

BACHELOR OF COMPUTER APPLICATIONS (BCA)

(Revised Syllabus)

BCA(Revised Syllabus)/ASSIGN/SEMESTER-III

ASSIGNMENTS

(July-2024&January-2025)

MCS-021,MCS-023,MCS-014,BCS-031,BCSL-032,BCSL-033,BCSL-034,



**SCHOOL OF COMPUTER AND INFORMATION SCIENCES
INDIRA GANDHI NATIONAL OPEN UNIVERSITY
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Important Notes

1. Submit your assignments to the Coordinator of your Study Centre on or before the due date.
2. Assignment submission before due dates is compulsory to become eligible for appearing in corresponding Term End Examinations. For further details, please refer to BCA Programme Guide.
3. To become eligible for appearing the Term End Practical Examination for the lab courses, it is essential to fulfill the minimum attendance requirements as well as submission of assignments (on or before the due date). For further details, please refer to the BCA Programme Guide.

Course Code	:	MCS-021
Course Title	:	Data and File Structures
Assignment Number	:	BCA(III)/021/Assignment/2024-25
Maximum Marks	:	100
Weightage	:	30%
Last Dates for Submission	:	31stOctober,2024(For July Session)
	:	30thApril,20245(For January Session)

This assignment has 16 questions of 5 Marks each, answer all questions. Rest 20 marks are for viva voce. Please go through the guidelines regarding assignments given in the Programme Guide for the format of presentation.

- Q1.** Write a program in C to accepts two polynomials as input and prints the resultant polynomial due to the multiplication of input polynomials.
- Q2.** Write a program in ‘C’ to create a single linked list and perform the following operations on it:
- (i) Insert a new node at the beginning, in the middle or at the end of the linked list.
 - (ii) Delete a node from the linked list
 - (iii) Display the linked list in reverse order
 - (iv) Sort and display data of the linked list in ascending order.
 - (v) Count the number of items stored in a single linked list
- Q3.** Write a program in ‘C’ to create a doubly linked list to store integer values and perform the following operations on it:
- (i) Insert a new node at the beginning, in the middle or at the end of the linked list.
 - (ii) Delete a node from the linked list
 - (iii) Sort and display data of the doubly linked list in ascending order.
 - (iv) Count the number of items stored in a single linked list
 - (v) Calculate the sum of all even integer numbers, stored in the doubly linked list.
- Q4.** What is a Dequeue? Write algorithm to perform insert and delete operations in a Dequeue.
- Q5.** Draw the binary tree for which the traversal sequences are given as follows:
- (i) Pre order: A B D E F C G H I J K
In order: B E D F A C I H K J G
 - (ii) Post order: I J H D K E C L M G F B A
In order: I H J D C K E A F L G M B
- Q6.** Write a program in ‘C’ to implement a binary search tree (BST). Traverse and display the binary search tree in the Inorder, Preorder and Post order form.

Q7. Define AVL tree. Create an AVL tree for the following list of data if the data are inserted in the order in an empty AVL tree.

12, 5, 15, 20, 35, 8, 2, 40, 14, 24, 27, 45, 50, 3, 4

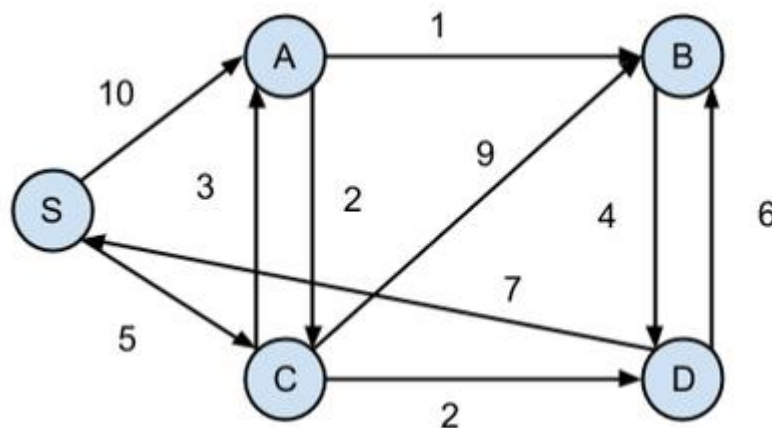
Further delete 2, 4, 5 and 12 from the above AVL tree.

Q8. Define a B-tree and its properties. Create a B-tree of order-5, if the data items are inserted into an empty B-tree in the following sequence:

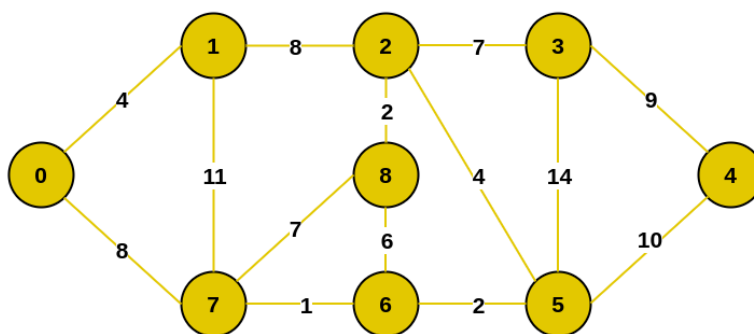
12, 5, 15, 20, 60, 45, 35, 40, 25, 8, 7, 55, 50, 66, 65, 80

Further, delete the items 5, 12, 8, and 20 from the B-tree.

Q9. Apply Dijkstra's algorithm to find the shortest path from the vertex 'S' to all other vertices for the following graph:



Q10. Apply Prim's Algorithm to find the minimum spanning tree for the following graph.



Example of a Graph

Q11. Apply Insertion and Selection sorting algorithms to sort the following list of items. So, all the intermediate steps. Also, analyze their best, worst and average case time complexity.

12, 5, 2, 15, 25, 30, 45, 8, 17, 50, 3, 7

- Q12.** What is a heap tree? Create a max heap tree for the following list of items inserted in the order. Also, explain the heap sort with the help of thus created heap tree.
10, 20, 5, 25, 30, 18, 3, 70, 55, 45, 12, 24
- Q13.** Write a program in 'C' language for 2-way merge sort.
- Q14.** What is Splay tree? Explain the Zig zag and Zag zig rotations in Splay tree with the help of a suitable example.
- Q15.** What is Red-Black tree? Explain insertion and deletion operations in a Red-Black tree with the help of a suitable example.
- Q16.** Explain Direct File and Indexed Sequential File Organization.

Course Code	:	MCS-023
Course Title	:	Introduction to Database Management Systems
Assignment Number	:	BCA(III)/023/Assignment/2024-25
Maximum Marks	:	100
Weightage	:	25%
Last Date of Submission	:	31stOctober,2024(For July Session) 30thApril,2025(For January Session)

This assignment has eight questions. Answer all questions of total 80 marks. Rest 20 marks are for viva voce. You may use illustrations and diagrams to enhance explanations. Please go through the guidelines regarding assignments given in the Programme Guide for the format of presentation. Answer to each part of the question should be confined to about 300 words.

Q1. (2 Marks)

- What is SQL? Explain its important features.
- Consider the following schemas:
BOOK (Book_ID, Title, Publisher_ID, Year_of Pub, Price)
AUTHOR (Author_ID, Book_ID, Author Name)
PUBLISHER (Publisher_ID, Book_ID, Address, Name_of Pub, No._of Copies)

Write a query in SQL for the following:

- Find the name of authors whose books are published by "ABC Press".
- Find the name of the author and price of the book, whose Book_ID is '100'.
- Find the title of the books which are published by Publisher_ID '20' and are published in year 2011.
- Find the address of the publisher who has published Book_ID "500".

Make suitable assumptions, if any. **(8 Marks)**

Q2.

- With the help of a suitable example, discuss the insertion, deletion and updation anomalies that can occur in a database. Briefly discuss the mechanism to remove such anomalies. **(6 Marks)**
- Write SQL commands for each of the following. Also illustrate the usage of each command through suitable example. **(4 Marks)**
 - Creation of views
 - Creation of sequences
 - Outer join
 - To give access permission to any user

Q3.

- What are integrity constraints? Discuss the various types of integrity constraints that can be imposed on database. **(3 Marks)**
- How are database security and database integrity related? Briefly discuss the different levels of security measures which may be considered to protect the database. **(3 Marks)**
- Consider the relation R (A, B, C, D, E) and the set of functional dependencies :-
 $F(A \rightarrow D, \{A,B\} \rightarrow C, D \rightarrow E)$

Assume that the decomposition of R into {R1 (A, B, C) and R2 (A, D, E)}.
Is this decomposition lossless? Justify? **(4 Marks)**

Q4.

- a) Explain the Log-based recovery scheme with the help of an example. **(5 Marks)**
- b) Compute the closure of the following set F of functional dependencies for relation schema $R = (A, B, C, D, E)$.
A \rightarrow BC
CD \rightarrow E
B \rightarrow D
E \rightarrow A

List the candidate keys for R. **(5 Marks)**

Q5.

- a) Give the limitations of file based system. How can they be overcome using DBMS? **(5 Marks)**
- b) Discuss the importance of file organisation in databases. Mention the different types of file organisations available. Discuss any one of the mentioned file organisations in detail. **(5 Marks)**

Q6.

- a) For what reasons is 2-phase locking protocol required? Explain. Discuss the disadvantages of basic 2-phase locking protocol. List the ways and means that can be used to overcome the disadvantages. **(5 Marks)**
- b) List and explain the 4 basic properties of a Transaction with the help of appropriate examples. **(5 Marks)**

Q7.

- a) What do you mean by fragmentation of a database? What is the need of fragmentation in DDBMS environment? Explain different types of fragmentation with an example of each. **(5 Marks)**
- b) Explain the need of Distributed DBMS over Centralized DBMS. Also give the structure of Distributed DBMS. **(5 Marks)**

Q8.

An organization needs to provide Medical facilities to its employees and their dependents. Organization is having a list of Doctors, Hospitals and Test centres for the employees facility. An employee may get Medical facility from the list of Doctors, Hospitals and Test centres provided by the organization to them. Employee does not need to pay anything for the facilities availed. The Doctors, Hospitals and Test centres directly raise their bill to the organization.

Identify the entities, relationships, constraints and cardinality and construct an ER diagram for the above mentioned specifications. List your assumptions and clearly indicate the cardinality mappings as well as any role indicators in your ER diagram. **(10 Marks)**

Course Code : **MCS-014**
Course Title : **Systems Analysis and Design**
Assignment Number : **BCA(III)/014/Assignment/2024-25**
Maximum Marks : **100**
Weightage : **25%**
Last Dates for Submission : **31stOctober,2024(For July Session)**
30thApril,2025(For January Session)

This assignment has three questions of 80 marks. Rest 20 marks are for viva voce. Answer all questions. You may use illustrations and diagrams to enhance the explanations. Please go through the guidelines regarding assignments given in the Programme Guide for the format of presentation.

- Q1.** Develop SRS for **Railway Reservation System** . SRS should be as per IEEE (30 Marks)
standard SRS template. Make necessary assumptions.
- Q2.** Draw the DFDs upto 3rd level for **Railway ReservationSystem**. (30 Marks)
- Q3.** Draw ERD for an **Railway Reservation System**. Make necessary (20 Marks)
assumptions.

Course Code	:	BCS-031
Course Title	:	Programming in C++Assignment
Number	:	BCA(III)031/Assignment/2024-25
Maximum Marks	:	100
Weightage	:	25%
Last Date of Submission	:	31stOctober,2024(for July session) 30thApril,2025(for January session)

This assignment has three questions carrying a total of 80 marks. Answer all the questions. Rest 20 marks are for viva-voce. You may use illustrations and diagrams to enhance explanations. Please go through the guidelines regarding assignments given in the Programme Guide for the format of presentation. Wherever required, you may write C++ program and take its output as part of solution

- Q1.** What is a Virtual Constructor? What are its advantages? Explain with examples. **(30 Marks)**
- Q2.** What is a Virtual Function? How does it differ from a Pure Virtual Function? Explain with examples. **(30 Marks)**
- Q3.** What is a Header File? Explain any 5 header files along with their functions. **(20 Marks)**

Course Code	:	BCSL-032
Course Title	:	C++Programming Lab
Assignment Number	:	BCA(III)/L-032/Assignment/2024-25
Maximum Marks	:	50
Weightage	:	25%
Last date of Submission	:	31stOctober,2024(for July session) 30thApril,2025(for January session)

This assignment has two questions. Answer both the questions. These questions carry 40 marks. Rest 10 marks are for viva-voce. Write C++ program and take its output as part of solution. Please go through the guidelines regarding the assignments given in the Programme Guide for the format of presentation.

- Q1.** Write a program in C++ for addition of two sparse Polynomials using Pointers. **(20 Marks)**
- Q2.** Write a program in C++ to generate ranks for the candidates based on the marks secured by them in an entrance examination. Make necessary assumptions. **(10 Marks)**
- Q3.** Write a program in C++ to create a book of 10 input pages. Make necessary assumptions. **(10 Marks)**

Course Code	:	BCSL-033
Course Title	:	Data and File Structures Lab
Assignment Number	:	BCA(III)/L-033/Assignment/2024-25
Maximum Marks	:	100
Weightage	:	25%
Last Dates for Submission	:	31stOctober,2024(for July Session) 30thApril, 2025(for January Session)

There are 8 questions of 10 marks each in this assignment carrying a total of 80 marks. Rest 20 marks are for viva voce. Please go through the guidelines regarding assignments given in the Programme Guide for the format of the presentation. Write all the programs in ‘C’ language.

- Q1.** Write a program to take input of a Matrix using array and display its transpose. **(10 Marks)**
- Q2.** Write a program in `C` Language to accept 10 strings as input and print them inlexicographic order **(10 Marks)**
- Q3.** Write a program to implement singly linked list for user inputs and perform the following operations on it:
(i) Reverse the linked list and display it.
(ii) Sort the nodes in ascending order and display them. **(10 Marks)**
- Q4.** Write a program using linked list that accepts two polynomials as input and displays the resultant polynomial after performing the multiplication of the input polynomials. **(10 Marks)**
- Q5.** Write a program to implement doubly linked list of integers as user inputs and perform the following operations:
(i) Calculate and display the sum of all the even integers of the doubly linked list
(ii) Insert new elements at the beginning, in the middle and at the end of the linked list **(10 Marks)**
- Q6.** Write a program in C to sort user input data using bubble sort method. Also, print the number of swaps and comparison operations performed for sorting the given data set. **(10 Marks)**
- Q7.** Write a program to convert an infix expression to a prefix expression. Use appropriate data structure. **(10 Marks)**
- Q8.** Write a program in ‘C’ language for the creation of a Red Black tree. Also,implement insertion and deletion operations. **(10 Marks)**

Course Code	:	BCSL-034
Title	:	DBMS Lab
Assignment Number	:	BCA(III)/L-034/Assignment/2024-25
Maximum Marks	:	50
Weightage	:	25%
Last Date of Submission	:	31stOctober,2024(for July Session) 30thApril,2025(for January Session)

This assignment has only one question. Answer the question. This question carries 40 marks. Rest 10 marks are for viva voce. You may use illustrations and diagrams to enhance the explanation. Assumptions can be made wherever required. Please go through the guidelines regarding the assignments given in the programme guide for the format of presentation.

Q1.

Design and implement a simple database using MS-Access for an *Online Retail Store*, using fundamental concepts of database management systems such as creating tables, establishing relationships, performing CRUD (Create, Read, Update, Delete) operations, and writing basic SQL queries.

Create a database schema for an online retail store and implement various operations on it. The database will manage information about customers, products, orders, and order details. Use SQL to create tables, establish relationships, and perform queries to manipulate and retrieve data.

I. Create Database Schema: (15 Marks)

- **Customers Table:**
 - **customer_id** (Primary Key, INT, Auto Increment)
 - **first_name** (VARCHAR)
 - **last_name** (VARCHAR)
 - **email** (VARCHAR, Unique)
 - **phone** (VARCHAR)
 - **address** (VARCHAR)
- **Products Table:**
 - **product_id** (Primary Key, INT, Auto Increment)
 - **product_name** (VARCHAR)
 - **description** (TEXT)
 - **price** (DECIMAL)
 - **stock_quantity** (INT)
- **Orders Table:**
 - **order_id** (Primary Key, INT, Auto Increment)
 - **customer_id** (Foreign Key, INT)
 - **order_date** (DATE)
 - **status** (VARCHAR)
- **OrderDetails Table:**
 - **order_detail_id** (Primary Key, INT, Auto Increment)
 - **order_id** (Foreign Key, INT)
 - **product_id** (Foreign Key, INT)
 - **quantity** (INT)
 - **total_price** (DECIMAL)

II. Relationships:

- Each order is placed by one customer.
- Each order can have multiple products.

- Each product can be part of multiple orders.

Draw an ER-diagram for this application.

(5 Marks)

III. Operations:

- **CRUD (Create, Read, Update, Delete) Operations**

(7 ½ Marks)

- Insert new records into each table.
- Read/display records from each table.
- Update existing records in each table.
- Delete records from each table.

IV. Write and execute the following SQL Queries:

(12 ½ Marks)

1. Retrieve all orders along with the customer details who placed the order.
2. Find all products that have been ordered by a specific customer.
3. Retrieve the total sales for each product.
4. Find all customers who have placed at least one order.
5. Retrieve the total quantity of products ordered by each customer.
6. Find all orders and their order details for a specific customer.
7. Retrieve all products along with the total quantity ordered.
8. Find the total revenue generated from orders placed within a specific date range.
9. Retrieve all customers who have ordered a specific product.
10. Find the most frequently ordered product.
11. Retrieve the average order value for each customer.
12. Find all products that have never been ordered.
13. Retrieve the total number of orders placed each month.
14. Retrieve the total number of products ordered in each order.
15. Find the top 5 customers based on total spending.
16. Retrieve all orders placed on a specific date.
17. Find the total number of unique products ordered by each customer.
18. Retrieve the order details for the order with the highest total price.
19. Find the top 3 products based on the total quantity ordered.
20. Retrieve the total sales for each month.

21. Find the customer who has placed the most orders.
22. Retrieve the total number of orders for each status.
23. Find the order with the highest quantity of a single product.
24. Retrieve the customer details for the order with the highest total price.
25. Find the average quantity of products ordered per order.

Note: You must perform the above said activities and also take prints of screenshots of the layouts, sample input and output along with the necessary documentation for this practical question. Assumptions can be made wherever necessary.