

MASTER OF COMPUTER APPLICATIONS (MCA)

MCA/ASSIGN/SEMESTER-III

**ASSIGNMENTS
(July - 2017 & January - 2018)**

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



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

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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 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(3)/031/Assignment/17-18
Maximum Marks	:	100
Weightage	:	25%
Last Dates for Submission	:	15th October, 2017 (For July 2017 Session)
	:	15th April, 2018 (For January 2018 Session)

There are eight questions in this assignment, which carries 80 marks. Rest 20 marks are for viva-voce. Answer all the questions. You may use illustrations 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.

1. Write Insertion sort algorithm. Determine its complexity in Best, Average and Worst Case. Sort the following sequence in increasing order: 35, 37, 18, 15, 40, 12; Using Insertion Sort. *(10 Marks)*

2. Give a divide and conquer based algorithm (Write a pseudo-code) to perform following: *(10 Marks)*
 - (i) find the is smallest element in an array of size. Derive the running time complexity of your algorithm.
 - (ii) finding the position of an element in an array of n numbers

Estimate the number of key comparisons made by your algorithms.

3. Write Quick Sort Algorithm. How is it Different from Randomized Quick Sort Algorithm? Prove that that Worst case of Quick Sort is Best case of Bubble Sort. Apply Quick sort Algorithm 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)*

4. Explain how dynamic programming reduces the complexity of a simple algorithm. Also explain the matrix chain multiplication algorithm in this context. Derive the principle of optimality for multiplication of matrix chain. Compute the optimal multiplications required following matrices.
A1 of order 30 x 35; A2 of order 35 x 15; A3 of order 15 x 5 *(10 Marks)*

5. Differentiate Between *(10 Marks)*
 - (i) Greedy technique and Dynamic programming technique
 - (ii) NP-Complete & NP Hard Problems
 - (iii) Decidable & Un-decidable problems
 - (iv) Context free & Context sensitive Language
 - (v) Strassen's Algorithm & Chain Matrix Multiplication algorithm

6. **Answer the Following:**

(10 Marks)

- (i) Explain the meaning of Big O notation with suitable example. How does it differ from Theta and Omega notations. Arrange the following growth rates in increasing order: $O(3n)$, $O(n^2)$, $O(1)$, $O(n \log n)$
- (ii) Explain the essential idea of Dynamic Programming. How Dynamic programming differs from Divide and conquers approach for solving the problems?
- (iii) Define Knapsack Problem and cite one instance of the knapsack problem. Compare Knapsack Problem with fractional knapsack problem. Give a Greedy algorithm for fractional Knapsack Problem.
- (iv) Write pseudo code for DFS and calculate its time complexity. Explain briefly how DFS differs from BFS
- (v) Write Prim's Algorithm. How Prim's algorithm differs from Kruskal's algorithm. Illustrate with the help of an example

7. **Answer the Following:**

(10 Marks)

- (i) Write a context free grammar to generate palindromes of even length Over alphabet $\Sigma = \{a,b\}$.
- (ii) Write the finite automata corresponding to the regular expression $(a+b)^*ab$.
- (iii) Explain the Chomsky's Classification of grammars. What is an ambiguous grammar? How do you prove that a given grammar is ambiguous? Explain with an example.
- (iv) If L_1 and L_2 , are context free languages then, prove that $L_1 \cup L_2$ is a context free language.
- (v) Construct a Turing Machine (TM) that copies a given string over $\{a, b\}$. Further find computation of TM for the string 'aab'.

8. **Write note on each of the following:**

(10 Marks)

- (i) Halting problem
- (ii) Rice theorem
- (iii) Post correspondence problem
- (iv) K-colourability problem
- (v) Independent set problem

Course Code	:	MCS-032
Course Title	:	Object Oriented Analysis and Design
Assignment Number	:	MCA(3)/032/Assignment/17-18
Assignment Marks	:	100
Maximum Marks	:	25%
Last Date of Submission	:	15th October, 2017 (For July 2017 Session)
	:	15th April, 2018 (For January 2018 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.

1. What is OOAD? Explain concepts of generalization and specialization in OOAD, with the help of examples. *(10 Marks)*
2. What is class diagram ? Draw class diagram for Online Banking System. *(10 Marks)*
3. Explain advantage of use case diagram? Draw use case diagram for Online Banking System. *(10 Marks)*
4. Draw a sequence diagram for Online Movie Ticket Booking System. *(10 Marks)*
5. (a) What is inheritance ? Explain its advantages. *(5 Marks)*
(b) What is dynamic modeling? Explain its advantages. *(5 Marks)*
6. Explain relation of functional model with object model and dynamic model. *(10 Marks)*
7. Draw a DFD for Online Admission System of an University. Make necessary assumptions required. *(10 Marks)*
8. Write short note on followings (minimum in 300 words) *(10 Marks)*
 - i) One –way association and two-way association
 - ii) Issues in Concurrency Control

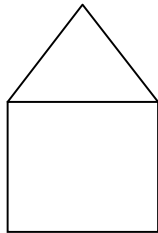
Course Code	:	MCS-033
Course Title	:	Advanced Discrete Mathematics
Assignment Number	:	MCA(3)/033/Assignment/17-18
Maximum Marks	:	100
Weightage	:	25%
Last Dates for Submission	:	15 th October, 2017 (For July 2017 session) 15 th April, 2018 (For January 2018 session)

This assignment has eleven questions, which carries 80 marks. Answer all the questions. The rest 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.

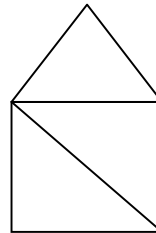
- Write generic formulae for a linear homogenous recurrence relation of order K with constant coefficient. Write all the steps for solving this type of a recurrence relation. (5 Marks)
- Write whether or not each recurrence relation in the following problems is a linear homogeneous with constant coefficient.. Also show the order of each linear homogeneous recurrence relation. (10 Marks)
 - $a_n = -7a_{n-1}$
 - $a_n = 6n a_{n-1}$
 - $a_n = -a_{n-1} + 7a_{n-2} - 8a_{n-3}$
 - $a_n = a_{n-1} + 5^{n-1}$
 - $a_n = 6n a_{n-2} + a_{n-1}$
- Solve the following recurrence relations using substitution (15 Marks)
 - $a_n = a_{n-1} + 7$
 $a_1 = 3$
 - $a_n = 2^n a_{n-1}$ $n > 0$ with initial condition $a_0 = 1$
 - $a_n = 6a_{n-1} - 8a_{n-2}$; $a_0 = 1, a_1 = 0$
- The population of tigers increases 4 percent per year. In 2000 the population was 15000. What was the population 30 years back i.e in year 1970? (7 Marks)
- A person invests Rs. 5000 of 10% interest compounded annually. If A_n represents the amount at the end of n years, find a recurrence relation and initial condition that defines the sequence $\{A_n\}$. (7 Marks)
- Use induction to show that if $r \neq 1$ (7 Marks)

$$a + ar + ar^2 + \dots + ar^n = \frac{a(r^{n+1} - 1)}{(r - 1)}$$

7. What are the practical application of Hamilton path & circuit? State Dirac's and Ore's theorems for a Hamilton circuit. (5 Marks)
8. For the following graphs, determine (6 Marks)
- Whether Dirac's theorem can be used to show that the following graphs have a Hamilton circuit?
 - Whether Ore's theorem can be used to show that the following graphs have a Hamilton circuit?
 - Whether the following graphs have a Hamilton circuit?



(a)



(b)

9. What are the chromatic numbers of K_n and C_n respectively? For which value of n are these graphs regular? Also draw the above graphs. (6 Marks)
10. Determine the number of subsets of a set of n elements, $n \geq 0$ (6 Marks)
11. Explain the following terms with the help of examples: (6 Marks)
- Exponential Generating Function
 - Combinatorial Identities
 - Partitions

Course Code	:	MCS-034
Course Title	:	Software Engineering
Assignment Number	:	MCA(3)/034/Assignment/17-18
Maximum Marks	:	100
Weightage	:	25%
Last Dates for Submission	:	15th October, 2017 (For July 2017 session) 15th April, 2018 (For January 2018 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.

1. Assume that you are assigned responsibility of developing an **Online Admission System (OAS)** for a University. **OAS** will have all necessary fields that are essential for obtaining necessary information from the applicant, scrutiny, and recommending admission. After Application Form for Admission is submitted, the data in the various needs to be validated by OAS regarding eligibility, existence of PINCODE etc. Appropriate e-mail should be sent to student acknowledging the submission of admission form online. Make necessary assumptions.

For developing **OAS** 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. *(20 Marks)*

Course Code	:	MCS-035
Course Title	:	Accountancy and Financial Management
Assignment Number	:	MCA(3)/035/Assignment/17-18
Maximum Marks	:	100
Weightage	:	25%
Last Dates for Submission	:	15th October, 2017 (For July 2017 Session) 15th April, 2018 (For January 2018Session)

This assignment has five questions. Answer any four 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.

1. a. What are the objectives and functions of financial (20 Marks) Management? Explain in detail.
b. List out and explain the important methods of investment proposals and discuss the conflicting opinions on the fundamentals of these different basic approaches?
2. The following is the trial balance of New Fashions Pvt. Ltd. As (20 Marks) on 31st March 2016

Amount (Rs.)

Sl. No	Account Heads	Debit	Credit
1	Premises	3,60,800	
2	Plant and machinery	4,95,000	
3	Opening inventory	1,12,500	
4	Debtors	1,06,050	
5	Land	87,500	
6	Cash in	4,725	
7	Current account –ABN Amro Bank	45,500	
8	Bills receivable	58,875	
9	Purchases	27,00,000	
10	Preliminary expenses	7,500	
11	Wages	86,970	
12	General expenses	10,252	
13	Salaries	90,338	

14	Bad Debts	3,165	
15	Interest on term loan	27,000	
16	Equity share capital		3,00,000
17	10% Preference share capital		1,00,000
18	Secured term loan from Delhi Financial Corporation @ 12% p.a		4,50,000
19	P&L A/C balance as on 1 st April 2016		39,375
20	Bills payable		55,500
21	Creditors		83,000
22	Sales		31,20,000
23	General reserves as on 1 st April 2016		37,500
24	Central sales tax payable		10,800
	Total	41,96,175	41,96,175

Further information:-

- (i) Authorised share capital of the company is as under
 - (1) 1,00,000 equity shares of Rs. 10 each
 - (2) 1,000 preference shares of Rs. 100 each.
- (ii) Issued share capital of the company is as under
 - (1) 30,000 equity shares
 - (2) 1,000 preference shares
- (iii) Depreciation is to be provided for @ 10% on premises and 14 % on plant and machinery
- (iv) 20% of preliminary expenses are to be written off.
- (v) Interest on term loan is due for six month
- (vi) Bills receivable Rs. 25,000 were dishonoured. Effect was not carried out
- (vii) Doubtful debts are to be provided for Rs. 3,000
- (viii) Value of inventory on 31.03.2006 is Rs. 1,35,000

- (ix) Income Tax is to be provided for @35%
- (x) The board of directors recommends dividend on preference shares and a dividend of 12% on equity shares after transferring 5% of net profit to general reserve. Please do the rounding of general reserve to next hundred rupees. Prepare the required financial statements.

3. **Distinguish between the following:** *(20 Marks)*

- a) Fixed and current assets
- b) spot exchange rate and currency futures exchange rate
- c) discount rate and a hurdle rate
- d) IRR and payback

4. **Briefly Comment on the following:** *(20 Marks)*

- a) Capital budgeting is the process in which a business determines and evaluates potential expenses or investments that are large in nature.
- b) Efficient cash management will intend at maximizing the cash inflows and showing cash outflows.
- c) Zero NPV project indicates normal profit.
- d) Cap rate reflects current returns on a non-levered basis.

5. **Write short notes on the following:** *(20 Marks)*

- a) Outstanding Expenses
- b) Master Budget
- c) Dividend Policy
- d) Trading and Profit and Loss

Course Code	:	MCSL-036
Course Title	:	Object Oriented Analysis and Design Software Engineering and Accounting and Financial Management.
Assignment Number	:	MCA(3)/L-036/Assignment/17-18
Maximum Marks	:	100
Weightage	:	25%
Last Dates for Submission	:	15th October, 2017 (For July 2017 session) 15th April, 2018 (For January 2018 session)

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 marks respectively. Rest 20 marks are for Vive voce.

Section A: MCS-032 Object Oriented Analysis and Design

1. Internet banking is an electronic payment system that facilitates customers of a bank or other financial institutions to conduct a wide range of financial transactions through the financial institution's website. To access financial institutions' website, a customer need to register with the institution for the services and provide all the details for the verification. Based on the verification, customers are allocated passwords.

The customer visits the financial institution's secure website, enter the password and then does financial transactions. The financial transactions include obtaining account balances, payment through e-wallets, a list of recent transactions, electronic bill payment, and fund transfer from a customer' accounts to another account. Most banks also allow customer to download copies of bank statements, which can be printed at the customer's premises. Some banks may charge for mailing hard copies. The facility may also enable the customers to order a cheque book, statements, report loss of credit cards and stop payment on a cheque.

The bank also has a provision of an online feedback facility to customers in order to improve its services

Do the following tasks for the above internet banking problem.

1. Draw use case diagram *(2 Marks)*
2. Define all classes and a class diagram *(4 Marks)*
3. Draw a simple object model *(4 Marks)*

4. Draw a state transition diagram (3 Marks)

Section B: MCS-34: Software Engineering

2. For the Internet Banking problem discussed in a section A do the following tasks:
1. Develop SRS (4 Marks)
 2. Draw Data Flow Diagrams(level 0, level 1) (4 Marks)
 3. Draw an E-R diagram and its related normalized tables (5 Marks)

Section C: MCS-035: Accountancy and financial Management

3. Post the following transactions of a book shop to prepare the journal, ledger and trial balance: (14 Marks)

March 2017	Transaction	Amount
5 th March	Started business with cash	1,50000.00
10 March	Deposited In the bank	70,000.00
15 March	Purchased books and magazines for cash	60,000.00
20 March	Purchased Furniture for cash	40,000.00
25 March	Sold booksfor cash	90,000.00
27 March	Paid salary to staff	25,000.00
31 March	Paid rent	30,000.00