MASTER OF COMPUTER APPLICATIONS

(MCA)

ASSIGNMENTS

(July - 2018 & January - 2019)

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(3)/031/Assignment/18-19**	**15th October, 2018**	**15th April, 2019**	**3**
MCS-032	**MCA(3)/032/Assignment/18-19**	**15th October, 2018**	**15th April, 2019**	**5**
MCS-033	**MCA(3)/033/Assignment/18-19**	**15th October, 2018**	**15th April, 2019**	**6**
MCS-034	**MCA(3)/034/Assignment/18-19**	**15th October, 2018**	**15th April, 2019**	**8**
MCS-035	**MCA(3)/035/Assignment/18-19**	**15th October, 2018**	**15th April, 2019**	**9**
MCSL-036	**MCA(3)/L-036/Assignment/18-19**	**15th October, 2018**	**15th April, 2019**	**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/2018-19**
Maximum Marks	:	**100**
Weightage	:	**25%**
Last Date of Submission	:	**15th October, 2018 (For July session)**
		15th April, 2019 (For January session)

Note: This assignment has 20 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.

Question 1: Obtain the minimum cost spanning tree for the following graph using PRIMS algorithm.
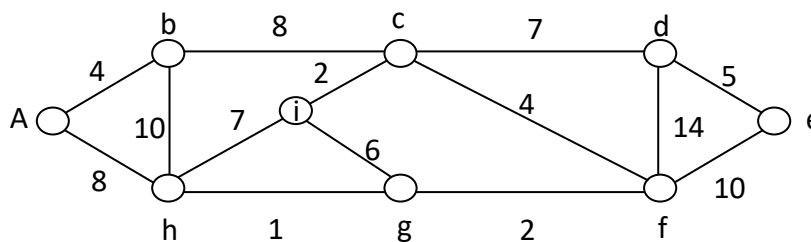
Question 2: Obtain the BFS tree for the above graph, given in Question No. 1 above

Question 3: Write a context free grammar to generate palindromes of even length Over alphabet $\sum$ = {a, b}.

Question 4: Write the finite automata corresponding to the regular expression (a + b)*ab

Question 5: Derive the principle of optimality for multiplication of matrix chain.

Question 6: 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   ; A_3 of order 15 X 5

Question 7: Explain the Chomsky's Classification of grammars.

Question 8: What is an ambiguous grammar? How do you prove that a given grammar is ambiguous? Explain with an example.

Question 9: If L_1 and L_2 are context free languages then, prove that L_1 U L_2 is a context free language.

Question 10: Define Pushdown Automata.

Question 11: Explain Decidable and Undecidable Problems. Give example for each.

Question 12: Construct a Turing machine that copies a given string over {a, b}.Also find a computation of TM for the string 'aab'.

Question 13: Explain the importance of asymptotic analysis for running time of an algorithm.

Question 14: Differentiate between NP-Complete and NP-Hand problems.

Question 15: Find the asymptotic tight bound for
$$T(n) = 2T\left(\frac{n}{4}\right) + \sqrt{n}, \text{ with } T(1) = 1.$$

Question 16: Consider a function f(n) defined as follows, Where n is a non-negative integer :

$$f(n) = \begin{cases} n & \text{if } n \leq 1 \\ n + f\left(\frac{1}{2}n\right) & \text{if } n \text{ is even, } n > 1 \\ n + f\left(\frac{1}{2}(n+1)\right) + f\left(\frac{1}{2}(n-1)\right) & \text{if } n \text{ is odd, } n > 1 \end{cases}$$

Write the recursion tree for n=5 and calculate f(n).

Question 17: Write Quick Sort Algorithm. Prove that worst case for Quick Sort is worst case for Bubble Sort. 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.

Question 18: Give a Greedy solution for the change making problem, to the make payment of amount 15597 considering the denominations {1000, 500, 100, 50, 20, 10, 5, 2, 1 }.

Question 19: Compare the Dynamic programming technique and Greedy technique for solving problems given below
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?
(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.

Question 20: 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?

Course Code	:	**MCS-032**
Course Title	:	**Object Oriented Analysis and Design**
Assignment Number	:	**MCA (III)/032/Assignment/2018-19**
Maximum Marks	:	**100**
Last Date of Submission	:	**15th October, 2018 (For July Session)**
		15th April, 2019 (For January Session)

Note: 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.

Question 1: What is OOAD? Explain why OOAD of software system should be preferred. (10 Marks)

Question 2: What is class diagram? How it is different from Object diagram? Draw class diagram for Online Examination System. (10 Marks)

Question 3: Explain advantage of use case diagram? Draw use case diagram for Online Examination System. (10 Marks)

Question 4: Draw a sequence diagram for payment using Mobile Wallet for shopping in a retail store. (10 Marks)

Question 5: (a) What is inheritance? Explain its advantages. (5 Marks)

(b) Explain Aggregation with the help of an example. (5 Marks)

Question 6: Explain relation of functional model with object model and dynamic model. (10 Marks)

Question 7: Draw a DFD upto 2nd level for Online Examination System of an University. Make necessary assumptions required. (10 Marks)

Question 8: 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/2018-19
Maximum Marks	:	100
Weightage	:	25%
Last Dates for Submission	:	15th October, 2018 (For July session)
		15th April, 2019 (For January 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.

Question 1: Give an example of a second order linear homogenous recurrence relation with constant coefficients. (2 Marks)

Question (a): Find the order and degree of the following recurrences relation|. Which of the following belongs to the linear homogenous recurrence relation with constant coefficient? (8 Marks)

(i) $f_n = f_{n-1} + f_{n-2}$

(ii) $a_n = 5a_{n-1} + n^3$

(iii) $a_n = a_{n-1} + a_{n-2} + \dots a_0$

(iv) $a_n = 5a_{n-1} a_{n-2}$

Question (b): Solve the following recurrences relation

i) $S_n = 2S_{n-1}$ (5 Marks)

ii) Find an explicit recurrence relation for minimum number of moves in which the n-disks in tower of Hanoi puzzle can be solved! Also solve the obtained recurrence relation through an iterative method.

(5 Marks)

Question 2: Draw 2-isomorphic graphs and 3 non- isomorphic graphs on five vertices. (5 Marks)

**Question 3:** Prove that the complement of $\overline{G}$ is G (5 Marks)

Question 4: Find $\lambda(G)$, when G is a Peterson graph (5 Marks)

Question 5: Write the expression for a linear homogenous recurrence relation with constant coefficients of degree K and explain the basic approach to solve it. (5 Marks)

Question 6: Draw the following graphs and state which of following graph is a regular graph? (5 Marks)

(i) C_5 (ii) W_5 (iii) Q_4 (iv) $K_{5,5}$ (v) K_5

Question 7 (a): What is a chromatic number of a graph? What is a chromatic number of the following graph? (5 Marks)
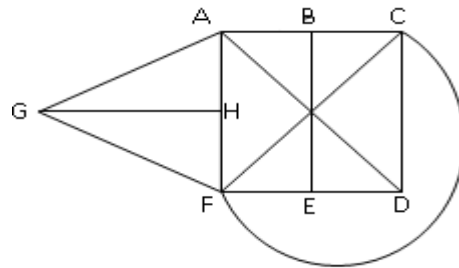
(b) Determine whether the above graph has a Hamiltonian circuit. If it has, find such a circuit. If it does not have, justify it (5 Marks)

Question 8 (a): What is the solution of the following recurrences relation
$$a_n = a_{n-1} + 2a_{n-1}, \ n \geqslant 2$$ (10 Marks)
with $a_0 = 0, a_1 = 1$
(b) $a_n = 2^n a_{n-1}, n > 0$ with initial condition $a_0 = 1$

Question 9: Show that if $G_1, G_2 \dots G_n$ are bipartite graph $\bigcup\limits_{i=1}^{n} G$ is a bipartite graph
(5 Marks)

Question 10: Determine the number of subsets of a set of n element, where $n \geqslant 0$
(5 Marks)

Question 11: Show that K_5 is not a planar graph. (5 Marks)

Course Code   :   MCS-034
Course Title   :   Software Engineering
Assignment Number   :   MCA(III)/034/Assignment/2018-19
Maximum Marks   :   100
Weightage   :   25%
Last Dates for Submission   :   15th October, 2018 (For July 2018 session)
                                15th April, 2019 (For January 2019 session)

Note: 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 an **Academic Counselor Information System (ACIS)**. ACIS will have all necessary fields that are essential for storing information about each and every academic counselor of the University Programme Wise, Course Wise, Regional Center Wise, Study Center Wise. Also, there should be provision for inclusion of Aadhar Card Number of every academic counselor and it is mandatory to include the Aadhar Card Number to apply as Academic Counselor. Stake holders should be in a position to generate reports etc. Make necessary assumptions.

For developing **ACIS** 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 (III)/035/Assignment/2018-19**
Maximum Marks	:	**100**
Weightage	:	**25%**
Last Dates for Submission	:	**15th October, 2018 (For July, 2018 Session)**
		15th April, 2019 (For January, 2019 Session)

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.

Question 1

(a) "Describe various ratios that are likely to help management of a manufacturing company forming an opinion on the solvency position of business.   (10 Marks)

(b) Under what circumstances may NPV and IRR give conflicting recommendations? Which criteria should be followed in such circumstances and why?   (10 Marks)

Question 2

What is meant by working capital management? What factors would you like to take into consideration in estimating the working capital requirement of a concern? Discuss the repercussions if a firm has inadequate working capital.   (20 Marks)

Question 4

Write short notes on the following:

(a)   Provision for bad and doubtful debts

(b)   Interest on Capital

(c)   Provision for discount on Creditors

(d)   Treatment of abnormal loss in final accounts   (10 Marks)

Question 5

Following are the balance sheets of a limited company as on 31st December, 2016 and 2017.

Liabilities	2016 Rs.	2017 Rs.	Assets	2016 Rs.	2017 Rs.
Share Capital	60,000	75,000	Furniture	36000	43,000
P & L A/c	8600	9000	Building	50950	48000
Creditors	22,000	18000	Stock	25500	20000
Bills payable	8,000	9000	Debtors	21500	15000
Bank	22000	……	Goodwill	2,500	1520
Loan(Long term)			Bank	……..	3100
Reserve	16,000	19800	Cash	150	180
	1,36,600	1,30,800		1,36,600	1,30,800

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

(a) Rs. 8,000 was paid as dividend during the year.

(b) Depreciation on Furniture was charged Rs. 4000 and on Building, it was Rs.3000.

(30 Marks)

Course Code	:	MCSL-036
Course Title	:	**Lab course for OOAD, S/E and Accountancy & Financial Management**
Assignment Number	:	MCA(III)/036L/Assignment/2018-19
Maximum Marks	:	100
Weightage	:	25%
Last Dates for Submission	:	15th October, 2018 (For July session)
		15th April, 2019 (For January 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

Question 1: As online commerce is increasing, many organizations are setting up on-line digital payment system which work as follows:

(i)   A costumer does shopping on any shopping site with a credit card or a debit card. A credit card and debit card is issued to any person after verification of all details by a bank such as identity card and the salary statement for the last six months.

(ii)   Purchasing detail goes through a payment gateway which encrypts the data to keep it private and send it to the payment processor

(iii)   The payment processor sends a request to the costumer's issuing bank to check whether they have enough credit to pay for the purchased items

(iv)   The issuing bank responds with a yes (a approval) or no (a denial)

(v)   The payment processor sends the answer back to the costumer's merchant bank to credit the account in the name of a costumer

Do the following tasks:
(1) Draw Use Case diagram	(2 marks)
(2) Define all classes and the 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

Question 2: For the digital payment problem discussed in a section A do the following tasks:

(1) Develop SRS	(4 marks)
(2) Draw Data Flow Diagrams (Level 0, Level1)	(4 marks)
(3) Draw an E-R diagram and its related normalized tables	(5 marks)

Section C: MCS-035: Accountancy and financial Management

Question 3: Post the following transactions of a chemist shop to prepare the journal, ledger and trial balance: (14 marks)

March 2018	Transaction	Amount
5th March	Started business with cash	2,50000.00
10 March	Deposited In the bank	80,000.00
15 March	Purchased medicines on credit	50,000.00
18 March	Purchased medical equipment on credit	60,000.00
20 March	Purchase Furniture for cash	60,000.00
22 March	Sold medicines for cash	60,000.00
25 March	Sold medicine on credit	90,000.00
27 March	Paid salary to staff	35,000.00
31 March	Paid rent	40,000.00