

Note:

- a) The candidate has to write two the programs One from Part-A and other from Part-B and execute one program as of External examiner choice.
- b) A minimum of 10 Programs has to be done in Part-B and has to be maintained in the Practical Record.
- c) Scheme of Evaluation is as follows:

Writing two programs - 10 Marks
Execution of one program - 10 Marks
Formatting the Output - 05 Marks
Viva - 05 Marks
Record - 05 Marks
Total - 35 Marks

SECOND SEMESTER

BCA201T: INDIAN LANGUAGE

Syllabus as per the one prescribed for science courses of Bangalore University.

BCA202T: ENGLISH

Syllabus as per the one prescribed for science courses of Bangalore University.

BCA203T: DATA STRUCTURES

Total Teaching Hours: 52

No of Hours / Week: 04

Unit-I

12 Hours

Introduction and Overview: Definition, Elementary data organization, Data Structures, data structures operations, Abstract data types, algorithms complexity, time-space tradeoff. Preliminaries: Mathematical notations and functions, Algorithmic notations, control structures, Complexity of algorithms, asymptotic notations for complexity of algorithms. String Processing: Definition, Storing Strings, String as ADT, String operations, word/text processing, Pattern Matching algorithms

Unit-II

10 Hours

Arrays: Definition, Linear arrays, arrays as ADT, Representation of Linear Arrays in Memory, Traversing Linear arrays, Inserting and deleting, Sorting: Bubble sort, Insertion sort, Selection sort, Searching: Linear Search, Binary search, Multidimensional arrays, Matrices and Sparse matrices.

Unit-III**10 Hours**

Linked list: Definition, Representation of Singly linked list in memory, Traversing a Singly linked list, Searching a Singly linked list, Memory allocation, Garbage collection, Insertion into a singly linked list, Deletion from a singly linked list; Doubly linked list, Header linked list, Circular linked list.

Unit-IV**10 Hours**

Stacks – Definition, Array representation of stacks, Linked representation of stacks, Stack as ADT, Arithmetic Expressions: Polish Notation, Application of Stacks, Recursion, Towers of Hanoi, Implementation of recursive procedures by stack. Queues – Definition, Array representation of queue, Linked list representation of queues Types of queue: Simple queue, Circular queue, Double ended queue, Priority queue, Operations on Queues, Applications of queues.

Unit-V**10 Hours**

Graphs: Graph theory terminology, Sequential representation of Graphs: Adjacency matrix, traversing a Graph. Tree – Definitions, Binary trees, Representing binary trees in memory, Traversing Binary Trees, Binary Search Trees, Searching, Inserting and Deleting in a Binary Search Tree.

Text Books:

1. Fundamentals of Data Structure in C, University Press,2018

REFERENCES BOOKS

1. Mark Allen Weiss, “Data Structures and Algorithm Analysis in C”, Second Edition, Pearson Education, 2013.
2. Robert Kruse, C.L.Tondo, Bruce Leung, Shashi Mogalla, “Data Structures and Program Design using C”, Pearson Education, 2009.
3. Forouzan, “A Structured Programming Approach using C”, 2nd Edition, Cengage Learning India, 2008.

BCA204T: DATA BASE MANAGEMENT SYSTEMS**Total Teaching Hours: 52****No of Hours / Week: 04****Unit - I****12 Hours**

Introduction: Database and Database Users, Characteristics of the Database Approach, Different people behind DBMS, Implications of Database Approach, Advantages of using DBMS, When not to use a DBMS. Database System Concepts and architecture: Data Models, Schemas, and Instances. DBMS Architecture and Data Independence, Database languages and interfaces. The database system Environment, Classification of DBMS.

Unit - II**10 Hours**

Data Modeling Using the Entity-Relationship Model: High level conceptual Data Models for Database Design with an example., Entity types, Entity sets, attributes, and Keys, ER Model Concepts, Notation for ER Diagrams, Proper naming of Schema Constructs, Relationship types of degree higher than two. Record Storage and Primary File Organization: Secondary Storage Devices. Buffering of Blocks. Placing file Records on Disk. Operations on Files, File of unordered Records (Heap files), Files of Ordered Records (Sorted files), Hashing Techniques, and Other Primary file Organization.

Unit - III**10 Hours**

Functional Dependencies and Normalization for Relational Database: Informal Design Guidelines for Relational schemas, Functional Dependencies, Normal Forms Based on Primary Keys., General Definitions of Second and Third Normal Forms Based on Primary Keys., General Definitions of Second and Third Normal Forms, Boyce-Codd Normal Form. Relational Data Model and Relational Algebra: Relational Model Concepts., relational Model Constraints and relational Database Schema, defining Relations, Update Operations on Relations., Basic Relational Algebra Operations, Additional Relational Operations., Examples of queries in the Relational Algebra., Relational Database design Using ER-to-Relational Mapping.

Unit – IV**10 Hours**

Relational Database Language: Data definition in SQL, Queries in SQL, Insert, Delete and Update Statements in SQL, Views in SQL, Specifying General Constraints as Assertions, specifying indexes, Embedded SQL. PL /SQL: Introduction.

Unit - V**10 Hours**

Transaction Processing Concepts: Introduction, Transaction and System Concepts, Desirable properties of transaction, Schedules and Recoverability, Serializability of Schedules, Transaction Support in SQL, Locking Techniques for Concurrency Control, Concurrency Control based on time stamp ordering.

Text book:

1. Ramez Elmasri and Shamkant B. Navathe, “Fundamentals of Database Systems”, 5th Edition, Pearson Education, 2007.

References:

1. Abrahamsi. Silberschatz, Henry. F. Korth, S. Sudarshan, “Database System Concepts” 6th Edition, McGraw Hill, 2012.
2. C.J.Date, “Introduction to database systems”, Eight Edition, Addison Wesley, 2003.

BCA205: NUMERICAL AND STATISCAL METHODS

Total Teaching Hours: 65

No of Hours / Week : 05

Unit - I

13 Hours

Floating-point representation and errors-Normalized floating-point forms, Errors in representing numbers, Floating point machine number and machine epsilon, Loss of significance and its avoidance. Roots of equations-locating roots of $f(x)=0$ Bisection method, Newton's method, Secant method.

Unit - II

13 Hours

Interpolation and numerical differentiation-polynomial interpolation, Lagrange and Newton form of interpolating Polynomial, Divided difference and recursive property, Inverse interpolation, First and Second derivative formulae via interpolation Polynomials. Numerical integration-Trapezoidal, Simpson's and adaptive Simpson rules.

Unit - III

13 Hours

System of linear equations-Gaussian elimination and back substitution-partial and complete pivoting, Doolittle, Cholesky and Crout LU decomposition methods, Jacobi and Gauss – Seidel iterative methods. Power (and inverse power) method of obtaining largest (smallest) eigenvalue and corresponding eigenvector. Ordinary differential equations-initial value problem, Picard's, Taylor series, Runge-Kutta first, second and fourth order methods.

Unit – IV

13 Hours

Basics concepts and definition of statistics. Mean, Standard deviation, coefficient of Variation, skewness & kurtosis, Carl Pearson Correlation, Rank correlation and illustrated examples. Probability: Basic concept and definition of probability, probability axioms, Laws of Probability, Conditional probability, Bayes theorem , Problems and application.

Unit - V

13 Hours

Random variable and Expectation: Discrete and continuous random variables, expectation of random variables, theorems on expectation, illustrative examples. Probability Distribution: Probability function, Probability mass/density function, Discrete Distribution – Bernoulli, Binomial Distribution, Continuous distribution – Normal Distribution, applications and problems.

BCA203P: DATA STRUCTURES USING C LAB

PART - A

1. Write a menu driven C program to perform the following string operations without using string functions: (i) String Length (ii) String Concatenation (ii) String Reverse
2. Write a C program to search for an element in an array using Binary search

3. Write a C program to sort a list of N elements using Merge sort technique.
4. Write a C program to sort a list of N elements of integer type using Quick Sort technique.
5. Write a C program to convert and print a given valid fully parenthesized infix arithmetic expression to postfix expression.
6. Write a C program to find the Binomial Coefficient using recursion.
7. Write a C program to simulate the working of Towers of Hanoi problem for N disks, print the moves taken by the problem using recursion.
8. Write a C program to demonstrate the working of a stack using an array. The elements of the stack may be integers. Operations to be supported are 1.PUSH, 2.POP 3.DISPLAY. The program should print appropriate messages for STACK overflow, Underflow. Use separate functions to detect these cases.
9. Write a C program to implement the operations of a Queue using linked list.
10. Using dynamic variables and pointers, Write a C program to construct a doubly linked list consisting of the following information in each node. Roll No (Integer), Name (Character String) .The Operations to be supported are:
 - a. DLINSERT - Inserting a node in the front of the list and after a node.
 - b. DLDELETE - Deleting the node based on Roll no.
 - c. DLSEARCH - Searching a node based on Roll no.
 - d. DLDISPLAY - Displaying all the nodes in the list.
11. The preorder and inorder traversals of a binary search tree is given below:
 Inorder: 5, 10, 15, 20, 30, 40
 Preorder: 20, 10, 5, 15, 40, 30

Write a program that can generate the postorder traversal of the binary search tree.

12. Using dynamic memory allocation ,construct a Binary Search Tree of integers. Write C functions to do the following:

Given a KEY, Perform a search in Binary search tree. If it is found display Key found else insert the Key in the Binary search tree.

While constructing the Binary search tree do not add any duplicate.

PART – B

During practical examination the External and Internal examiners may prepare exam question paper related to theory syllabus apart from Part-A. (A minimum of 10 Programs has to be prepared).

Note:

- a) The candidate has to write two the programs One from Part-A and other from Part-B and execute one program as of External examiner choice.
- b) A minimum of 10 Programs has to be done in Part-B and has to be maintained in the Practical Record.
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Writing two programs - 10 Marks

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Formatting the Output - 05 Marks

Viva - 05 Marks
Record - 05 Marks
Total - 35 Marks

BCA204P: DATABASE MANAGEMENT SYSTEM LAB

PART – A

1. The EMP detail databases has a table with the following attributes. The primary keys are underlined.

EMP (EmpNo: int, name: string, dob: date, PhNo: int)

- Create the above table.
- Remove the existing attributes from the table.
- Change the date type of regno from integer to string.
- Add a new attribute Date of Joining(DOJ) to the existing table.
- Enter five tuples into the table.
- Display all the tuples in student table.

2. CONSIDER THE FOLLOWING RELATIONS:

Student (snum: integer, sname: string, major: string, level: string, age: integer)

Class (name: string, meets at: string, room: string, fid: integer)

Enrolled (snum: integer, cname: string)

Faculty (fid: integer, fname: string, deptid: integer)

- Create the above table.
- Find the names of all Juniors (level = JR) who are enrolled in a class taught by Prof. Harshith
- Find the names of all classes that either meet in room R128 or have five or more Students enrolled.
- Find the names of all students who are enrolled in two classes that meet at the same time.
- Find the names of faculty members who teach in every room in which some class is taught.
- Find the names of faculty members for whom the combined enrolment of the courses that they teach is less than five.

3. A LIBRARY database has a table with the following attributes.

LIBRARY (bookid:int, title: string, author: string, publication: string, yearpub:int, price: real)

- Create the above table.
- Enter the five tuples into the table
- Display all the tuples in student table.
- Display the different publishers from the list.
- Arrange the tuples in the alphabetical order of the book titles.
- List the details of all the books whose price ranges between Rs. 100 and Rs. 300

4. Employee database has a table with the following attributes.

employee (emp_id: integer, emp_name: string, gender: character)

department (dept_id: integer, dept_name: string)

pay details (emp_id: integer, dept_id: integer, salary: integer)

- Create the above tables by properly specifying the primary keys and the foreign keys
- Enter at least 5 tuples for each relation.

- c) List all the employee name, department name and salary
 - d) Give a count of how many employees are working in each department
 - e) List all female employees in alphabetic order.
5. The SALARY database of an organization has a table with the following attributes.
EMPSALARY (empcod:int, emp_name: string, dob: date, department: string, salary: real)
- a) Create the above table.
 - b) Enter the five tuples into the table
 - c) Display all the number of employees working in each department.
 - d) Find the sum of the salaries of all employees.
 - e) Find the sum and average of the salaries of employees of a particular department.
 - f) Find the least and highest salaries that an employee draws.
6. Consider the insurance database given below. The primary keys are underlined, and the data types are specified.
- PERSON (driver-id-no: string, name: string, address: string)
- CAR (regno: string, model: string, year: int)
- ACCIDENT (report-no: int, date: date, location: String)
- OWNS (driver-id-no: string, regno: string)
- PARTICIPATED (driver-id-no: string, regno: string, report-no: int, damage-amount: int)
- a) Create the above tables by properly specifying the primary keys and the foreign keys
 - b) Enter at least five tuples for each relation.
 - c) Demonstrate how you:
 - i. Update the damage amount for the car with some specific regno in the accident with report no 12 to 25000.
 - ii. Add a new accident to the database.
 - d) Find total number of people who owned cars that were involved in accidents in 2002
 - e) Find the number of accidents in which cars belonging to a specific model were involved
7. Consider the following database of student's enrollment in courses and books adopted for each course.
- STUDENT (regno: string, name: string, major: strong, bdate: date)
- COURSE (course-no: int cname: string, dept: string)
- ENROLL (reg-no: string, course-no: int, sem: int, marks: int)
- BOOK-ADOPTION (course-no: int, sem: int, book-isbn: int)
- TEXT (book-isbn: int, book-title: string, publisher: string, author: string)
- a) Create the above tables by properly specifying the primary keys and the foreign keys
 - b) Enter at least five tuples for each relation.
 - c) Demonstrate how you add a new text book to the database and make this book be adopted by some department.
 - d) Produce a list of text books (include Course-no, book-isbn, book-title) in the alphabetical order for courses offered by the 'Compute Science' department that use more than two books.
 - e) List any department that has all its adopted books published by a specific publisher.
8. The following tables are maintained by a book dealer
- AUTHOR (author-id: int, name: string, city: string, country: string)
- PUBLISHER (publisher-id: int name: string, city: string, country: string)

CATALOG (book-id: int, title: string, author-id: int, publisher-id: int, category: int, year: int, price: int)

CATEGORY (category-id: int, description: string) ORDER-DETAILS (order-no: int, book-id: int, quantity: int)

- a) Create above tables by properly specifying the primary keys and the foreign keys.
- b) Enter at least five tuples for each relation.
- c) Give the details of the authors who have 2 or more books in the catalog and the price of the books is greater than the average price of the books in the catalog and the year of publication is after 2010.
- d) Find the author of the book which has maximum sales.
- e) Demonstrate how to increase price of books published by specific publisher by 10%

9. Consider the following database for BANK.

BRANCH (branch-name: string, branch-city: string, assets: real)

ACCOUNT (accno: int, branch-name: string, balance: real)

DEPOSITOR (customer-name: string, accno: int)

CUSTOMER (customer-name: string, customer-street: string, customer-city: string)

LOAN (loan-no: int, branch-name: string, amount: real)

BORROWER (customer-name: string, loan-no: int)

- a) Create the above tables by properly specifying the primary keys and foreign keys.
- b) Enter at least five tuples for each relation.
- c) Find all the customers who have at least two accounts at the main branch.
- d) Find all customer who have an account at all the branches located in a specific city.
- e) Demonstrate how to delete all account tuples at every branch located in specific city.

10. Consider the following database for ORDER PROCESING.

CUSTOMER (cust_no: int, cname: string, city: string)

ORDER (order_no: int, odate: date, ord_amt: real)

ORDER_ITEM (order_no: int, itemno:int, qty: int)

ITEM (itemno: int, unitprice: real)

SHIPMENT (orderno: int, warehouseno: int, ship-date: date)

WAREHOUSE (warehouseno: int, city: string)

- a) Create the above tables by properly specifying the primary keys and the foreign keys
- b) Enter at least five tuples for each relation.
- c) List the order number and ship date for all orders shipped from particular warehouse.
- d) Produce a listing: customer name, no of orders, average order amount
- e) List the orders that were not shipped within 30 days of ordering

11. THE FOLLOWING RELATIONS KEEP TRACK OF AIRLINE FLIGHT INFORMATION:

Flights (no: integer, from: string, to: string, distance: integer, departs: time, arrives: time, price: real)

Aircraft (aid: integer, aname: string, cruisingrange: integer)

Certified (eid: integer, aid: integer)

Employees (eid: integer, ename: string, salary: integer)

- a) Find the names of aircraft such that all pilots certified to operate them have salaries more than Rs.80, 000.

- b) For each pilot who is certified for more than three aircrafts, find the eid and the maximum cruisingrange of the aircraft for which she or he is certified.
- c) Find the names of pilots whose salary is less than the price of the cheapest route from Bengaluru to Frankfurt.
- d) For all aircraft with cruisingrange over 1000 Kms, Find the name of the aircraft and the average salary of all pilots certified for this aircraft.
- e) Find the names of pilots certified for some Boeing aircraft. vi. Find the aids of all aircraft that can be used on routes from Bengaluru to New Delhi.

12. INVENTORY DATABASE An inventory database has the following tables

ITEM (ItemCode: number, ItemName: text, Price: number (10,2))

PURCHASE (ItemCode: number, Quantity: number)

- a. Create above table with above attributes.
- b. Enter 5 – 7 tuples into the tables.
- c. List the items purchased
- d. Display the total items purchased (listing must have the columns: ItemCode ItemName Total Quantity)
- e. List the items which are not purchased by anyone.

PART – B

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