

POST GRADUATE DIPLOMA IN COMPUTER APPLICATIONS PGDCA-(NEW)

PGDCA-NEW/ASSIGN/SEMESTER-II

ASSIGNMENTS

(July – 2024 & January – 2025)

MCS-206, MCS-207, MCS-208, MCSL-209, MCSL-210



**SCHOOL OF COMPUTER AND INFORMATION SCIENCES
INDIRA GANDHI NATIONAL OPEN UNIVERSITY
MAIDAN GARHI, NEW DELHI – 110 068**

CONTENTS

Course Code	Assignment No.	Submission-Schedule		Page No.
		For July-December Session	For January-June Session	
MCS-206	PGDCA(II)/206/Assignment/24-25	31 st October 2024	30 th April, 2025	3
MCS-207	PGDCA(II)/207/Assignment/24-25	31 st October 2024	30 th April, 2025	5
MCS-208	PGDCA(II)/208/Assignment/24-25	31 st October 2024	30 th April, 2025	8
MCSL-209	PGDCA(II)/L-209/Assignment/24-25	31 st October 2024	30 th April, 2025	9
MCSL-210	PGDCA(II)/L-210/Assignment/24-25	31 st October 2024	30 th April, 2025	10

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 PGDCA 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 PGDCA Programme Guide.
4. The viva voce is compulsory for the assignments. For any course, if a student submitted the assignment and not attended the viva-voce, then the assignment is treated as not successfully completed and would be marked as ZERO.

Course Code	:	MCS-206
Course Title	:	Object Oriented Programming Using Java
Assignment Number	:	PGDCA_NEW(II)/206/Assignment/2024-25
Maximum Marks	:	100
Weightage	:	30%
Last Date of Submission	:	31st October, 2024 (for July session) 30th April, 2025 (for January session)

Note: This assignment has eight questions of 80 Marks. Answer all questions. Rest 20 marks are for viva voce. 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.

Question1:

- (a) Explain different data types available in java. **(5 Marks)**
- (b) Explain features of object oriented programming. Explain role of JVM in java programming. **(5 Marks)**

Question2:

- (a) What is a class? How a class is defined in Java? Explain use different access specifiers in java. **(5 Marks)**
- (b) Explain use of this, final and static keywords in Java. **(3 Marks)**
- (c) What is Character class? Explain use of *compareTo* and *toString* methods of Character class. **(2 Marks)**

Question 3:

- (a) Write a java program to find sum of two matrices. Define proper class and methods in your program. **(4 Marks)**
- (b) Explain use of java File class and its methods with the help of examples **(6 Marks)**

Question 4:

- (a) What is inheritance? What are different types of inheritance supported by java? Explain how inheritance is implemented in java with the help of an example. **(6 Marks)**
- (b) What is abstract class? Explain its advantages. How is it different from Interface? **(4 Marks)**

Question 5:

- (a) What is polymorphism? Explain its advantages with examples. **(4 Marks)**
- (b) What is an exception? Explain various causes of exceptions. How exceptions are handled in java? Explain how user defined exceptions are created in Java. **(6 Marks)**

Question 6:

- (a) What is multithreading? Explain how multiple child threads are created? Write a java program to demonstrate interthread communication. **(7 Marks)**
- (b) Explain use of List interface and Vector class in Java. **(3 Marks)**

Question 7:

- (a) Explain Swing package/class hierarchy. What is difference between AWT and Swing ? **(6 Marks)**
- (b) What is FXML? Explain event handling in JavaFX. **(4 Marks)**

Question 8:

- (a) Write a Java program using JDBC to manage saving accounts of a bank. Make necessary assumptions. Make provisions of exception handling in your program. **(8 Marks)**
- (b) Explain use of commit () and rollback() in JDBC programming with the help of a small program. **(2 Marks)**

Course Code	:	MCS-207
Course Title	:	Database Management Systems
Assignment Number	:	PGDCA_NEW(II)/207/Assignment/2024-25
Maximum Marks	:	100
Weightage	:	25%
Last Dates for Submission	:	31st October, 2024 (for July session) 30th April, 2025 (for January session)

There are five questions in this assignment, which carries 80 marks. Rest 20 marks are for viva voce. 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 the presentation. The answer to each part of the question should be confined to about 300 words. Make suitable assumption, if any.

Question 1: (Covers Block 1) (4+4+4+4+4=20 Marks)

- (a) Explain the three level DBMS architecture with the help of an example. Also, explain the concept of data independence in the context of database systems with the help of an example.
- (b) Explain the following terms in the context of a relational model with the help of one example of each– Super key, Domain, Cartesian Product, Primary Key, Natural join, Set Intersection, Set Difference operation and referential integrity constraint.
- (c) A University maintains the list of the books available in its library using a database system. In addition, this system is used for issue and return of books to its students. This database is used to find the following details by the students of the university and the staff of the library:
 - List of the classification number, ISBN number, Title, Author Names, Subject Area of the books.
 - Searching of books using subject area, Title and Author name.
 - List of books that are issued to a specific student.
 Draw an ER diagram for the library. Specify key attributes and constraints on each entity type and on each relationship type. Note any unspecified requirements and make appropriate assumptions to make the specification complete.
- (d) Design normalised tables in 3NF for the ER diagram drawn in part (c), with the required integrity constraints.
- (e) Explain how the secondary index can be created in a file. Also, explain the advantages and disadvantages of using secondary indexes. When should you use secondary Indexes? Give reasons in support of your answer.

Question 2: (Covers Block 2) (4+4+2+10=20 Marks)

- (a) Consider a Relation: **Student (EnrolNo, StudentName, ProgrammeCode, ProgrammeName, CourseCode, CourseName, Grade)**. Some of the constraints on the relation **Student** are:
 - A student is assigned one unique Enrolment Number (EnrolNo).
 - Two students may have same name.
 - A student can register in one Programme only.

- A Programme consists of several compulsory courses.
- Grades can be “A”, “B”, “C”, or “D” and only one grade value is recorded for a student in a course.

Perform the following task for the relation given above:

- What is the key to the relation?
 - Identify and list the functional dependencies in the relation.
 - Make an instance of this relation showing possible redundancies.
 - Decompose R into 2NF and 3NF relations.
- (b) Explain the concept of Multi-valued dependency and Join dependency with the help of an example of each. Also, explain the 4th Normal Form and 5th Normal form.
- (c) Explain the following terms with the help of an example of each – Assertion, Cursor, Stored Procedure, Triggers.
- (d) Consider the following relational database:

Customer (custID, custName, custAddress, custPhone)

Account (AccountNumber, custId, TypeOfAccount, Balance)

Transaction (DateTimeofTransaction, AccountNumber, DebitORCredit, Amount)

The underlined attribute(s) in the relation forms the primary key. In relation Customer, the custID is the unique identifier of a customer. The purposes of other attributes in Customer relation are self explanatory. You may define the domain of different attributes. The TypeOfAccount attribute can take the value (“Saving”, “Current”, “Salary”, “Other”). Please note that at a specific time of a date only one transaction can be performed from an account. Please also note that the Account relation has foreign key custID and Transaction relation has foreign key AccountNumber. Write and run the following SQL queries on the database:

- Create the tables with the primary and foreign key constraints.
- Insert at least 5 records in the first 2 tables and 20 records in the 3rd table.
- List “Saving” Account details showing the AccountNumber, custName, custPhone, Balance of all the accounts. These records should be shown in the order of custName.
- Find all the transactions made by customer whose custID is “240002”.
- Find the list of those customers who have more than one account.
- Find the total of Debit transactions made for Account Number “A0054”
- Find the total of balance of all the accounts of a customer.
- Find the list of customers whose name start with an alphabet “B”
- List the pair of customers who share the same phone number.
- Find the list of the customers, who have not made any credit transaction since 1st January, 2023.

Question 3: (Covers Block 3)

(2+4+2+4+2+3+3=20 Marks)

- (a) Explain the ACID properties of transactions with the help of an example of each.
- (b) What are the problems that can be encountered, if the three transactions (given in Figure 1) are run concurrently? Explain with the help of different transaction schedules of these transactions.

Transaction A	Transaction B	Transaction C
Read X	Read X	Read X
Read Y	ADD 500	SUBTRACT 200
Read Z	Write X	WRITE X
	Read Y	
	SUBTRACT 500	
	Write Y	

Figure 1: Three Concurrent Transactions

- (c) What is 2-Phase locking? Lock and unlock various data items of the transactions, given in Figure 1, using 2-Phase locking such that no concurrency related problem occurs, when the transactions A, B and C are executed concurrently.
- (d) Explain the Log based Recovery with the help of an example. What are Redo and Undo operations. Why do you need checkpoint? Explain the process of recovery with check points with the help of an example.
- (e) Explain with the help of an example, how recovery is performed when Deferred database modification scheme is used.
- (f) What is the cost of selection operation, when the index scan method is used? Explain with the help of an example. Explain the cost of Join operation when Merge-Join method is used.
- (g) Make the query tree for the following query (assume the database of problem 2(d)).

```

SELECT c.custName, c. custId, a.AccountNumber, t.DebitORCredit
FROM Customer c, Account a, Transaction t
WHERE c.custId = a.custId AND a.AccountNumber = t.AccountNumber
AND Amount > 10000;

```

Question 4: (Covers Block 4)

(5 Marks each=20 Marks)

- (a) What are object-relational database? Explain the concept of complex data types used in these databases. Explain the object model in the context of Object Oriented database systems. How object-oriented database systems are different from Object-relational database systems?
- (b) Explain the multi-dimensional data model of a data warehouse. Also, define the concept of decision tree with the help of an example. List any four applications of data mining.
- (c) Explain the need of NoSQL databases. Explain the characteristics of any two types of NoSQL databases.
- (d) Write short notes on the following database technologies:
 - (i) Distributed databases
 - (ii) Block chain databases

Course Code	:	MCS-208
Course Title	:	Data Structures and Algorithms
Assignment Number	:	PGDCA_NEW(II)/208/Assignment/2024-25
Maximum Marks	:	100
Weightage	:	25%
Last Date of Submission	:	31st October, 2024 (for July session) 30th April, 2025 (for January session)

There are four questions in this assignment, which carry 80 marks. Each question carries 20 marks. Rest 20 marks are for viva voce. All algorithms should be written nearer to C programming language. You may use illustrations and diagrams to enhance the explanations, if necessary. Please go through the guidelines regarding assignments given in the Programme Guide for the format of presentation.

Question 1: (20 Marks)

What is a Doubly Linked Circular List? What are its advantages and disadvantages? Give a scenario where its application is appropriate. Justify your answer.

Question 2: (20 Marks)

What is a Tree? How does it differ from a Binary Tree? Is it possible to convert a Tree to a Binary Tree? If yes, then, explain the process with an example.

Question 3: (20 Marks)

What are Red Black Trees? How do they differ from Splay Trees? What are their applications?

Question 4: (20 Marks)

Write a short note on the recent developments in the area of finding shortest path between two nodes of a Graph. Make necessary assumptions.

Course Code : **MCSL-209**
Course Title : **Data Structures and Algorithms Lab**
Assignment Number : **PGDCA-NEW(II)/L-209/Assignment/2024-25**
Maximum Marks : **100**
Weightage : **30%**
Last Dates for Submission : **31st October, 2024 (for July session)**
30th April, 2025 (for January session)

There are two questions in this assignment carrying a total of 40 marks. Each question carries 20 marks. Your Lab Record will carry 40 Marks. Rest 20 marks are for viva voce. 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.

Question 1: (20 Marks)

Write an algorithm and a program in 'C' language for the implementation of Circular Doubly Linked List. The implementation should include creation, insertion, deletion, updation, Lookup.

Question 2: (20 Marks)

Write an algorithm and a program in 'C' language for addition of two Polynomials.

Course Code	:	MCSL-210
Course Title	:	DBMS and Java Lab
Assignment Number	:	PGDCA_NEW(II)/L-210/Assignment/2024-25
Maximum Marks	:	100
Weightage	:	30%
Last Date of Submission	:	31st October, 2024 (for July session) 30th April, 2025 (for January session)

Note: This assignment has two sections. Answer all questions in each section. Each Section is of 20 marks. Your Lab Records will carry 40 Marks (20 Marks for each section). Rest 20 marks are for viva voce. You may use illustrations and diagrams to enhance the explanations. You must execute the program and submit the program logic, sample input and output along with the necessary documentation. Assumptions can be made wherever necessary. Please go through the guidelines regarding assignments given in the programme guide for the format of presentation.

Section 1: DBMS Lab

An e-Commerce portal provide online product purchase/shopping facility to its customers. It maintains the database of Products(including product category, price, discont to prime members) Customers (regular customer, prime customer) , Orders and Order Details . Customers need to register themselves by providing their address and contact details including email id and mobile number before placing any order. To become a prime customer a membership fee is charged to the customer. Customer order may include more than one products and a customer can place more than one orders. This shopping portal provides facility of both online payment and cash on delivery (COD).

Question 1: **(5 Marks)**

List the entities, their attributes and relationships for the description given above and make an ER-diagram for this e-Commerce Portal. You may use the concept of keys, aggregation, generalisation, cardinality etc. as per need. Design the suitable RDBMS tables for the ER-diagram you have created. The database design should include keys, foreign keys, constraints and referential integrity constraints. Your database design should be normalized up to 3rd Normal Form. Make necessary assumptions wherever require.

Question 2: **(5 Marks)**

Implement the database design (create tables) that you have created in question 1 using a RDBMS with proper integrity constraints. Enter about 8- 10 meaningful records in each of your table.

Question 3: **(10 Marks)**

Write and run the following queries for your database using SQL commands:

1. List all the customers whose pin code is “ 110068” and have prime membership.

2. List the order id and amount of those orders which are placed during 2nd week of the month and are of amount less than 20,000.
3. List the customer details, who has placed their orders on 10-8-2024 and order value is more than 5000.
4. List all the customers whose name starts with alphabet 'P' and are not prime member.
5. Find the total price of the order id O00105 .
6. List the "Home & Kitchen Appliances" products information in the increasing order of discount rate (in terms of percentage of price) for prime members.
7. Find the detail of products which not have been ordered even once during first week of the month.
8. List the order details of the orders which are placed by prime members on 10-8-2024 and payment mode is COD.

Section 2: Java Lab

Question 1: **(2 Marks)**

Write a program to demonstrate use of different access specifiers in Java.

Question 2: **(6 Marks)**

Write a java program to demonstrate constructor overloading, method overloading and method overriding. Make necessary assumptions.

Question 3: **(4 Marks)**

Write a java program to create and use user defined exception

Question 4: **(2 Marks)**

Write java programe to demonstrate use of StringBuider class methods ensureCapacity, setLength , append and replace.

Question 5: **(6 Marks)**

Write a program using JDBC for simple CRUD application.