecture" (A.W.L.)
3. मध्य प्रदेश हिंदी ग्रंथ अकादमी से प्रकाशित विषय से संबंधित पुस्तकें।

Reference Books:

4. William Stalling, "Computer Organization & Architecture", Pearson Education Asia.
5. V. Carl Hamacher , "Computer Organization", TMH
6. Tannenbaum, "Structured Computer Organization", PHI.
7. Er. Rajiv Chopra, "Computer Architecture", Revised 3rd Edition, S. Chand & Company Pvt. Ltd

Suggestive digital platform web links

<https://www.youtube.com/watch?v=4TzMyXmzL8M>

<https://nptel.ac.in/courses/106/106/106106166/>

<https://nptel.ac.in/courses/106/106/106106134/>

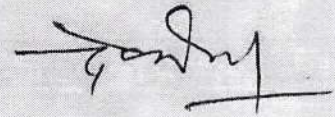
Suggested equivalent online courses

<https://nptel.ac.in/courses/106/105/106105163/>

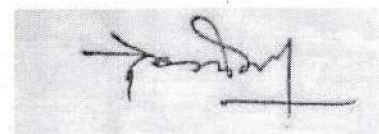
PART D: Assessment and Evaluation

| | | | |
|---|-----------------|---|--------------------------|
| Internal Assessment : Continuous Comprehensive Evaluation (CCE) : 25 Marks Shall be based on allotted assignments and Class Tests. The marks shall be as follows: | | External Assessment: University Exam (UE) : 75 Marks Time : 02.00 Hours | |
| Assessment and presentation of assignment | 4 Marks | Section (A): Three Very Short Questions (50 Words Each) | 03 x 03 = 09 Marks |
| Class Test I (Objective Questions) | 5 Marks | OR Nine MCQ Questions | OR 09 x 01 = 09 Marks |
| Class Test II (Descriptive Questions) | 8 Marks | Section (B) : Four Short Questions (200 Words Each) | 04 x 09 = 36 Marks |
| Class Test III (Based on solving circuit design problems) | 8 Marks | Section (C): Two Long Questions (500 Words Each) | 02 x 15 = 30 Marks |
| Total | 25 Marks | Total | 75 Marks |

Any remarks/suggestions:



| PART A: Introduction | | | |
|--|---|--|-------------------------------|
| Program: Certificate | Class: B.C.A | Year: I Year | Session: 2021-22 |
| 1. | Course Code | S1-BCAA1P | |
| 2. | Course Title | Computer Fundamentals and Digital Lab | |
| 3. | Course Type (Core Course/Elective/Generic Elective/ Vocational) | Major – Paper I | |
| 4. | Pre-Requisite (if any) | Open for All | |
| 5. | Course Learning Outcomes(CLO) | <p>After the completion of this course, a successful student will be able to do the following:</p> <ul style="list-style-type: none"> • Familiarity with parts of the computer and peripheral devices used with the computer. • Realization of the basic logic and universal gates. • Verify the behavior of logic gates using truth tables. • Implement Binary-to -Gray, Gray-to -Binary code conversions. • Design half and full adder circuit using basic gates. • Design and construct flip flops and verify the excitation tables. | |
| 6. | Credit Value | Practical - 2 Credits | |
| 7. | Total Marks | Max.Marks: 25+75 | Min. Passing Marks: 33 |
| PART B: Content of the Course | | | |
| No. of Lab. Practicals (in hours per week): 1 Hrs. per week | | | |
| Total No. of Labs: 30 Hrs. | | | |
| | Suggestive list of Practicals | | No. of Labs. |
| | <p>I. Computer Fundamentals</p> <p>a) Identify various parts of the computer by physical examination.</p> <p>b) Identify various parts inside the CPU like motherboard, SMPS, ports, buses, IC chips, Processor, HDD, RAM etc.</p> <p>c) Identify various I/O devices available in the lab physically.</p> <p>II. Digital Electronics</p> <p>a) Verification and interpretation of truth table for AND, OR, NOT gates</p> <p>b) Verification and interpretation of truth table for NAND, NOR gates</p> <p>c) Verification and interpretation of truth table for Ex-OR, Ex-NOR gates</p> <p>d) Study of half adder using XOR and NAND gates and verification of its operation</p> <p>e) Study of full adder using XOR and NAND gates and verification of its operation</p> | | 30 Hrs. |



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|--|--|--|
| | <p>f) Study of half subtractor and verification of its operation</p> <p>g) Study of full subtractor and verification of its operation</p> <p>h) Realization of logic functions with the help of NAND -Universal Gates</p> <p>i) Realization of logic functions with the help of NOR -Universal Gates</p> <p>j) Verify the truth table of RSflip-flops using NAND and NOR gates</p> <p>k) Verify the truth table of JKflip-flops using NAND and NOR gates</p> <p>l) Verify the truth table of T and D flip-flops using NAND and NOR gates</p> <p>m) Implementation of 4x1 multiplexer using logic gates</p> <p>n) Implementation of 1x4 demultiplexer using logic gates</p> <p>o) Verify Gray to Binary conversion using NAND gates only</p> <p>p) Verify Gray to Binary conversion using NAND gates only</p> | |
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PART C: Learning Resources

Textbooks, Reference Books, Other Resources

Suggested Readings

Textbooks:

- M.Morris Mano, "Computer System Architecture", PHI.
- Heuring Jordan, "Computer System Design & Architecture" (A.W.L.)
- मध्यप्रदेश हिंदी ग्रंथ अकादमी से प्रकाशित विषय से संबंधित पुस्तकें ।

Reference Books:

- William Stalling, "Computer Organization & Architecture", Pearson Education Asia.
- V. Carl Hamacher, "Computer Organization", TMH
- Tannenbaum, "Structured Computer Organization", PHI.

Suggestive digital platform web links

<https://de-iitr.vlabs.ac.in/>

Suggested equivalent online courses

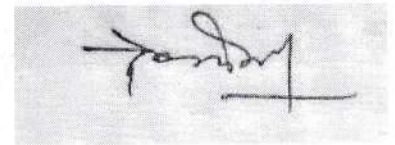
<https://nptel.ac.in/courses/106/105/106105163/>

PART D: Assessment and Evaluation

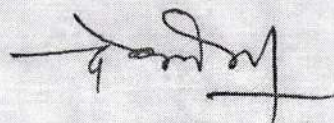
| | | | |
|---|--------------|--|--------------|
| Internal Assessment : Continuous Comprehensive Evaluation (CCE) : 25 Marks | | External Assessment: University Exam (UE): 75 Marks | |
| | | Time : 02.00 Hours | |
| Internal Assessment | Marks | External Assessment | Marks |
| Hands-on Lab Practice | 5 Marks | Practical record file | 10 Marks |
| Viva | 5 Marks | Viva voce practical | 15 Marks |
| Lab Test from practical list | 7 Marks | Table works/ Exercise Assigned (02) in practical exam | 40 Marks |



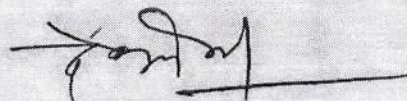
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|--|-----------------|---|-----------------|
| Assignments (Charts/ Model)/ Technology Dissemination/ Excursion/ Lab visit/ Industrial Training | 8 Marks | Reports of excursion/ Lab visits/ Industrial training/ Survey/ Collection/ Models | 10 Marks |
| Total <i>Excursion/ Lab visits/ Industrial Training is compulsory</i> | 25 Marks | Total | 75 Marks |



| PART A: Introduction | | | |
|--|--|--|------------------------|
| Program: Certificate | | Class: B.C.A. | Year: I Year |
| | | Session: 2021-22 | |
| 1. | Course Code | S1 - BCAA2T | |
| 2. | Course Title | Programming Methodology & Data Structures | |
| 3. | Course Type (Core Course/Elective/Generic Elective/ Vocational) | Major – Paper II | |
| 4. | Pre-Requisite (if any) | To study this course, a student must have basic knowledge of Computers. | |
| 5. | Course Learning Outcomes(CLO) | <p>After the completion of this course, a successful student will be able to do the following:</p> <ul style="list-style-type: none"> • Develop simple algorithms and flow charts to solve a problem with programming using top down design principles. • Writing efficient and well-structured computer algorithms/programs. • Learn to formulate iterative solutions and array processing algorithms for problems. • Use recursive techniques, pointers and searching methods in programming. • Will be familiar with fundamental data structures, their implementation; become accustomed to the description of algorithms in both functional and procedural styles. • Have knowledge of complexity of basic operations like insert, delete, search on these data structures. • Possess ability to choose a data structure to suitably model any data used in computer applications. • Assess efficiency tradeoffs among different data structure implementations. • Implement and know the applications of algorithms for searching and sorting. • Know the contributions of Indians in the field of programming and data structures. | |
| 6. | Credit Value | Theory – 4 Credits Practical – 2 Credits | |
| 7. | Total Marks | Max. Marks : 25+75 | Min. Passing Marks: 33 |
| PART B: Content of the Course | | | |
| No. of Lectures (in hours per week): 2 Hrs. per week | | | |
| Total No. of Lectures: 60 Hrs. | | | |
| Module | Topics | | No. of Lectures |
| I | Introduction to Programming - Program Concept, Characteristics of Programming, Stages in Program Development, Algorithms, Notations, Design, Flowcharts, Types of Programming Methodologies. | | 8 |



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| | <p>Basics of C++: A Brief History of C++, Application of C++, Compiling & Linking, Tokens, Keywords, Identifiers & Constants, Basic Data Types, User-Defined Data Types, Symbolic Constant, Type Compatibility, Reference Variables, Operator in C++, Scope Resolution Operator, Member Dereferencing Operators, Memory Management Operators, Manipulators, Type Cast Operator.</p> <p>Functions In C++: The Main Function, Function Prototyping, Call by Reference Call by Address, Call by Value, Return by Reference, Inline Function, Default Arguments, Constant Arguments, Function Overloading, Function with Array.</p> | |
| II | <p>Classes & Objects: A Sample C++ Program with class, Defining Member Functions, Making an Outside Function Inline, Nesting of Member Functions, Private Member Functions, Arrays within a Class, Memory Allocation for Objects, Static Data Members, Static Member Functions, Array of Objects, Object as Function Arguments, Friend Functions, Virtual functions, Returning Objects, Constant member functions, Pointer to Members, Local Classes.</p> <p>Constructor & Destructor: Constructor, Parameterized Constructor, Multiple Constructors in a Class, Constructors with Default Arguments, Dynamic Initialization of Objects, Copy Constructor, Dynamic Constructor and Destructor.</p> | 10 |
| III | <p>Inheritance: Defining Derived Classes, Single Inheritance, Making a Private Member Inheritable, Multilevel Inheritance, Hierarchical Inheritance, Multiple Inheritance, Hybrid Inheritance, Virtual Base Classes, Abstract Classes, Constructor in Derived Classes, Nesting of Classes. Operator Overloading & Type Conversion, Polymorphism, Pointers, Pointers with Arrays C++, Streams, C++ Stream Classes, Unformatted I/O Operation, Formatted I/O Operation, Managing Output with Manipulators, Exception Handling.</p> | 8 |
| IV | <p>Data Structure: Basic concepts, Linear and Non-Linear data structures</p> <p>Algorithm Specification: Introduction, Recursive algorithms, Data Abstraction, Performance analysis.</p> <p>Arrays: Representation of single, two-dimensional arrays, triangular arrays, sparse matrices-array and linked representations.</p> <p>Stacks: Operations, Array and Linked Implementations, Applications-Infix to Postfix Conversion, Infix to Prefix Conversion, Postfix Expression Evaluation, Recursion Implementation.</p> <p>Queues: Definition, Operations, Array and Linked Implementations. Circular Queue-Insertion and Deletion Operations, Dequeue (Double Ended Queue), Priority Queue- Implementation.</p> | 12 |
| V | <p>Linked Lists: Singly Linked Lists, Operations, Concatenating, circularly linked lists-Operations for Circularly linked lists, Doubly Linked Lists- Operations, Doubly Circular Linked List, Header Linked List</p> <p>Trees: Representation of Trees, Binary tree, Properties of Binary Trees, Binary Tree Representations- Array and Linked Representations,</p> | 10 |



| | | |
|-----|--|----|
| | Binary Tree Traversals, Threaded Binary Trees. Heap: Definition, Insertion, Deletion. | |
| VI | Graphs: Graph ADT, Graph Representations, Graph Traversals, Searching. Hashing: Introduction, Hash tables, Hash functions, Overflow Handling. Sorting: Bubble Sort, Selection Sort, Insertion Sort, Quick Sort, Merge Sort, Comparison of Sorting Methods, Search Trees: Binary Search Trees, AVL Trees- Definition and Examples. | 10 |
| VII | Indian Contribution to the field: Innovations in India, origin of Julia Programming Language, Indian Engineers who designed new programming languages, open source languages, Dr. Sartaj Sahni – computer scientist - pioneer of data structures, Other relevant contributors and contributions. | 2 |

PART C: Learning Resources

Textbooks, Reference Books, Other Resources

Suggested Readings

Textbooks:

- J. R. Hanly and E. B. Koffman, "Problem Solving and Program Design in C", Pearson, 2015
- E. Balguruswamy, "C++ ", TMH Publication ISBN 0-07-462038-X
- Herbert Schildt, "C++ The Complete Reference "TMH Publication ISBN 0-07-463880-7
 - मध्य प्रदेश हिंदी ग्रंथ अकादमी से प्रकाशित विषय से संबंधित पुस्तकें।

Reference Books:

- R. Lafore, 'Object Oriented Programming C++'
- N. Dale and C. Weems, "Programming and problem solving with C++: brief edition", Jones & Bartlett Learning.
- Adam Drozdek, "Data Structures and algorithm in C++", Third Edition, Cengage Learning.
- Sartaj Sahani, "Data Structures, Algorithms and Applications with C++", McGraw Hill.
- Robert L. Kruse, "Data Structures and Program Design in C++", Pearson.
- D.S. Malik, "Data Structure using C++", Second edition, Cengage Learning.
- M. A. Weiss, "Data structures and Algorithm Analysis in C", 2nd edition, Pearson.
- Lipschutz, "Schaum's outline series Data structures", Tata McGraw-Hill

Suggestive digital platform web links

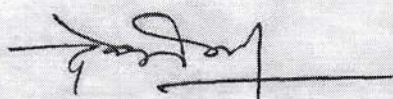
<https://www.youtube.com/watch?v=BCIS40yzssA>
<https://www.youtube.com/watch?v=vLnPwxZdW4Y&vl=en>
<https://www.youtube.com/watch?v=Umm1ZQ5ltZw>

Suggested equivalent online courses

| S.No. | Online Course | Duration | Platform |
|-------|--|------------|----------|
| 1 | Programming in C++ https://nptel.ac.in/courses/106/105/106105151/ | 8 weeks | NPTEL |
| 2 | Beginning C++ Programming - From Beginner to Beyond https://www.udemy.com/course/beginning-c-plus-plus-programming/ | Self paced | Udemy |


PART D: Assessment and Evaluation

Internal Assessment : Continuous External Assessment: University Exam (UE) : 75



| | | | |
|--|-----------------|--|--------------------|
| Comprehensive Evaluation (CCE) : 25 Marks Shall be based on allotted assignments and Class Tests. The marks shall be as follows: | | Marks Time : 02.00 Hours | |
| Assessment and presentation of assignment | 8 Marks | Section (A) : Three Very Short Questions (50 Words Each) OR Nine MCQ Questions | 03 x 03 = 09 Marks |
| Class Test I (Objective Questions) | 4 Marks | | |
| Class Test II (Descriptive Questions) | 5 Marks | Section (B) : Four Short Questions (200 Words Each) | 04 x 09 = 36 Marks |
| Class Test III (Based on solving programming problems) | 8 Marks | Section (C): Two Long Questions (500 Words Each) | 02 x 15 = 30 Marks |
| | | | |
| Total | 25 Marks | Total | 75 Marks |

Any remarks/suggestions: **Focus of the course/teaching should be on developing ability of the student in analyzing a problem, building the logic and efficient code for the problem.**

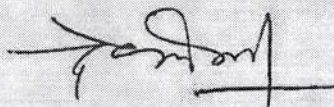


PART A: IntroductionProgram: **Certificate**Class: **B.C.A.**Year: **I Year**Session: **2021-22**

| | | | |
|----|---|--|-------------------------------|
| 1. | Course Code | S1-BCAA2P | |
| 2. | Course Title | Programming Methodology & Data Structures Lab | |
| 3. | Course Type (Core Course/Elective/Generic Elective/ Vocational) | Major – Paper II | |
| 4. | Pre-Requisite (if any) | To study this course, a student must have basic knowledge of Computers. | |
| 5. | Course Learning Outcomes(CLO) | <p>After the completion of this course, a successful student will be able to do the following:</p> <ol style="list-style-type: none"> 1. Develop simple algorithms and flow charts to solve a problem with programming using top down design principles. 2. Writing efficient and well-structured computer algorithms/programs. 3. Learn to formulate iterative solutions and array processing algorithms for problems. 4. Use recursive techniques, pointers and searching methods in programming. 5. Possess ability to choose a data structure to suitably model any data used in computer applications. 6. Implement and know the applications of algorithms for searching and sorting etc. | |
| 6. | Credit Value | Practical – 2 Credits | |
| 7. | Total Marks | Max. Marks : 25+75 | Min. Passing Marks: 33 |

PART B: Content of the CourseNo. of Lab Practicals (in hours per week): **1 hour per week**Total No. of Lab.: **30 Hrs.**

| | Suggestive list of Practicals | No. of Labs. |
|--|--|---------------------|
| | <p>Given the problem statement, students are required to formulate problem, develop flowchart/algorithm, write code in C++, execute and test it. Students should be given assignments on following :</p> <ol style="list-style-type: none"> 1. Write a program to swap the contents of two variables. 2. Write a program for finding the roots of a Quadratic Equation. 3. Write a program to find area of a circle, rectangle, square using switch case. 4. Write a program to print table of any number. 5. Write a program to print Fibonacci series. 6. Write a program to find factorial of a given number using recursion. 7. Write a program to convert decimal (integer) number into | 30 |



equivalent binary number.

8. Write a program to check given string is palindrome or not.
9. Write a program to print digits of entered number in reverse order.
10. Write a program to print sum of two matrices.
11. Write a program to print multiplication of two matrices.
12. Write a program to generate even/odd series from 1 to 100.
13. Write a program whether a given number is prime or not.
14. Write a program for call by value and call by reference.
15. Write a program to create a pyramid structure
1
12
123
1234
16. Write a program to check entered number is Armstrong or not.
17. Write a program to input N numbers and find their average.
18. Write a program to find the area and volume of a rectangular box using constructor.
19. Write a program to design a class time with hours, minutes and seconds as data members. Use a data function to perform the addition of two time objects in hours, minutes and seconds.
20. Write a program to implement single inheritance.
21. Write a program to find largest element from an array.
22. Write a program to implement push and pop operations on a stack using array.
23. Write a program to perform insert and delete operations on a queue using array.
24. Write a program for Linear search.
25. Write a program for Binary search.
26. Write a program for Bubble sort.
27. Write a program for Selection sort.
28. Write a program for Quick sort.
29. Write a program for Insertion sort.
30. Write a program to implement linked list.

PART C: Learning Resources

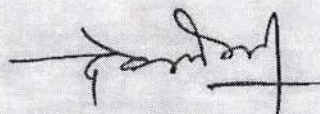
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- D.S. Malik, "Data Structure using C++", Second edition, Cengage Learning.
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- Lipschutz, "Schaum's outline series Data structures", Tata McGraw-Hill

Suggestive digital platform web links

<https://www.youtube.com/watch?v=BCIS40yzssA>

<https://www.youtube.com/watch?v=vLnPwxZdW4Y&vl=en>

<https://www.youtube.com/watch?v=Umm1ZQ5ltZw>

Suggested equivalent online courses

| S.No. | Online Course | Duration | Platform |
|-------|--|------------|----------|
| 1 | Programming in C++ https://nptel.ac.in/courses/106/105/106105151/ | 8 weeks | NPTEL |
| 2 | Beginning C++ Programming - From Beginner to Beyond https://www.udemy.com/course/beginning-c-plus-plus-programming/ | Self paced | Udemy |

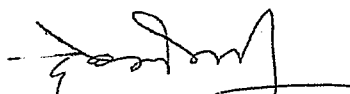
PART D: Assessment and Evaluation

Internal Assessment : Continuous Comprehensive Evaluation (CCE) : 25 Marks

**External Assessment: University Exam (UE) : 75 Marks
Time : 02.00 Hours**

| Internal Assessment | Marks | External Assessment | Marks |
|--|-----------------|---|-----------------|
| Hands-on Lab Practice | 5 Marks | Practical record file | 10 Marks |
| Viva | 5 Marks | Viva voce practical | 15 Marks |
| Lab Test from practical list | 7 Marks | Table works/ Exercise Assigned (02) in practical exam | 40 Marks |
| Assignments (Charts/ Model)/ Technology Dissemination/ Excursion/ Lab visit/ Industrial Training | 8 Marks | Reports of excursion/ Lab visits/ Industrial training/ Survey/ Collection/ Models | 10 Marks |
| Total <i>Excursion/ Lab visits/ Industrial Training is compulsory</i> | 25 Marks | Total | 75 Marks |

| PART B: Content of the Course | | |
|---|---|-----------------|
| Total No. of Lectures(in hours per week): 3 Hours per week | | |
| Total Lectures: 90 Hours | | |
| Unit | Topics | No. of Lectures |
| I | Network goals and application, Network structure, Network services, Example of networks and Network Standardization, Networking models: centralized, distributed and collaborative. Network Topologies: Bus, Star, Ring, Tree, Hybrid: Selection and Evaluation factors. | 15 |
| II | Theoretical Basis for Data communication, Transmission media, Twisted pair (UTP, STP), Coaxial Cable, Fiberoptics: Selection and Evaluation factors. Line of Sight Transmission, Communication Satellites. Analog and Digital transmission. Transmission and switching, frequency division and time division multiplexing, STDM, Circuit switching, packet switching and message switching, | 20 |
| III | Brief Overview of LAN (Local Area Network) : Classification. Brief overview of Wide Area Network (WAN). Salient features and differences of LAN with emphasis on: Media, Topology, Speed of Transmission, Distance, Cost. Terminal Handling, Polling, Token passing, Contention. IEEE Standards: their need and developments. | 20 |
| IV | Open System: What is an Open System? Network Architectures, ISO-OSI Reference Model, Layers: Application, Presentation, Session, Transport, Network, Data Link & Physical. Physical Layer - Transmission, Bandwidth, Signaling devices used, media type. Data Link Layer - : Addressing, Media Access Methods, Logical link Control, Basic algorithms/protocols. | 20 |
| V | Network Layer: Routing: Fewest-Hops routing, Type of Service routing, Updating Gateway routing information. Brief overview of Gateways, Bridges and Routers, Gateway protocols, routing daemons. OSI and TCP/IP model. TCP/IP and Ethernet. The Internet: The structure of the Internet, the internet layers, Internetwork problems. Internet Standards. | 15 |


 Dr Goswami

PART C: Learning Resources

Textbooks, Reference Books, Other Resources

Suggested Readings:

1. Tannanbaum, A.S.: Computer Networks, Prentice Hall, 1985.processing, Prentice Hall,1983.
2. Black : Computer Networks : Protocols, standords and Interfaces, Prentice Hall International 1. Tannanbaum, A.S.: Computer Networks, Prentice Hall, 1985.processing, Prentice Hall,1983.
3. Fourauzan B., "Data Communications and Networking", 3rd edition, TataMcGraw-HillPublications, Reference Books:
 1. Comer D., "Computer Networks and Internet", 2ND Edition, PearsonEducation
 2. S.K.Basandra& S. Jaiswal, "Local Area Networks", Galgotia Publications
 3. William Stallings, "Data and Computer Communication"
 4. Book published by M.P. Granth Academy , Bhopal

Suggested Web Links:

<https://nptel.ac.in/courses/106/105/106105082/>
http://cse.iitkgp.ac.in/~sandipc/courses/cs31006/slides/application_layer.pdf
https://onlinecourses.nptel.ac.in/noc22_ee61/preview
<https://nptel.ac.in/course.html>
<https://pll.harvard.edu/subject/computer-networking>
<http://www.mphindigranthacademy.org/>

<http://www.mphindigranthacademy.org/>

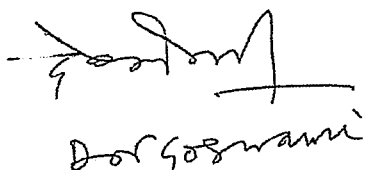
Part D-Assessment and Evaluation

Suggested Continuous Evaluation Methods:

Maximum Marks : 100

Continuous Comprehensive Evaluation (CCE) : 30marks University Exam (UE) 70marks

| | | |
|---|--|----------|
| Internal Assessment : Continuous Comprehensive Evaluation (CCE):30 | Class Test Assignment/Presentation | Total 30 |
| External Assessment : University Exam Section: 70 Time : 03.00 Hours | Section(A) : Objective Questions Section (B) : Short Questions Section (C) : Long Questions | Total 70 |


D. Goswami

PART A:INTRODUCTION

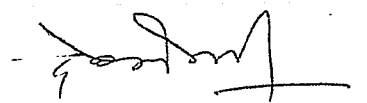
| | | | |
|---------------------------------------|---|---|--------------------------------|
| Program: Diploma | Class: BCA | Year: II Year | Session: w.e.f. 2022-23 |
| Subject: Computer Applications | | | |
| 1. | Course Code | S2-BCAA2T | |
| 2. | Course Title | Database Management Systems Using PL/SQL | |
| 3. | Course Type (Core Course/ Discipline Specific Elective/ Generic Elective/ Vocational) | Core Course(Theory) | |
| 4. | Pre-Requisite (if any) | To study this course, a student must have the basic knowledge of Computers. | |
| 5. | Course Learning Outcomes(CLO) | After completing this course student will be able to: <ul style="list-style-type: none"> • explain the features of database management systems and relational database. • design conceptual models of a database using ER modelling for real life applications and construct queries in relational algebra. • create and populate a RDBMS for a real-life application, with constraints and keys, using SQL. • retrieve any type of information from a database by formulating complex queries in SQL. • analyse the existing design of a database schema and apply concepts of normalization to design an optimal database. | |
| 6. | Credit Value | 4 credits (4-TH) | |
| 7. | Total Marks | Max.Marks: 30+70 | Min. Passing Marks: 33 |

PART-B:CONTENT OF THE COURSE

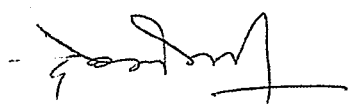
Total No. of Lectures-Tutorials-Practical (in hours per week): **L-4**

Total No. of Lectures: **60 L**

| Unit | Topics | No. of Lectures |
|-------------|--|------------------------|
| I | Introduction to DBMS: Why database? Characteristics of data in database, DBMS. What are database advantages of DBMS? Database Architecture and Modeling: Conceptual, physical and logical database models, Role of DBA, Database design. Entity Relationship (ER) Model: Components of ER-model, ER modeling symbols, Relationships. Enhanced Entity Relationship (EER) Model: An introduction, Superclass and | 12 |


 Dr. Goswami

| | | |
|-----|---|----|
| | <p>subclass entity types, Specialization, Generalization, Attribute inheritance, Categorization & Aggregation.</p> <p><i>Keywords: DBMS, DBA, Entity Relationship (ER), EER, Superclass, Subclass, Specialization, Generalization, Categorization & Aggregation.</i></p> | |
| II | <p>The Relational Data Model:</p> <p><i>Fundamental Concepts:</i> Relations, Null Values, Keys, Foreign Keys, Integrity Constraints - Entity Integrity & Relational Integrity.</p> <p><i>Normalization Process:</i> First Normal Form, Functional Dependencies, Second Normal Form, Third Normal Form, Boyce-Codd Normal Form (BCNF), Fourth Normal Form; Other Normal Forms - Fifth Normal Form & Domain/Key Normal Form.</p> <p><i>Transforming a Conceptual Model to a Relational Model:</i> Transforming Objects Sets and Attributes, Transforming Models without External Keys, Transforming Specialization and Generalization Object Sets, <i>Transforming Relationships:</i> One-One Relationships, One-Many Relationships, Many-Many Relationships; Transforming Aggregated Object Sets, Transforming Recursive Relationships.</p> <p><i>Keywords: Keys, Normalization, BCNF, Aggregated Object Sets, Recursive Relationships.</i></p> | 12 |
| III | <p>Relational database implementation:</p> <p>(a) Relational Algebra and Calculus</p> <p><i>Relational Algebra:</i> Union, Intersection, Difference, Product, Select, Project, Join - Natural, Theta & Outer Join, Divide, Assignment.</p> <p><i>Relational Calculus:</i> Target list & Qualifying Statement, The Existential Quantifier, The Universal Quantifier.</p> <p><i>Keywords: JOIN, Target list, Existential Quantifier, Universal Quantifier.</i></p> | 12 |
| IV | <p>Relational database implementation (continued):</p> <p>(b) Relational Implementation with SQL</p> <p><i>Relational Implementations:</i> An Overview.</p> <p><i>Schema and Table Definition:</i> Schema definition, Data types & domains, Defining Tables, Column Definition.</p> <p><i>Data Manipulation:</i> Simple Queries (SELECT, FROM, WHERE), Multiple-Table Queries, Subqueries, Correlated Subqueries, EXISTS and NOT EXISTS operators, Built-In Functions (SUM, AVG, COUNT, MAX, and MIN), GROUP BY and HAVING clause, Built-In Functions with Subqueries.</p> <p><i>Relational Algebra Operations:</i> UNION, INTERSECT, EXCEPT, JOIN.</p> <p><i>Database Change Operations:</i> INSERT, UPDATE, DELETE. Using SQL with Data Processing Languages; View Definition, Restrictions on View Queries and Updates.</p> <p><i>Keywords: Schema, SELECT, Data Manipulation, Database Change Operation, View.</i></p> | 12 |


 Dr. G. Goswami

| | | |
|----------|---|----|
| V | <p>Physical Database Systems</p> <p>Introduction, Physical Access of the Database.</p> <p><i>Physical Storage Media:</i> Secondary Storage, Physical Storage Blocks.</p> <p><i>Disk Performance Factors:</i> Access Motion Time, Head Activation Time, Rotational Delay, Data Transfer Rate, Data Transfer Time.</p> <p><i>Data Storage Formats on Disk:</i> Track Format, Record Format–Fixed-Length Records & Variable-Length Records, Input/output Management.</p> <p><i>File Organizing and Addressing Methods:</i> Sequential File Organization, Indexed-Sequential File Organization, Direct File Organization, Hashing: Static Hash Functions and Dynamic Hash Functions.</p> <p>Keywords: <i>Disk Performance Factors, Sequential File Organization, Indexed-Sequential File Organization, Direct File Organization, Hashing.</i></p> | 12 |
|----------|---|----|

PART C: LEARNING RESOURCES

Textbooks, Reference Books, Other Resources

Suggested Readings:

Textbooks:

1. Gary W. Hansen & James V. Hansen, "Database Management and Design", 2ndEd., 2007, Prentice Hall of India Pvt Ltd.
2. Instructional Software Research & Development (ISR D) Group, Lucknow "Introduction to Database Management Systems", 2006, Ace Series, Tata McGraw Hill Publishing Company Limited, New Delhi
3. Ramez Elmasri, Shamkant B. Navathe, "Fundamentals of Database Systems", 7th Edition, 2016, Pearson

Reference Book:

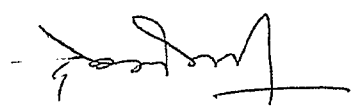
1. Raghu Ramakrishnan & Johannes Gehrke, "Database Management Systems", 3rd Edition, 2014, McGraw Hill Education
2. C.J. Date, "An Introduction to Database System", 8th Edition, 2003, Pearson
3. Abraham Silberschatz, Henry F. Korth, S. Sudharshan, "Database System Concepts", 6th Edition, 2010, Tata McGraw Hill
4. Books published by M.P. Hindi Granth Academy, Bhopal

Suggestive digital platform web links

- http://en.wikipedia.org/wiki/Relational_model
- http://en.wikipedia.org/wiki/Relational_algebra
- cs.nyu.edu/courses/Fall12/CSCI-GA.2433-001/lecture4.pdf
- <https://www.w3schools.in/dbms/database-normalization/>
- <https://beginnersbook.com/2015/05/normalization-in-dbms/>
- <https://ecomputernotes.com/fundamental/what-is-a-database/functional-dependence>
- <http://www.mphindigranthacademy.org/>

Suggested equivalent online courses

NPTEL Course: *INTRODUCTION TO DATABASE SYSTEMS* or *DATABASE DESIGN*


 Dr. Goswami

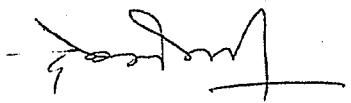
Part D-Assessment and Evaluation

Suggested Continuous Evaluation Methods:

Maximum Marks : 100

Continuous Comprehensive Evaluation (CCE) : 30marks University Exam (UE) 70marks

| | | |
|---|--|----------|
| Internal Assessment : Continuous Comprehensive Evaluation (CCE):30 | Class Test Assignment/Presentation | Total 30 |
| External Assessment : University Exam Section: 70 Time : 03.00 Hours | Section(A) : Objective Questions Section (B) : Short Questions Section (C) : Long Questions | Total 70 |



Dol Goswami

PART A: INTRODUCTION

| | | | | | | | |
|--|--|--|--|-------------|------------------------|-------------------------|--|
| Program: Diploma | | Class: BCA | | Year: II Yr | | Session: w.e.f. 2022-23 | |
| Subject: Computer Applications | | | | | | | |
| 1. | Course Code | S2-BCAA2P | | | | | |
| 2. | Course Title | DBMS Using PL/SQL Lab | | | | | |
| 3. | Course Type (Core Course / Discipline Specific Elective / Generic Elective / Vocational) | Core Course (Practicals) | | | | | |
| 4. | Pre-Requisite (if any) | To study this course, a student must have the basic knowledge of Computers. | | | | | |
| 5. | Course Learning Outcomes (CLO) | <p>This lab is based on the theory course of DBMS. This lab course involves the development of the practical skills in DBMS using MS-Access/Visual-FoxPro/SQL-Server/etc. This course is an attempt to upgrade and enhance students' theoretical skills and provide the hands-on experience.</p> <p>After completing this lab course sessions, student will be able:</p> <ul style="list-style-type: none"> • to create Databases & Views, • execute simple & advance SQL queries, • use DBMS tools in the areas of database applications. <p><u>Topics to be covered in the lab syllabus</u></p> <ul style="list-style-type: none"> <input type="checkbox"/> Introduction to MS-Access/Visual-FoxPro/SQL-Server/etc <input type="checkbox"/> Hands on practice on the application package used in the lab (i.e. on MS-Access/Visual-FoxPro/SQL-Server/etc) <input type="checkbox"/> Database creation using MS-Access/Visual-FoxPro/SQL-Server/etc <input type="checkbox"/> Simple SQL queries (Single table retrieval) <input type="checkbox"/> Use of Advanced SQL queries <input type="checkbox"/> Implementation of Views | | | | | |
| 6. | Credit Value | 2 credits (2-PR) | | | | | |
| 7. | Total Marks | Max. Marks: 30 Int + 70 Ext | | | Min. Passing Marks: 33 | | |
| PART B: CONTENT OF THE COURSE | | | | | | | |
| Total No. of Lectures-Tutorials-Practical (in hours per week): P - 2 | | | | | | | |
| Total Number of Practical: 02 Hours per Week | | | | | | | |

Practicum details:

Students are required to practice the concepts learnt in the theory by designing and querying a database for a chosen organization (Like: College, Library, Transport, etc). The teacher may devise appropriate weekly lab assignments to help students practice the designing, querying a database in the context of example database. Some indicative list of experiments with their aim, problem definition, theory is given below:


 (D.N. Srinivas)

Experiment-1

Aim: To draw ER Model and Relational Model for a given database. Show ER to Relational Model reduction.

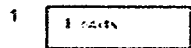
Resources used: MS-Access/Visual-FoxPro/SQL-Server/etc

Problem Definition: List the data requirements for the database of the company which keeps track of the company employee, department and projects. The database designers provide the following description:

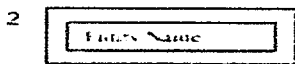
1. The company is organized into departments. Each department has unique name, unique number, and particular employee to manage the department. We keep track of the start date and the employee begins managing the department. The department has several locations.
2. The department controls a number of projects each of which has a unique name, unique number and a single location.
3. We store each employee names social security number, address, salary, sex and dob. An employee is assigned one department but may work on several projects which are not necessarily controlled by the same department. We keep track of the department of each employee works on each project and for insurance purpose. We keep each dependent's first name, sex, dob and relation.

Theory: The ER data model was developed to facilitate the database design by allowing specification of an enterprise schema that represents the overall logical structure of the database. The ER model data model is one of the several data models. The semantic aspect of the model lies in its representation of the meaning of the data. The ER model is very useful many database design tools drawn on concepts from the ER model. The ER model employs 3 basic notations: entity set, relationship set and attributes.

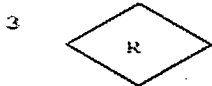
Symbols Used in ER Notation



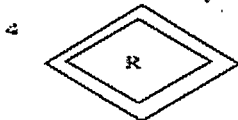
Entity set: An entity is a set of entities of the same type that share the properties or attributes.



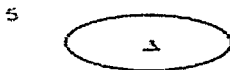
Weak entity set: An entity set may not have sufficient attributes to form a primary key. Such an entity set is termed as weak entity set.



Relationship Set: A relationship is an association among several entities. A relationship set is a set of relationship of the same type.



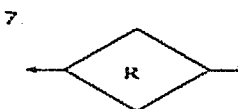
Identification relationship set for weak entity set: The relationship associating the weak entity set with the identifying entity set is called the identifying relationship.



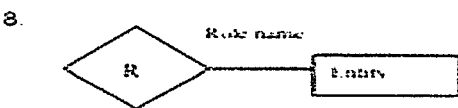
Primary key: The primary key is used to denote a candidate key that is chosen by the database designers as the principal means of identifying entities within an entity set.



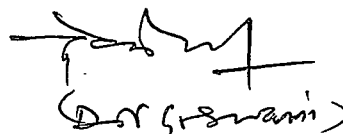
Many to many relationship



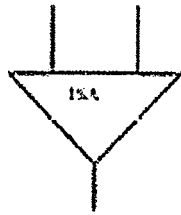
One to One relationship



Role Indicator


(Dr. Srivastava)

9.



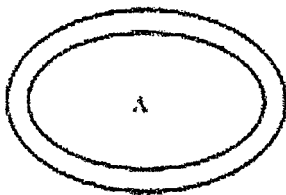
Total Generalization

10.



Attribute

11.



Multi valued Attribute

12.



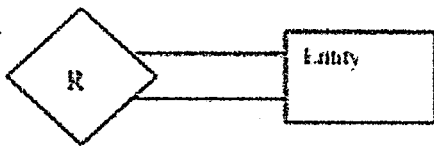
Derived Attribute

13.



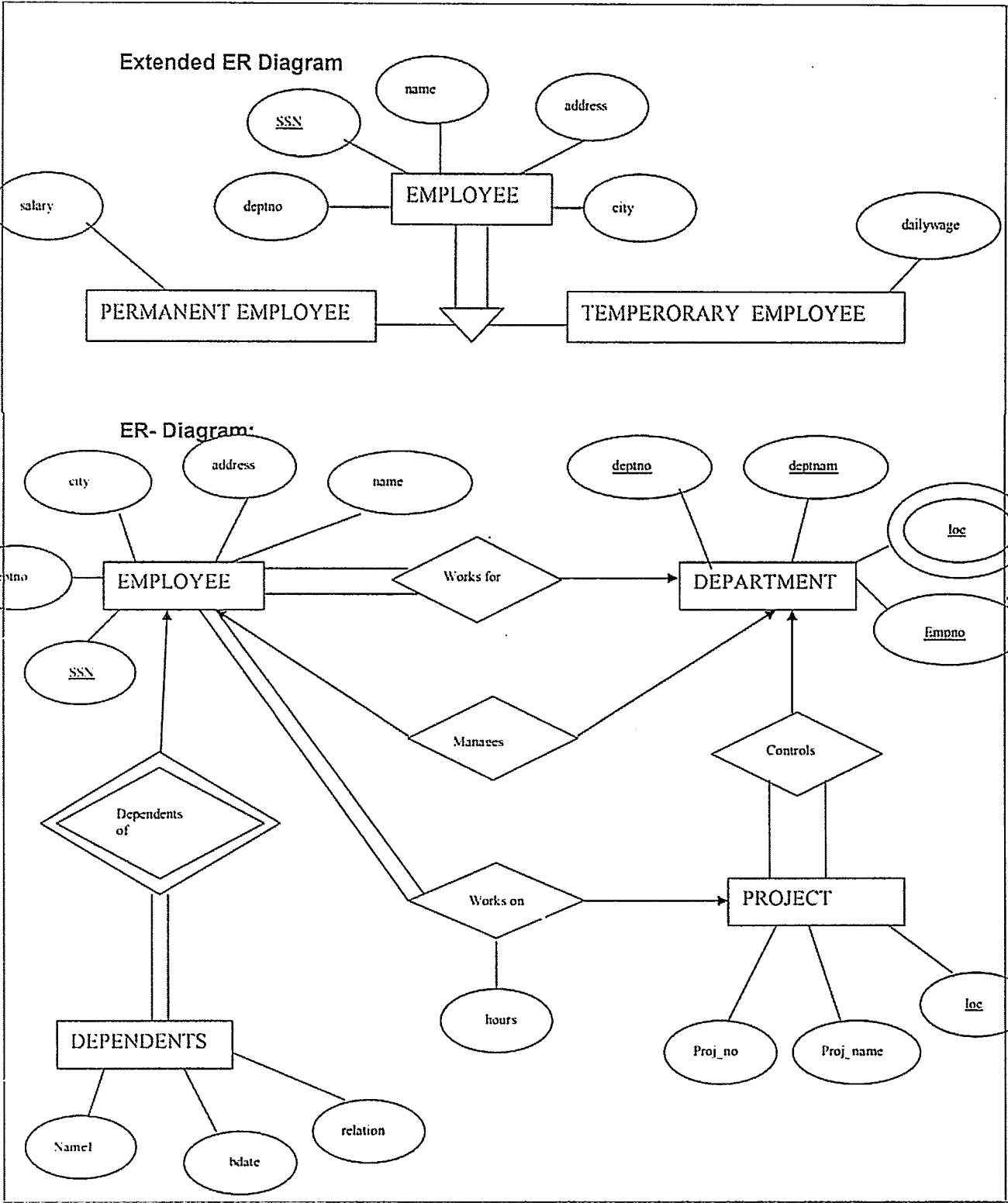
Discriminating Attribute of weak entity set : The discrimination of weak entity set is a set of attributes that allows the distinction to be made.

14.



Total Participation of entity set in relationship: The participation of an entity set E in a relationship set R is said to be total if every entity in E participates in at least one relationship in R.

[Handwritten signature]
 (D. G. Surani)



Handwritten signature
(Dr. S. Rami)

Relational Model:

Employee

| fname | SSN | address | salary | city | deptno |
|-------|-----|---------|--------|------|--------|
| | | | | | |

Department

| deptno | deptname | mgr_SSN |
|--------|----------|---------|
| | | |

Department Location

| deptno | deptloc |
|--------|---------|
| | |

Project

| projno | projname | location | deptno |
|--------|----------|----------|--------|
| | | | |

Works on

| SSN | hours | projname |
|-----|-------|----------|
| | | |

Dependents

| name1 | relation | bdate | SSN |
|-------|----------|-------|-----|
| | | | |

Employee

| |
|---------|
| SSN |
| fname |
| address |
| salary |
| city |
| deptno |

Department

| |
|----------|
| deptno |
| deptname |
| mgr_SSN |

Department Location

| |
|---------|
| deptno |
| deptloc |

Project

| |
|----------|
| projno |
| projname |
| location |
| deptno |

Works on

| |
|--------|
| SSN |
| hours |
| projno |

Dependents

| |
|----------|
| name1 |
| relation |
| bdate |
| SSN |

Conclusion: We have drawn ER model and Relational Model for the same.

[Handwritten signature]
(Dr. Gowami)

Experiment-2

Aim: Implementation Database

1. Creation of Database with proper constraints (Pk, Fk,.....etc)
2. Insert into database using different types of insert statements
3. Display

Resources used: MS-Access/Visual-FoxPro/SQL-Server/etc

Theory: The set of relations in a database must be specified to the system by means of a data definition language (DDL). The SQL DDL allows specification of not only a set of relations but also specific information about the relation including:

1. The schema for each relation
2. The domain of values associated with each attribute
3. The integrity constraints
4. The set of indices to be maintained for each relation
5. The security and authorization information for each relation
6. The physical storage structure of each relation on disk

Create Table

create table tab (A₁D₁, A₂D₂, , A_nD_n, <integrity constraint-1>, <integrity constraint-k>)

where tab is the name of the relation each A_i is the name of the attribute in the schema of relation tab and D_i is the domain type of the values in the domain of attribute A_i. There are a number of different allowable integrity constraints. We specify here only the primary key for the relation.

Insert

A newly created relation is empty initially. We can use the insert command to load data into the relation.

insert into <table name> values (A₁, A₂, , A_n)

The values are specified in the order in which the corresponding attributes are listed in the relation schema.

Display

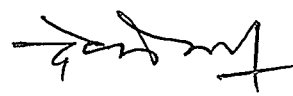
To display the table after creation and insertion we use the following syntax:

*select * from <table name>*

Select clause is used to list the attributes desired in the result of a query. It corresponds to the projection operation of the relational algebra. From clause lists the relations to be scanned in the evaluation of the expression. The asterisk symbol (“*”) is used to denote “all attributes”.

Conclusion

Thus, we have successfully created the database of company and inserted values in the database.


(D.N. Goswami)

Experiment-3

Aim: Data Definition (schema) Modification

1. Alter table: add column, remove column, add constraint, remove constraint
2. Drop table
3. Show schema of any table
4. Applying different constraints check, not null, etc.

Resources used: MS-Access/Visual-FoxPro/SQL-Server/etc

Theory: The various command, clauses, functions used for the modification of database are as follows:

(1) **Alter table:** Alter table command is used to add attribute to an existing relation. All the tuples are assigned to null as the values for the new attribute. The form of the alter table command is

Alter table r add A D

Where, *r* is the name of an existing relation. *A* is the name of the attribute to be added and *D* is the domain of the added attribute. We can drop attribute from a relation by the command:

Alter table r drop A

(2) **Update:** In certain situation we may wish to change a value in a tuple without changing all values in the tuple. For this purpose, the update statement can be used, as we could for insert and delete. We can choose the tuple be updated by using a query.

eg, update EMPLOYEE
set age=20
where SSN=514065

The preceding update statement is applied only to tuple where SSN=514065. If we want same changes in all tuples, then we write

Update EMPLOYEE
set age=20

(3) **Drop Table:** To remove a relation from an SQL database we use the drop table command. The drop table command deletes all information about the dropped relation from the database

drop table r

The relation *r* and to delete all tuples from *r*, the following command is used.

delete from r

(4) **Adding and Removing Columns:** To add a column to an existing relation, we use

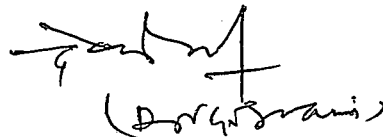
*alter table r
add A D*

eg. alter table EMPLOYEE
add age int

To remove a column from an existing relation we use

*Alter table r
drop column A*

Eg. alter table EMPLOYEE
drop column age



(Dorabans)

(5) **Not Null:** The not null specification prohibits the insertion of a null value. For a attribute any database modification that would cause null to be inserted in an attribute declared to be not null generates an error diagnostic. If an attribute is declared as the primary key then it cannot take a null value.

Eg. *alter table EMPLOYEE
alter column salary int NOT NULL*

(6) **Check:** The heck clause in SQL can be applied to relation declarations as well to domain declarations when applied to a relation declaration, the clause check(p) specified a predicate p that must be specified by every tuple in a relation. A common use of the check clause is to ensure that the attribute value satisfy specified condition.

Eg. *alter table EMPLOYEE
add constraint em_age
check (age>19)*

Conclusion: Thus, we have executed all the queries required for the modification of database.

Experiment-4

Aim: Simple SQL queries (Single table retrieval)

1. Make use of different operators (relational, logical etc.)
2. Selection of rows and columns, renaming columns, use of distinct keyword
3. String handling (% , etc.)
4. Update statement, case update
5. Delete, cascade delete (if possible)

Resources used: MS-Access/Visual-FoxPro/SQL-Server/etc

Theory:

1. **Select clause:** Select clause is used to list the attributes desired in the result of a query. It corresponds to the projection operation of the relational algebra:

Eg. *select *from EMPLOYEE*
-all attributes
select fname, SSN from EMPLOYEE
-only fname and SSN

2. **from clause:** From clause lists the relations to be scanned in the evaluation of the expansion.

3. **where clause:** The where clause corresponds to the selection predicate of the relational algebra. It consists of a predicate involving attribute of the relations that appear in the from clause.

(i) **and:** and clause is used when we want a result and all the conditions are satisfied in the where clause.

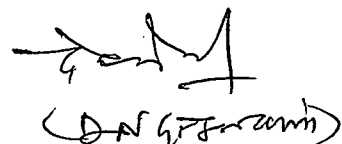
*True and unknown = true
False and unknown = unknown
Unknown or unknown = unknown*

(ii) **as (Rename operator):** SQL provides a mechanism for renaming both relations and attributes. It uses the as clause taking the form

old_name as new_name

(iii) **distinct:** If we want to eliminate duplicates, we use the keyword distinct in the aggregation expression.

eg. *select distinct salary
from EMPLOYEE*



Handwritten signature and name: (DAN G. FERRARI)

(iv) **String operations:** The most commonly used operations on strings are pattern matching using the operation like we describe the patterns by using the two special characters % and _.

%: The % character matches any substring

_: The character matches any character

eg, 'Perry%' matches any string beginning with "Perry".

'%idge%' matches any string containing "idge" as substring

"___" matches any string of exactly three characters

"___%" matches any string of at least three characters

(v) **Update and Case Update:** In certain situations, we may wish to change a value in a tuple without changing all the values in the tuple. For this purpose, the update statement can be used.

eg. *update EMPLOYEE*
set age=20
where SSN=514065

SQL provides a case construct which we can use to perform both the update with a single update statement avoiding the problem with the order of updates.

eg. *update account*
set balance =case
when balance<=1000
*then balance*1.05*
*else balance*1.06*
end

(vi) **delete:** To delete a tuple from relation r, we use the following command

delete from r
where, r is the name of the relation

Conclusion: Thus, we have executed simple queries in SQL.

Experiment-5

Aim: Advanced SQL Queries-1

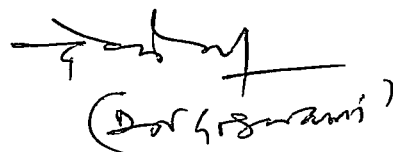
1. Group by, having clause, aggregate function
2. Set operations like union, union all and use of order by clause
3. Nested queries: in, not_in, exists, not exists and any, all

Resources used: MS-Access/Visual-FoxPro/SQL-Server/etc

Theory:

1. Group by clause: These are circumstances where we would like to apply the aggregate functions to a single set of tuples but also to a group of sets of tuples, we would like to specify this wish in SQL using the group by clause. The attributes or attributes given by the group by clause are used to form groups. Tuples with the same value on all attributes in the group by clause placed in one group:

eg.
select dept_no, avg(sal) as avg_sal
from EMPLOYEE
group by dept_no


(Dr. H. B. Swarni)

2. **Having clause:** A having clause is like a where clause but only applies only to groups as a whole whereas the where clause applies to the individual rows. A query can contain both where clause and a having clause. In that case

- a. The where clause is applied first to the individual rows in the tables or table structures objects in the diagram pane. Only the rows that meet the conditions in the where clause are grouped.
- b. The having clause is then applied to the rows in the result set that are produced by grouping. Only the groups that meet the having conditions appear in the query output.

eg.

```
select dept_no from EMPLOYEE
group by dept_no
having avg (salary) >=all
(select avg (salary)
from EMPLOYEE
group by dept_no)
```

3. **Aggregate functions:** Aggregate functions such as SUM, AVG, count, count (*), MAX and MIN generate summary values in query result sets. An aggregate functions (with the exception of count (*)) processes all the selected values in a single column to produce a single result value:

eg.

```
select dept_no, count (*)
from EMPLOYEE
group by dept_no
```

eg.

```
select max(salary) as maximum
from EMPLOYEE
```

eg.

```
select sum(salary) as total_salary
from EMPLOYEE
```

eg.


```
select min(salary) as minsal
from EMPLOYEE
```

4. **Union and Union Operators:** Combines the result of two or more queries into a single result set consisting of all the rows belonging to all queries in the union. This is different from using joins that combine columns from two tables. Two basic rules for combining the result sets of two queries with union are:

- A. The number and the order of the columns must be identical in all queries.
- B. The data types must be compatible:

```
select max(salary) as maximum
from EMPLOYEE
union
select min(salary)
from EMPLOYEE
union
```

Specifies that multiple result two or more queries into a single result set consisting of all the rows belonging to all queries into single result set consisting of all the rows belonging to all queries in the union. This is different from using joins that combine columns from two tables. Two basic rules are followed.


(Dr. G. Swami)

5. **Order by clause:** SQL allows the user to order the tuples in the result set of the query of a query by the values of one or more attributes using the order by clause. The default order is in the increasing order of values. We can specify the keyword DES if we want values in descending order.
6. **Exists and not exists:** Subqueries introduced with exists and not queries can be used for two set theory operations: Intersection and Difference. The intersection of two sets contains all elements that belong to both of the original sets. The difference contains elements that belong to only first of the two sets.

eg.

```
select *from DEPARTMENT
where exists (select * from PROJECT
where DEPARTMENT.dept_no=PROJECT.dept_no)
```

7. **IN and NOT IN:** SQL allows testing tuples for membership in a relation. The "IN" connective tests for set membership where the set is a collection of values produced by select clause. The "NOT IN" connective tests for the absence of set membership. The IN and NOT IN connectives can also be used on enumerated sets.

eg.

```
select proj_name from PROJECT
where dept_no not in (select dept_no from DEPARTMENT
where dept_name="chemistry")
```

eg.

```
select fname from EMPLOYEE
where SSN in (select mgr_SSN from DEPARTMENT)
```

Conclusion: Thus, we have studied and executed all the queries mentioned using various clauses.

Experiment-6

Aim: Advanced SQL Queries -2.

- (1) Join (Inner & Outer)
- (2) Exists & Union

Resources used: MS-Access/Visual-FoxPro/SQL-Server/etc

Theory:

JOINS: SQL joins are used to query data from two or more tables, based on a relationship between certain columns in these tables.

Type of JOIN:

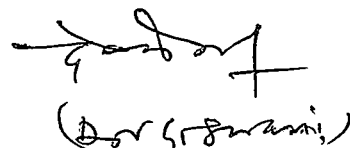
- **Equi Joins:**

This operation allows to connect, with a relation of equality, the tables which have at least a common attribute. One must have $n-1$ conditions of join, n being the number of tables which intervene in the query.

If no condition of join is specified, the corresponding query will realize the Cartesian product of the implied tables.

Syntax:

```
SELECT TABLE1.col1, TABLE1.col2...
TABLE2.col1, TABLE2.col2...
FROM table_name1, table_name2
WHERE table_name1.col1 = table_name2.col2
```


 (Dr. S. S. Swami)

TYPE OF Equi-Joins:

An equi-join is further classified into two categories:

- (a) Inner Join
- (b) Outer Join

(a) Inner Join:

The INNER JOIN keyword return rows when there is at least one match in both tables.

Syntax:

```
SELECT column_name(s)
FROM table_name1
INNER JOIN table_name2
ON table_name1.column_name=table_name2.column_name
```

(b) Outer Joins:

The outer join is returning all the rows returned by simple join or equijoin as well as those rows from one table that do not match any row from the other table, the symbol (+) represents outer join. the outer table operator can appear only on side of the expression.

Type of Outer Joins:

- **Left OUTER JOIN:** Return all rows from the left table, even if there are no matches in the right table.

Syntax:

```
SELECT TABLE1.column.....
TABLE2.column.....
FROM table_name1, table_name2
WHERE table_name1.column(+) = table_name2.column;
```

- **Right OUTER JOIN:** Return all rows from the right table, even if there are no matches in the left table.

Syntax:

```
SELECT TABLE1.column.....
TABLE2.column.....
FROM table_name1,table_name2
WHERE table_name1.column = table_name2.column(+);
```

EXISTS

EXISTS uses a subquery as a condition, where the condition is True if the subquery returns any rows, and False if the subquery does not return any rows.

Syntax:

```
SELECT columns
FROM tables
WHERE EXISTS (subquery);
```

UNION

There are occasions where you might want to see the results of multiple queries together, combining their output; use UNION.

The SQL UNION operator combines two or more SELECT statements.

Syntax:

```
SELECT column_name(s) FROM table_name1
UNION
SELECT column_name(s) FROM table_name2
```

Notice that SQL requires that the Select list (of columns) must match, column-by-column, in data type This concept is useful in situations where a primary key is related to a foreign key, but the foreign key value for some primary keys is NULL. For example, in one table, the primary key is a salesperson, and in another

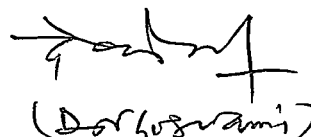
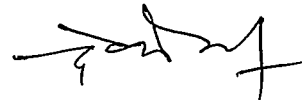

(Dorhosvami)

table is customers, with their salesperson listed in the same row. However, if a salesperson has no customers, that person's name won't appear in the customer table.

Conclusion: Thus, we have studied and executed all the queries mentioned using various clauses.


(Dr. G. S. G. G. G.)

Experiment-7

Aim: Implementation of views.

1. Creation of views
2. Usage of views
3. Creation of views using views
4. Drop view

Resources used: MS-Access/Visual-FoxPro/SQL-Server/etc

Theory:

Views: Any relation that is not part of any logical model but is made visible to the user as a virtual relation is called as a view. It is possible to support a large number of views on the top of any given set of actual database relation. Views help in 2 ways:

1. For security purpose
2. Create a personalized collection of relation that is better user's intuition than is logical model

Creation of Views:

1. Views is defined using 'create view' command
2. To define a view we must give the view a better name and must state the query that computes the view.

Syntax:

create view <view name> as <query expression>

Where query expression is any legal query expression.

3. Once we have defined a view, we can use the view name to refer to the virtual relation that the view generation.
4. Attribute name of the view can be specified explicitly as:

Create view V(VA₁, VA₂,.....VA_n) as select (A₁,A₂,.....,A_n) from R₁ where(p)

where, p: predicate

R₁: relation

A₁-A_n: attribute of view

V: view name

Creation of views using VIEW:

Since, view relations may appear in any place that a relation name may appear, except for restrictions on the use of views in update expressions. Thus, one view may be used in the expression defining another view. For eg. Let Emp_work_info is a view with attribute F_name, SSN, Project_no, Work_hrs. Then creation of other view can be done as:

```
create view new_view
select f_name, work_hrs
from emp_work_info
```

Updating of views

Although views are useful for the queries, they present a serious problem. If we express updates insertion or deletion on view as the modification done to the database in terms of the views must be translated to a modification to actual relations in the logical methods of database,

Drop view

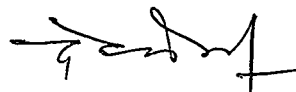
A view creates earlier can be dropped using 'Drop View' command

Syntax:

Drop view 'r'

where, r: View Name.

It deletes all the information about view from the database.


(Dr. (Ravi))

PART C:LEARNING RESOURCES

Textbooks, Reference Books, Other Resources

Suggested Readings:

1. Dr Rajeev Chopra, "Database Management System (DBMS) A Practical Approach", 2010, S Chand
2. Jitendra Patel, "DBMS Lab Manual" Kindle Edition, 2012
3. Books published by M.P. Hindi Granth Academy, Bhopal

Suggestive digital platform web links

<https://gfgc.kar.nic.in/raibag/FileHandler/270-101d616b-255a-4add-8d9b-dd2e22fec7c1.pdf>

https://pesitsouth.pes.edu/pdf/2019/July/CS/LM_DBMS%20LAB.pdf

<http://www.mphindigranthacademy.org/>

Suggested equivalent online courses

Nil

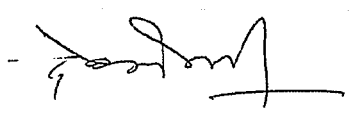
Part D-Assessment and Evaluation

Suggested Continuous Evaluation Methods:

| Internal Assessment | Marks | External Assessment | Marks |
|---|-----------|--------------------------|-----------|
| Class Interaction /Quiz | | Viva Voce on Practical | |
| Attendance | | Practical Record File | |
| Assignments (Charts/ Model Seminar / Rural Service/ Technology Dissemination/ Report of Excursion/ Lab Visits/ Survey / Industrial visit) | | Table work / Experiments | |
| TOTAL | 30 | | 70 |

Any remarks/suggestions: Students should also prepare a small Audio-video clip to present the details of

- Assignments submitted
- Imparting training of common online citizen services or software tools


Dr Goswami

BCA III Year

Govt. Science College , (Autonomous), Jabalpur
Department of Physics
BCA III YEAR

BCA-32-COMPUTER NETWORKS

Max Marks: 40

Min. Marks:13

| |
|--|
| Unit I |
| Introduction: Computer Network, Goals and Applications, Models – OSI and TCP/IP, Types of networks: LAN, MAN and WAN, Topologies, LAN components – File server, Workstations, Network Adapter Cards. Networking medium: twisted pair, coaxial cable, optical fiber, Digital data rates, Serial Data Formats, Encoded data Formats, Connection Oriented and Connectionless services, Switching Techniques – Circuit Switching, Packet Switching, Message Switching. |
| Unit II |
| Data Link Layer: Design Issues, Framing, Error detection: Parity Check, LRC, VRC, Check Sum and Cyclic Redundancy Check (CRC); Correction Technique: Hamming code. Flow Control: Elementary Data Link Protocols: An Unrestricted Simplex Protocol, Simplex Stop-and-Wait Protocol, Sliding Window Protocols: One-Bit Sliding Window Protocol, Go Back N and Selective Repeat. Data link layer in the Internet: SLIP and PPP. |
| Unit III |
| Limits of Communication, RS 449 Interface Standards, RS 422 and RS 423. Multiplexing methods : FDM, TDM, WDM, sampling theorem and quantization, Delta Modulation. MAC Sublayer: Multiple access protocols: Pure Aloha, Slotted Aloha, CSMA Protocols; Collision- Free Protocols; IEEE MAC Sublayer protocols: 802.3, 802.4, 802.5:Ethernet, Fast Ethernet, Token Bus, Token Ring, FDDI, Wireless LANs. |
| Unit IV |
| Network Layer: Design issues, Routing Algorithms: Optimality Principle, Shortest Path Routing, Flooding, Distance Vector Routing. Link State Routing, Hierarchical Routing, Broadcasting Routing, Multicast Routing. The Network Layer in the Internet: Internet Protocol, IP addresses and Internet Control protocols. |
| Unit V |
| Transport Layer: Elements of Transport Protocols, Addressing, Connection Establishment & Release, Flow Control & Buffering, Multiplexing. Introduction to UDP & TCP. Application layer: DNS, WWW and HTTP, Cookies, Proxy Server. E-mail Protocols (SMTP, POP3, IMAP, MIME), FTP, TELNET. Network Security: Cryptography, Symmetric- key Algorithms: DES, AES, Public-key Algorithms: RSA, Digital Signatures. |

BOOKS:

Text Books:

1. Data & Network Communication by Michael A. Miller
2. Data Communications and Networking, B.A. Forouzan, Tata McGraw-Hill.

Reference Books:

1. Deitel&Deitel, Goldberg, "Internet and World Wide Web-How to Program", Pearson Education Asia,2001
2. Computer Networks-A. S. Tanenbaum.

Govt. Science College , (Autonomous), Jabalpur
Department of Physics
BCA III YEAR

BCA-33-WEB PROGRAMMING

MAX. MARKS: 40

MIN. PASS MARKS: 13

| |
|---|
| Unit-I Web Technology: Introduction to WWW, web browsers, web servers, HTTP, URL. HTML: Introduction, Objective, HTML Command Tags: Text, List, Table, creation of links, inserting graphics, forms. Cascading style sheets: Introduction to CSS, creating style sheets, Types of CSS. |
| Unit-II A Brief History of PHP, PHP Characteristics, Installing and Configuring PHP on Windows, PHP Language Basics: Lexical Structure, Data Types, Variables, Expressions and Operators, Decision Statements, Flow Control Statements, Embedding PHP in Web Pages. Strings: String Constants, Printing Strings, Accessing Individual Characters, String Handling Functions: length, Word count, string position, reverse, replace. |
| Unit-III Arrays: Indexed Arrays, Associative Arrays, Identifying Elements of an Array, Storing Data in Arrays, Multidimensional Arrays, extracting multiple values, converting between arrays and variables, Traversing Arrays, Sorting. Functions: Calling a Function, Defining a Function, Variable Scope, Function Parameters, Return Values, Variable Functions, Anonymous Functions. Object Oriented Programming Concepts: Classes, Objects, Member Functions, Encapsulations, Inheritance, and Polymorphism.(only basic definitions of these topics) |
| Unit-IV Form Handling in PHP: Setting Up Web Pages to Communicate with PHP, Handling Text Fields, Text Areas, Check Boxes, Radio Buttons, List Boxes, Password Controls, Hidden Controls, Image Maps. File Handling: Working with files and directories, File Open and Read, File Create and Write, Reading and writing Character in file, reading entire file, Rename and Delete File, getting information of files, ownership and permissions. |
| Unit-V Database Access : Using PHP to access a database. Introduction to MySQL, connectivity with MySQL. XML: What is XML? XML document structure, PHP and XML, XML parser, the document object model, the simple XML extension, changing a value with simple XML. |
| Practicals Note: As per the syllabus and under guidance of respective faculty every student has to perform minimum 50 lab. exercise covering all units with equal weightage. |

BOOKS:

1. Programming PHP by RasmusLerdorf and Kevin Tatroe, O'Reilly Publications
2. Beginning PHP5 by Wrox Publication
3. Mastering PHP : BPB Publication
4. PHP 5.1 for beginners by Evan Bayross and Sharman Shah, SPD Publications
5. PHP 5.2 The Complete Reference by Steven Holzner, McGraw Hill Edition 2008.

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Deaprtment of Physics
BCA III YEAR

BCA-34-MANAGEMENT INFORMATION SYSTEM

Max Marks: 40

Min Marks:13

| |
|---|
| UNIT-I: |
| Management & Organizational Support Systems For Digital Firm: Definition of MIS; Systems approach to MIS: Report writing s/w, MIS and Human factor, Considerations, concept of organizational information sub-system, MIS & problem solving. Case Studies. |
| UNIT-II: |
| Information Systems & Business Strategy: Information Management. Who are the users? Manager & Systems, Evolution of Computer based information system (CBIS), Model of CBIS. Information services organization : Trend to End-User computing, justifying the CBIS, Achieving the CBIS, Managing the CBIS, Benefits & Challenges of CBIS implementation. Strategic Information System, Business level & Firm level Strategy, Case Studies. |
| UNIT-III: |
| Information Systems In the Enterprise: Systems from Management & Functional perspective & their relationship: Executive Information System, Decision Support System Sales & Marketing Information System, Manufacturing Information System, Human-Resource Information System. Finance & Account Information System. Case Studies. |
| UNIT-IV: |
| Information Technology for Competitive Advantage : Firm in its environment, What are the information resources? Who manages the information resources? Strategic planning for information resources. End-User Computing as a strategic issue, Information resource management concept. Case Studies. |
| UNIT-V: |
| E-Commerce & International Information System : Introduction to E-Commerce, Business Intelligence. E-Commerce strategy, Electronic Data Interchange, E-commerce methodology, E-commerce technology, Business application of the Internet. Electronic Business success strategies. Managing International Information Systems: IIS architecture, Global business drivers , challenges, strategy: divide, conquer, appease, cooptation, business organization, problems in Implementing global information systems, Computer crime, ethics & social issues. |

Text Books:-

1. MIS A Concise Study, S.A. Kelkar, PHI.
2. MIS managing the digital firm, Kenneth C. Laudon& Jane P. Laudon (Pearson Education).
3. ElectronicCommerce: Greenstein, Merylin, Tata Mc.Graw Hill

Reference Books :-

1. MIS, Suresh K. Basandra (Wheelers)
2. Introduction to computer Information System for Business, Mark G. Simkin, S. Chand & Co., 1996.
3. Analysis & Design of Information Systems, James A. Senn. MCGraw-Hill International.

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Deaprtment of Physics
BCA-III YEAR

BCA-35- COMPUTER GRAPHICS (WITH MULTIMEDIA)

Max. Marks: 40

Min. Marks: 13

| |
|--|
| UNIT – I |
| A brief background about applications of Computer Graphics. Overview of graphic systems, video display devices, refresh cathode ray tubes, raster and random screen display, color CRT monitors, flat panel displays, LCD's. Design and architecture of raster scan and random scan display systems. A brief introduction to input devices and hardcopy devices. Output primitives, DDA and Bresenham's 2D line drawing algorithms, parallel line algorithms. |
| UNIT – II |
| Midpoint circle generating algorithm, Ellipse generating algorithm, Character generation, attributes of output primitive, line and curve attributes, character attributes, Basic Transformation, Composite Transformation |
| UNIT – III |
| Clipping operations, Cohen Sutherland line clipping, Liang Barsky line clipping, Nicholl-Lee-Nicholl line clipping, polygon clipping, Sutherland Hodgeman and Weiler-Atherton polygon clipping, text and curve clipping. |
| UNIT IV |
| Photoshop-Introduction: Working with image file- creating a new file, opening an existing file, importing and image, grabbing scanner image, grabbing a digital camera image, adding file information, saving a file, saving to another format, switch between file, closing a file. Adding contents with tools: selecting a tool, setting a tools option in option bar, resetting defaults, choosing colors, working with painting and drawing tools. Working with image view: using the zoom tool, changing the view zone. |
| UNIT – V |
| Selecting image content: Using the marquee tool, using the lasso tool, selecting pictures with magic wand, selecting by color range, adjusting and removing selection. Changing a selection: Deleting, Moving, Copying, Transforming, Modifying, Saving, and loading a selection, undoing a change. Using positioning tools: showing and hiding a grid, showing and hiding rulers, using snap and snap to locking guides. Using layers, masks and paths: Working with layer, deleting a layer, setting layer properties, choosing a layer style, arranging layer order, grouping and ungrouping layers, flatter the image. |

Text Book:

Computer Graphics by Donald Hearn and M. Pauline Baker, Second Edition, PHI 1997. Photoshop 6 for Windows by Lisa A. Buckley, Pub. BPB.

Reference Books:

Learn yourself Photoshop by Vishnu Priya Singh and M. Singh Asia Pub.

WEBSITE LINKS:

<http://cs.fit.edu/~wds/classes/graphics/History>

http://people.csail.mit.edu/fredo/Depiction/1_Introduction/reviewGraphics.pdf

http://www.evl.uic.edu/datsoupi/502/14_mach.pdf

<http://www.dgp.toronto.edu/~hertzman/418notes.pdf>

Govt. Science College , (Autonomous), Jabalpur
Department of Physics
BCA III YEAR

BCA-36-CLOUD COMPUTING CONCEPTS

Max Marks: 40

Min Marks:13

| |
|--|
| UNIT-I: |
| Introduction: Historical development, Vision of Cloud Computing. Characteristics of Cloud Computing as per NIST, Cloud Computing reference model, Cloud computing environments, cloud services requirements, cloud and dynamic infrastructure, cloud Adoption and rudiments. Overview of cloud applications: EGC Analysis in the cloud Protein structure predication, Gene Expression Data Analysis, Satellite Image Processing, CRM /and ERP, Social Networking. |
| UNIT-II: |
| Cloud Computing Architecture: Cloud Reference Model, Types of Clouds, Cloud Interoperability & Standards, Scalability and fault tolerance, Cloud Solutions: Cloud Ecosystem, Cloud Business Process Management, Cloud Service Management, Cloud Offerings: Cloud Analytics, Testing Under Control, Virtual Desktop Infrastructure. |
| UNIT-III: |
| Cloud Management & Virtualization Technology: Resiliency, Provisioning, Asset management, Concepts of Map reduce, Cloud Governance, High Availability and Disaster Recovery. Virtualization: Fundamental Concepts of Compute, storage, networking, desktop and Application Virtualization, Virtualization benefits, server Virtualization, Block and file level storage virtualization Hypervisor Management software, Infrastructure Requirements, Virtual LAN(VLAN) and Virtual SAN(VSAN) and their Benefits. |
| UNIT-IV: |
| Cloud Security: Cloud Information Security Fundamentals, Cloud Security Services, Design Principles, Secure Cloud Software Requirements, Policy Implementation, Cloud Computing. Security Challenges, Virtualization security Management, Cloud Computing Security Architecture . |
| UNIT-V: |
| Market Based Management of Clouds, Federated Clouds/Inter Cloud: Characterization & Definition, Cloud Federation Stack, Third party Cloud Services. Case Study: Google App Engine, Microsoft Azure, Hadoop, Amazon, Aneka |

List of Experiments:

1. Installation and configuration of Hadoop/Euceliptus etc.
2. Service deployment & usage over cloud.
3. Management of cloud resources.
4. Using existing cloud characteristics & services models.
5. Cloud Security Management
6. Performance evaluation of services over cloud. Grading System 2013-14

Recommended Text:

1. Buyya, Selvi, "Mastering cloud Computing" TMH Pub
2. Kumar Saurabh, "Cloud Computing", Wiley Pub
3. Krutz, Vines, "cloud Security", Wiley Pub
4. Velte, "Cloud Computing-A Practical Approach", TMH Pub
5. Socinesky, "Cloud Computing", Wiley Pub