MASTER OF COMPUTER APPLICATIONS

(MCA)

MCA/ASSIGN/III/YEAR/2012

ASSIGNMENTS
Year, 2012-13

(3rd Semester)

(MCS-031, MCS-032, MCS-033, MCS-034, MCS-035, MCSL-36)

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

CONTENTS

Course Code	**:**	**MCS-031**
Course Title	**:**	**Design and Analysis of Algorithms**
Assignment Number	**:**	**MCA (3)/031/Assign/2012**
Maximum Marks	**:**	**100**
Weightage	**:**	**25%**
Last Dates for Submission	**:**	**15th October, 2012 (For July 2012 Session)** **15th April, 2013 (For January 2013 Session)**

There are ten questions in this assignment, which carries 80 marks. Rest 20 marks are for viva-voce. Answer all the questions. You may use illustration and diagrams to enhance the explanations. Please go through the guidelines regarding assignments given in the MCA Programme Guide for the format of presentation. The examples, whenever asked to be given, should be different from those that are discussed in the course material.

Question1: Using Insertion Sort, sort the following sequence in increasing order and do the analysis of the algorithm: 35, 37, 18, 15, 40, 12 **(10 marks)**

Question 2: Write a pseudocode for divide and conquer algorithm for finding the position of an array of *n* numbers and estimate the number of key comparisons made by your algorithm. **(10 marks)**

Question 3: Apply quicksort to sort the following list: Q U I C K S O R T in alphabetical order. Find the element whose position is unchanged in the sorted list. **(10 marks)**

Question 4: Write Strassen's matrix multiplications algorithm for obtaining the product of two matrices. **(10 marks)**

Question 5: (i) Define DFS. Explain briefly how it differs from BFS. **(10 marks)**
(ii) Write pseudocode for DFS and calculate its time complexity

Question 6: Apply Kruskal's algorithm to find minimal spanning tree with an example. **(10 marks)**

Question7: Arrange the following growth rates in increasing order:
$O(3^n)$, $O(n^2)$, $O(1)$, $O(n \log n)$ **(4 marks)**

Question 8: Using Principle of Mathematical Induction, prove that the sum $2^0 + 2^1 + \ldots + 2^n$ is $2^{n+1} - 1$ for all $n \geq 1$. **(6 marks)**

Question 9: Define Knapsack Problem and cite one instance of the problem. **(5 marks)**

Question 10: Explain the essential idea of Dynamic Programming. How does Dynamic Programming differ from Divide and conquer approach for solving problems? **(5 marks)**

Course Code	**:**	**MCS-032**
Course Titlle	**:**	**Object Oriented Analysis and Design**
Assignment Number	**:**	**MCA(3)/032/Assign/2012**
Assignment Marks	**:**	**100**
Weightage	**:**	**25%**
Last Dates for Submission	**:**	**15th October, 2012 (For July 2012 Session)** **15th April, 2013 (For January 2013 Session)**

There are eight questions in this assignment, which carried 80 marks. Rest 20 marks are for viva-voce. Answer all the questions. Make necessary assumptions where ever required. Please go through the guidelines regarding assignments given in the Program Guide for the format of presentation.

Question 1: What is Object Orientation? Explain features of Object Oriented approach of system design. Why it is better than Structured approach of system design. **(10 Marks)**

Question 2: What is UML? Briefly explain, different UML Diagrams used for Modeling. **(10 Marks)**

Question 3: What is class diagrams? Explain how classes are identified in designing of an object oriented system, with the help of an example. **(10 Marks)**

Question 4: What is generalization? Explain how it is different from specialization with an example. **(10 Marks)**

Question 5: What is dynamic model? Also explain how it is different from object model. **(10 Marks)**

Question 6: What is state diagram ? Differentiate between a simple state diagram and a composite state diagram. Draw state diagram for Railway Reservation System. **(10 Marks)**

Question 7: What is Bi-directional Implementation? Explain advantages of Bi- directional Implementation with example. **(10 Marks)**

Question 8: What is ternary association? Explain how ternary associations are mapped into tables with an example. **(10 Marks)**

Course Code	**:**	**MCS-033**
Course Title	**:**	**Advanced Discrete Mathematics**
Assignment Number	**:**	**MCA(3)/033/Assign/2012**
Maximum Marks	**:**	**100**
Weightage	**:**	**25%**
Last Dates for Submission	**:**	**15th October, 2012 (For July 2012 Session)** **15th April, 2013 (For January 2013 Session)**

There are FIVE questions of total 80 marks in this assignment. Answer all questions. 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.

Question 1: (a) Using Karnaugh map, simplify
X': A'BC'D'+ ABCD+ ABCD'+ ABCD' **(5 Marks)**

(b) Describe Konigsberg's 7 bridges problem and Euler's solution to it. B **(5 Marks)**

(c) Show that the sum of the degrees of all vertices of a graph is twice the number of edges in the graph. **(5 Marks)**

Question 2: (a) Let G be a non directed graph with 12 edges. If G has 5 vertices each of degree 3 and the rest have degree less than 3, what is the minimum number of vertices G can have? **(5 Marks)**

(b) What is Graph Cloning? Explain K-edge cloning with an example. **(5 Marks)**

(c) Let f(n)= 5 f(n/ 2) + 3 and f(1) = 7. Find f(2k) where k is a positive integer. Also estimate f(n) if f is an increasing function. **(5 Marks)**

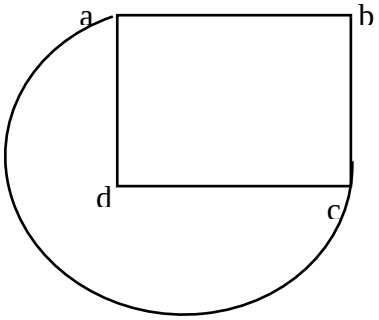
Question 3: (a) Define r-regular graph. Give an example of 3-regular graph. **(5 Marks)**

(b) $Let\ A = \{X \in R : X \neq 1\}\ and\ define\ f(x) = \frac{2x}{x-1}$

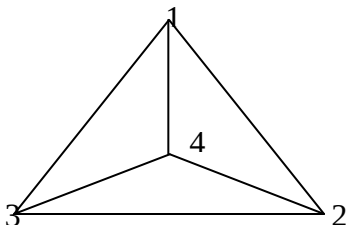
f is bijective function with Range of f as the

$set\ B = \{y \in R : y \neq 2\}.\ Find\ f^{-1}(y)$ **(5 Marks)**

(c) What are isomorphic graphs? Are the graphs given below isomorphic? Explain why? **(7 Marks)**



(i)



(ii)

(d) What is connected Graph? Construct a graph with chromatic number 5. **(4 Marks)**

Question 4:

(a) Solve following recurrence relations **(9 Marks)**

i) $a_n = a_{n-1} + n, \quad a_0 = 2$

using substitution method

ii) $a_n - 9\,a_n - 1 + 26\,a_{n-2} + 24\,a_{n-3} = 0 \; for \; n \geq 3$

iii) $a_n = a_{n-1+2,}\; n \geq 2$

(b) Write a short note on Tower of Hanoi Problem. How can it be solved using recursion ? **(4 Marks)**

Question 5:

(a) Show that for subgraph H of a graph G **(4 Marks)**

$\Delta (H) \leq \Delta (G)$

(b) What is Divide and Concuer relations? Explain with an example? **(4 Marks)**

(c) Find a power series associated with the problem where we have to find a number of ways to select 10 people to form and expert committee from 6 Professors and 12 Associate Professors. **(4 Marks)**

(d) Tree is a Bipartite Graph" justify the statement with an example? **(4 Marks)**

Course Code	**:**	**MCS-034**
Course Title	**:**	**Software Engineering**
Assignment Number	**:**	**MCA(3)/034/Assign/12**
Maximum Marks	**:**	**100**
Weightage	**:**	**25%**
Last Dates for Submission	**:**	**15th October, 2012 (For July 2012 Session)** **15th April, 2013 (For January 2013 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.

Question 1:

Assume that you are assigned responsibility of developing a Student Admission System (SAS). Admissions take place through various modes such as accepting applications by post, online etc. SAS should accept data from all modes and create a merit list for admissions to various programmes offered by the University.

For developing SAS as specified above,

(a) Which SDLC paradigm will be selected. Justify your answer. **(20 marks)**
(b) List the functional and non-functional requirements. **(10 marks)**
(c) Estimate cost **(10 marks)**
(d) Estimate effort **(10 marks)**
(e) Develop SRS using IEEE format **(30 marks)**

Course Code	**:**	**MCS-035**
Course Title	**:**	**Accountancy and Financial Management**
Assignment Number	**:**	**MCA (3)/035/Assign/2012**
Maximum Marks	**:**	**100**
Weightage	**:**	**25%**
Last Dates for Submission	**:**	**15th October, 2012 (For July 2012 Session)** **15th April, 2013 (For January 2013 Session)**

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.

Question 1:

From the following Trial Balance of Rama Nand Sagar, prepare Trading and Profit & Loss Account for the year ended 31st December, 2011 and a Balance Sheet as on that date:-

Dr. Balances	Rs.	Cr. Balances	Rs.
Opening Stock	20,000	Sales	2,70,000
Purchases	80,000	Purchase Return	4,000
Sales Return	6,000	Discount	5,200
Carriage Inwards	3,600	Sundry Creditors	25,000
Carriage Outwards	800	Bills Payable	1,800
Wages	42,000	Capital	75,000
Salaries	27,500		
Plant & Machinery	90,000		
Furniture	8,000		
Sundry Debtors	52,000		
Bills Receivable	2,500		
Cash in Hand	6,300		
Travelling Expenses	3,700		
Lighting	1,400		
Rent and Taxes	7,200		
General Expenses	10,500		
Insurance	1,500		
Drawings	18,000		
	3,81,000		3,81,000

Adjustments:-

(1) Stock on 31st December, 2011 was valued at Rs. 24,000 (Market Value Rs. 30,000).

(2) Wages outstanding for December, 2011 amounted to Rs. 3,000.

(3) Salaries outstanding for December, 2011 amounted to Rs. 2,500.

(4) Prepaid insurance amounted to Rs. 300.

(5) Provide depreciation on Plant and Machinery at 5% and on Furniture at 20%.

(20Marks)

Question 2:

Following are the balance sheets of a limited company as on 31st December, 2010 and 2011.

Liabilities	2010 Rs.	2011 Rs.	Assets	2010 Rs.	2011 Rs.
Share Capital	64,000	84,000	Goodwill	3,000	2,250
Reserves	13,000	15,500	Buildings	50,950	48,000
B. & L A/c	8,600	8,800	Plant	35,000	43,000
Bank Loan (Long-term)	25,000	---	Stock	25,500	18,800
			Debtors	42,000	36,200
Creditors	38,000	34,000	Cash	150	180
Bills Payable	8,000	8,500	Bank	---	2,100
	1,56,600	1,50,800		1,56,600	1,50,800

Taking into account the following additional information, you are re-required to prepare funds flow statement and statement of changes in working capital.

(a) Dividend paid was Rs.6,000/-

(b) Rs.3,600/- was written off as depreciation on plant and Rs.2,950/- on buildings.

(c) Profit on sale of plant was Rs.3,000/-

(20 Marks)

Question 3:

The following are the ratios extracted from the Balance Sheet of a company as on 31st Dec 2011. Draw up the Balance Sheet of the company.

Current Liabilities	1.0
Current Assets	2.5
Liquidity Ratio	1.5
Stock Turnover Ratio (Based on COGS)	6
Fixed Assets Turnover Ratio (Based on sale)	2
Gross Profit as percentage of sales	20%
Debtor collection period	2 Months
Working capital	Rs.3, 00,000
Shareholders Capital	Rs.5, 00,000
Reserve and Surplus	Rs.2, 50,000

(20 Marks)

Question 4: Critically examine the various methods of evaluation of capital budgeting proposals? Explain the significance and application of the technique of discounted cash-flow. **(20 Marks)**

Question 5: What do you mean by receivable management? What are its objectives? Explain the dimensions of receivable management. **(20 Marks)**

Course Code	**:**	**MCSL-036**
Course Title	**:**	**Lab Course**
Assignment Number	**:**	**MCA (3)/036L/Assign/2012**
Maximum Marks	**:**	**100**
Weightage	**:**	**25%**
Last Dates for Submission	**:**	**31st October, 2012 (For July 2012 Session)** **30th April, 2013 (For January 2013 Session)**

This assignment has three sections. Answer all the questions in each section. Section 1 and Section 2 are of 13 marks each. The lab records related to these sections also carries 13 marks each. Section 3 and lab records related to section 3 carry 14 marks each. 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.

SECTION 1: MCS-032

Question 1:

Ram and Shyam are starting a breakfast in a small town. They will have three bedrooms for guests. They want to develop software service to manage the reservations and to monitor expenses and profits. When a potential customer calls for a reservation, they will check the calendar, and if there is a vacancy, they will enter the customer name, address, phone number, dates, agreed upon price, credit card number, and room number(s). Reservations must be guaranteed by 1 day's payment.

Reservations will be held without guarantee for an agreed upon time. If not guaranteed by that date, the reservation will be dropped.

i) Draw at least two use case diagrams and define all the classes.	**(2 marks)**
ii) Draw the Sequence and Collaboration Diagrams.	**(3 marks)**
iii) Draw the Class Diagrams.	**(3 marks)**
iv) Draw the State Transition Diagram.	**(3 marks)**
v) Draw the Component Deployment Model.	**(2 marks)**

SECTION 2: MCS-034

Question 1:

An automobile dealer wants to automate its inventory. It can record all of the cars that a customer purchases. It records all repairs. It records all arriving shipments of repair parts. The dealer wants daily reports on total daily repairs, daily sales, and total inventory. This report is called "dailyreport." The dealer also keeps track of all customers and potential customers that visit the dealership. The dealer also wants a monthly report showing all visits and purchases by customers listed by day of the month. The dealer also wants the ability to query about any customer or potential customer.

i) Develop the SRS by performing requirements study. **(2 marks)**

ii) Identify various processes of the system and generate the DFD's for the system. You may use any software to develop the DFD. **(2 marks)**

iii) Design the ER diagram for the company and do the database design giving all the constraints. **(2 marks)**

iv) Perform the detailed procedural design for any two processes. **(2 marks)**

v) Create at least four test cases for each of the procedures designed in part (iv) **(2 marks)**

vi) Suggest some security mechanism for the usage of the system with various privileges. **(2 marks)**

vii) Draw the PERT diagram for the given set of tasks and dependencies. Complete the table showing the critical path and the slack time. **(2 marks)**

SECTION 3: MCS-035

Question 1:

Prepare Trading Account and Profit and Loss A/c of Mr. Sanyam and Balance Sheet from the following balances extracted from books for the year ending 31st March 2009:

(14 marks)

Trial Balance of Mr. Sanyam as on 31st March, 2009

	Dr.	Cr.
Particulars	**Amount (Rs.)**	**Amount (Rs.)**
Cash Account	1,520	
Bank Account	17,425	
Machinery Account	10,000	
Furniture A/c	900	
Stock (1-4-2005)	4,000	
Purchase A/c	2,750	
Discount Allowed	50	
Repair A/c	100	
Cartage A/c	50	
Municipal Taxes	100	
Advertising A/c	100	
Rent A/c	150	
Salaries	300	
Bad debts A/c	500	
Capital		18,750
Bad debts recovered A/c		150

Discount Received		45
Sales		15,000
Loan @ 12% p.a.		2,000
Shyam Bros.		2,000
	37,945	**37,945**

Following adjustment are to be made:

(i) Salaries Outstanding Rs. 200, Prepaid Rent Rs. 50.
(ii) Provide depreciation on machinery at 10%; write off furniture by 20%.
(iii) Interest on loan has been due for one year and remained unpaid.
(iv) Write off Rs. 400 which are not to be paid to Shyam Bros.
(v) Provide interest on capital @6% p.a. for full year.
(vi) Value of closing stock on 31.3.2006 was Rs. 8,000.