

MASTER OF COMPUTER APPLICATIONS (MCA)

MCA/ASSIGN/SEMESTER-III

ASSIGNMENTS

(July - 2021 & January - 2022)

MCS-031, MCS-032, MCS-033, MCS-034, MCS-035, MCSL-036



**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-031	MCA(III)/031/Assignment/21-22	31 st October, 2021	15 th April, 2022	3
MCS-032	MCA(III)/032/Assignment/21-22	31 st October, 2021	15 th April, 2022	5
MCS-033	MCA(III)/033/Assignment/21-22	31 st October, 2021	15 th April, 2022	6
MCS-034	MCA(III)/034/Assignment/21-22	31 st October, 2021	15 th April, 2022	8
MCS-035	MCA(III)/035/Assignment/21-22	31 st October, 2021	15 th April, 2022	9
MCSL-036	MCA(III)/L-036/Assignment/21-22	31 st October, 2021	15 th April, 2022	11

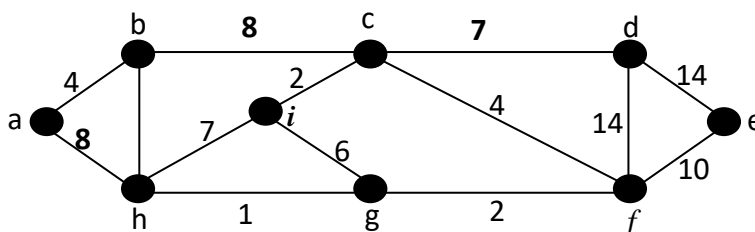
Important Notes

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 MCA 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 MCA 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-031**
Course Title : **Design and Analysis of Algorithms**
Assignment Number : **MCA(III)031/Assignment/2021-22**
Maximum Marks : **100**
Weightage : **25%**
Last Date of Submission : **31th October, 2021(For July, 2021 Session)**
15th April, 2022 (For January, 2022 Session)

Note: This assignment has 16 questions of 80 marks (each question carries equal marks). Answer all the 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 context free grammar to generate palindromes of even length Over alphabet $\Sigma = \{a, b\}$.
- Q2:** Write the finite automata corresponding to the regular expression $(a + b)^*ab$
- Q3:** Discuss the principle of optimality for multiplication of matrix chain.
- Q4:** Compute the optimal number of scalar multiplications required to multiply the following matrices.
- A_1 of order 30 X 35 ; A_2 of order 35 X 15 ; and A_3 of order 15 X 5
- Q5:** Explain the Chomsky's Classification of grammars.
- Q6:** If L_1 and L_2 are context free languages then, prove that $L_1 \cup L_2$ is a context free language.
- Q7:** Construct a Turing machine that copies a given string over $\{a, b\}$. Also find a computation of TM for the string 'aab'.
- Q8:** Find the asymptotic tight bound for $T(n) = 2T\left(\frac{n}{4}\right) + \sqrt{n}$, with $T(1) = 1$.
- Q9:** What is an ambiguous grammar ? How do you prove that a given grammar is ambiguous ? Explain with an example.
- Q10:** Obtain the minimum cost spanning tree for the following graph using PRIMS algorithm.



- Q11:** Obtain the BFS tree for the above graph, given in Question No. 10 above
- Q12:** Compare the Dynamic programming technique and Greedy technique for solving problems. Consider an array

$A = \{3, 14, 27, 31, 39, 42, 55, 70, 74, 81, 85, 93, 98\}$.

- (i) What is the largest number of comparisons made by binary search for any key in array A (given above)?
- (ii) Find the average number of comparisons made by binary search for a successful search in array A.
- (iii) Find the average number of comparisons made by binary search for an unsuccessful search in array A.

Q13: Write Quick Sort Algorithm. Prove that “worst case for Quick Sort is Best case for Bubble Sort”, When arrays are already sorted. Analyze the average case running time of Quick Sort Algorithm. Sort the following sequence of numbers, Using Quick Sort : 15, 10, 13, 9, 12, 7 Find the number of Comparisons Copy/Assignment Operations required by the Algorithm in sorting the list.

Q14: Give a Greedy solution for the change making problem, considering the denominations = { 1000, 500, 100, 500, 20, 10, 5, 2, 1 }.

Q15: Write Short Note on Divide and Conquer Techniques. Give suitable example for it. Discuss the Tournament sort algorithm and determine its Recursive and Iterative expression, is Divide and Conquer Technique applicable to Tournament Sort, if Yes Discuss how if No discuss why?

Q16: Differentiate between

- a) Decidable and Undecidable Problems.
- b) NP-Complete and NP-Hard problems.

Course Code	:	MCS-032
Course Title	:	Object Oriented Analysis and Design
Assignment Number	:	MCA (III)/032/Assign/2021-22
Maximum Marks	:	100
Weightage	:	25%
Last Date of Submission	:	31th October, 2021(For July, 2021 Session) 15th April, 2022 (For January, 2022 Session)

There are eight questions in this assignment, which carried 80 marks. Rest 20 marks are for viva-voce. Answer all the questions. Please go through the guidelines regarding assignments given in the Program Guide for the format of presentation. Use diagram as part of answer wherever required for better explanation.

- Q1:** What is OOAD? Critically evaluate advantage of OOAD over structured analysis and design of system. **(10 Marks)**
- Q2:** What is class diagram ? How it is different from Object diagram? Draw class diagram for Online Shopping System. **(10 Marks)**
- Q3:** What is Use Case diagram? Explain advantage of use case diagram with the help of an example **(10 Marks)**
- Q4:** Draw a sequence diagram for Online Money Transfer from Account of one Bank to the account of Another Bank. Make necessary assumptions required. **(10 Marks)**
- Q5 (a):** What is generalization? Explain generalization and inheritance with the help of an example using suitable diagram. **(5 Marks)**
- Q5 (b):** What is State Diagram ? Draw State Diagram for cash withdrawal from an ATM system. **(5 Marks)**
- Q6:** What is functional model ? How is it different from object model and dynamic model? Explain in detail. **(10 Marks)**
- Q7:** Draw a DFD for Online Banking System. Make necessary assumptions required. **(10 Marks)**
- Q8:** Write short note on followings (minimum in 250 words) **(10 Marks)**
- i) Object ID and Persistency
 - ii) Issues in Concurrency Control
 - iii) State diagram
 - iv) Integrity Constraints

Course Code	:	MCS-033
Course Title	:	Advanced Discrete Mathematics
Assignment Number	:	MCA(III)/033/Assignment/2021-22
Maximum Marks	:	100
Weightage	:	25%
Last Dates for Submission	:	31st October, 2021 (For July, 2021 Session)
	:	15th April, 2022 (For January, 2022 Session)

Answer all the questions in the assignment which carry 80 marks in total. 20 marks are for viva voce. You may use illustrations. Place go through the guidelines regarding assignments given in the Programme Guide for the format of presentation.

Q1:

(a) Define the following terms. **(4 Marks)**

- Recurrence Relation
- Order
- Degree
- Homogeneous Recurrence Relation

(b) Find the order and degree of the following recurrences. Also state whether they are homogeneous or non-homogeneous. **(6 Marks)**

- (i) $a_n = 5a_{n-1} + n^3$
(ii) $a_n = na_{n-3} + 2^n$
(iii) $a_n = a_{n-1} + a_{n-2} + \dots + a_0$
(iv) $a_n = a^2_{n-1} + a_{n-2}a_{n-3}a_{n-4}a_{n-5}$

(c) Write a linear homogeneous recurrence relation of order k. **(2 Marks)**

Q2: Solve the followings recurrence relation using Substitution method. **(5 Marks)**

$s_n = 2s_{n-1}$
Subject to the initial condition $s_0 = 1$

Q3: State the following recurrence problems and derive its recurrence relations. **(6 Marks)**

- (i) Tower of Hanoi
(ii) Power set

Q4: What kind of recurrence relations are solved by the following methods: **(8 Marks)**

- (a) Method of Inspection
(b) Method of Telescoping sums

Explain through examples.

Q5: (a) Draw the following graphs and compute its chromatic numbers. **(8 Marks)**

- (i) Peterson graph
(ii) Grotzsch graph
(iii) C_6
(iv) $K_{3,3}$

(b) Construct a graph with a chromatic number 5. **(4 Marks)**

Q6: Solve the following recurrence relation by a Substitution method. **(5 Marks)**

$$t_n = t_{n-1} + n^2 \text{ for } n > 1$$
$$t_1 = 1$$

Q7:

(a) How can you identify whether a graph is Hamiltonian? Explain through an example. Is a Hamiltonian graph Eulerian? **(4 Marks)**

(b) What are the conditions stated in Hamiltonian theorems for a graph to be Hamiltonian? Explain. **(4 Marks)**

Q8: Prove the following statements: **(10 marks)**

(a) The sum of degrees of all vertices in a graph G is twice the number of edges in G .

(b) For a subgraph H of a graph G , $\Delta(H) \leq \Delta(G)$

Q9: find the generating functions for the following sequences 1, 1, 1, 1, 1, 0, 0, 0, 0, **(5 Marks)**

Q10:

(a) How do you prove the graphs are isomorphic? Are the two graphs isomorphic if they have the same degree of sequence. Explain. **(5 Marks)**

(b) Is it possible to draw a 3-regular graph on five vertices? Justify. **(4 Marks)**

Course Code	:	MCS-034
Course Title	:	Software Engineering
Assignment Number	:	MCA(III)/034/Assign/2021-22
Maximum Marks	:	100
Weightage	:	25%
Last Dates for Submission	:	31th October, 2021(For July, 2021 Session) 15th April, 2022 (For January, 2022 Session)

This assignment has one question for 80 marks. 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.

Q1:

Assume that you are assigned responsibility of developing an **Online Examination System (OES)** which caters to both Objective Type Questions and Essay Type Questions for a University. **OES** will have all fields such as Programme Code, Programme Title, Course Code, Course Title, Time, Max. Marks etc. There should be provision for generation of reports. Make necessary assumptions.

For developing **OES** as specified above,

- | | |
|--|-------------------|
| (a) Which SDLC paradigm will be selected. Justify your answer. | (10 Marks) |
| (b) List the functional and non-functional requirements. | (20 Marks) |
| (c) Estimate cost. | (15 Marks) |
| (d) Estimate effort. | (15 Marks) |
| (e) Develop SRS using IEEE format. | (15 Marks) |
| (f) List queries for whom Reports can be generated | (5 Marks) |

Course Code	:	MCS-035
Course Title	:	Accountancy and Financial Management
Assignment Number	:	MCA(III)/035/Assignment/2021-22
Maximum Marks	:	100
Weightage	:	25%
Last Dates for Submission	:	31st October, 2021 (For July, 2021 Session)
	:	15th April, 2022 (For January, 2022Session)

Note: This assignment has five questions. Answer all questions. 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.

Q1: Explain the meaning and significance of the following: **(16 Marks)**

- (a) Money measurement concept
- (b) Cost concept
- (c) Conservatism concept
- (d) Periodicity concept

Q2: From the following information prepare final accounts: **(16 Marks)**

Trial Balance as on 31st March, 2021

Purchases (Adjusted)	1,49,600	Sales	1,60,000	1,60,000
Wages	10,450	Capital	37,550	37,550
Rent of Building	4,200	Commission	450	450
Insurance and Rates (including premium of Rs. 150 p.a. paid upto 31-12-2001)	200	Creditors	15,000	15,000
Stock (30-6-2001)	20,625			
Cash	925			
Loose Tools	2,000			
Plant	17,000			
Debtors	3,000			
Sundry expenses	5,000			
	2,13,000			2,13,000

Adjustments:

1. Loose tools were valued at Rs. 1,600 on 31-03-2021
2. Depreciate plant by 10%.
3. Manager is entitled to a commission of 10% of net profits after charging such commission.
4. Provide 5% for doubtful debts.
5. One-third of the building was occupied by the employees who reside in the business building. Treat the value of the perquisite as wages.
6. Wages include Rs. 500 paid for the installation of a plant on 1-1-2021
7. Loss of stock by fire on 20/3/2021 amounted to Rs. 10,000 and 10% claim was admitted by the Insurance Company.

- Q3:** Define 'Financial Management' and discuss its main functions. Discuss the objectives of financial management. **(16 Marks)**
- Q4:** What are the various types of 'Investment Decisions'? Explain in detail the various 'Capital Budgeting Techniques'. **(16 Marks)**
- Q5:** What is 'Receivables Management'? Explain in detail the quantitative effect of relaxing the four dimensions of a firm's credit policy. **(16 Marks)**

Course Code	:	MCSL-036
Course Title	:	Lab course for OOAD, S/E and Accountancy & Financial Management
Assignment Number	:	MCA(III)/L036/Assignment/2021-22
Maximum Marks	:	100
Weightage	:	25%
Last Dates for Submission	:	31st October, 2021 (For July, 2021 Session)
	:	15th April, 2022 (For January, 2022 Session)

Note: The assignment has three components. Answer all the questions in each section. Assignment marks of section A, section B and section C are 13, 13 and 14 respectively. The lab records of section A, section B and section C carry 13, 13 and 14 respectively. The rest 20 marks are for Vive voce.

Section A- Object Oriented Analysis and Design

Q1: You are required to develop a mobile app for cab booking which should have the following features:

- Create and manage profiles of a frequent customers and drivers
- On-demand cab booking
- Real time cab tracking and provide trip information to customers
- Online payment
- Feedback by users and cab drivers.
- SMS Alerts
- Booking cancellation

- (a) Draw an Use Case diagram **(2 Marks)**
 (b) Define all classes and a class diagram **(4 Marks)**
 (c) Draw a simple object model **(4 Marks)**
 (d) Draw a state transition diagram **(3 Marks)**

Section B: Software Engineering

Q2: for the problem defined in the Section A perform the following tasks :

- (a) Draw DFDs (Level 0 and Level 1) **(4 Marks)**
 (b) Identify important modules in developing the mobile app **(2 Marks)**
 (c) Write procedures for implementation of 2 modules of the mobile app **(7 Marks)**

Section C: Accountancy and Financial Management

Q3: The following transactions of a company to prepare the formal ledges and trial balance. **(14 Marks)**

March 2021	Transaction	Amount
3 rd March	Started business with cash	500000.00
7 th March	Deposited in a bank	250000.00
12 th March	Purchased computers and peripheral devices on credit	200000.00
15 th March	Purchased furnitures on credit	100000.00
17 th March	Purchased software on cash	50000.00
20 th March	Sold application software on credit	50000.00
29 th March	Paid rent	60000.00
30 th March	Paid Salary to staff	150000.00