MASTER OF COMPUTER APPLICATIONS (MCA)

ASSIGNMENTS

(July - 2019 & January - 2020)

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
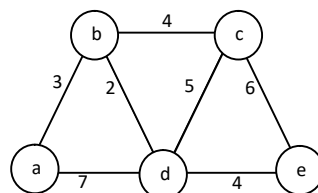
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Important Notes

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.
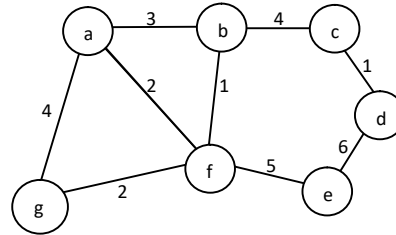
Course Code   :   **MCS-031**
Course Title   :   **Design and Analysis of Algorithms**
Assignment Number   :   **MCA(III)-031/Assignment/2019-20**
Maximum Marks   :   **100**
Weightage   :   **25%**
Last Date of Submission   :   **15th October, 2019 (For July, 2019 session)**
                                        15th April, 2020 (For January, 2020 session)

Note: This assignment has 13 questions of 80 marks (Q.no.1 to 11 are of 6 marks each, Q12 carries 10 marks and Q 13 carries 4 marks). Answer all the questions. Rest 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.

Q1. Enumerate five important characteristics of an Algorithm, and discuss any five well-known techniques for designing algorithms to solve problems. State Travelling Sales Persons problem. Comment on the nature of solution to the problem.

Q2. Write recursive binary search algorithm and compare its run time complexity with the non recursive binary search algorithm. Solve the recurrence $T(n) = 2T\,(n/2) + n$ $n \geq 2$

$$= 1 \qquad\qquad n < 2$$

Q3. Derive the principle of optimality for multiplication of matrix chain. Compute the optimal number of scalar multiplication required to multiply the following matrices.
                 A1 of order 30*35
                 A2 of order 35*15
                 A3 of order 15*5

Q4. Write Selection sort Algorithm. Use it to sort the list 90, 42, 41, 120, 60, 50. Calculate the complexity of the selection sort algorithm in best case , average case and worst case.

Q5. Sort the following elements using Heap Sort: 10, 28, 46, 39, 15, 12, 18, 9, 56, 2.Show each step, while creating a heap and processing a heap. Also determine the Best case and worst complexity of Heap sort algorithm. Prove that best case for bubble sort is worst case for heap sort

Q6. Using Dijkstra's algorithm, find the minimum distances of all the nodes from source node '**a**' for the following graph:

Q7. Obtain the minimum cost spanning tree for the following graph using Prim's algorithm.

Obtain the DFS and BFS tree for the graph given considering node **"a"** as root node.

Q8. 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. Write a context free grammar to generate palindromes of even length Over the set of alphabets $\Sigma = \{a, b\}$.

Q9. What are context free languages? how they are different from context sensitive Languages? If L_1 and L_2 are context free languages then, prove that $L_1 \cup L_2$ is context free language.

Q10. Compare Turing machine and push down automata. Construct a Turing Machine TM to accept all languages of palindromes on the set of alphabets $\Sigma = (a, b)$.

Q11. Compare Non-Deterministic Finite Automata and Deterministic Finite Automata. Write the finite automata corresponding to the regular expression $(a + b)*ab$. Also prove that for any set S of Strings $S*=(S*)*= S**$.

Q12. Differentiate the following give suitable example for each
    a. NP-hard problems and NP complete Problems.
    b. Push Down Automata and Turing Machine
    c. Decidable problems and Undecidable problems
    d. Quick Sort and Randomized quick sort
    e. Greedy Techniques and Divide & Conquer Techniques

Q13. Discuss the following with suitable example for each
    f. Vertex Cover problem
    g. Knapsac problem
    h. Strassen's algorithm
    i. Dynamic Programming

Course Code	:	**MCS-032**
Course Title	:	**Object Oriented Analysis and Design**
Assignment Number	:	**MCA (III)/032/Assignment/2019-20**
Maximum Marks	:	**100**
Last Date of Submission	:	**15th October, 2019 (For July, 2019 Session)**
		15th April, 2020 (For January, 2020 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? Explain concepts of objects and class with the help of examples and diagrams. **(10 Marks)**

Q2. What is message passing? Explain links and associations with the help of examples and diagrams. (**10 Marks)**

Q3. What are activities in Object Oriented Analysis? Critically explain challenges in Object Identification. Also explain concept of objects identity and persistent objects. (**10 Marks)**

Q4. Draw a sequence diagram for online transmission of video lecture from a Studio. Make necessary assumptions. **(10 Marks)**

Q5. What is UML? Briefly explain different types of UML diagrams. Explain advantages of using UML . **(10 Marks)**

Q6. Draw class diagram for Online admission system in Graduation Programmes of an Open University, which offer admission to the students on the basis of merit list created using marks obtained at 10+2 level. Make necessary assumptions. **(10 Marks)**

Q7. Draw a DFD for Online Banking System. Make necessary assumptions required. **(10 Marks)**

Q8. What is state diagram? Draw state diagram for online Train Ticket Booking. Make necessary assumptions required. **(10 Marks)**

Course Code   :   MCS-033
Course Title   :   Advanced Discrete Mathematics
Assignment Number   :   MCA(III)/033/Assignment/2019-20
Maximum Marks   :   100
Weightage   :   25%
Last Dates for Submission :   15ᵗʰ October, 2019 (For July, 2019 session)
                               15ᵗʰ April, 2020 (For January, 2020 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.   What is a recurrence relation? Describe the Tower of Hanoi problem and formulate the problem as recurrence relation problem. Show all the intermediate steps.   **(7 Marks)**

Q2.   Let C_n be the number of comparisons needed to sort a list of n integers. Find the recurrence relation C_n.   **(4 Marks)**

Q3.   Describe the binary search problem and formulate it as a recurrence relation problem using **divide & conquer** method. Show all the intermediate steps.   **(4 Marks)**

Q4. (a)   Define bipartite graph. Give two examples of it.   **(3 Marks)**

   (b)   Show that if $G_1, G_2, \ldots . G_3$ are bipartite, then   **(5 Marks)**

   the $\displaystyle\bigcup_{i=1}^{n}$ G is bipartite.

Q5.   Solve the recurrence relation $a_n = 2a_{n-1} + 1$ with $a_1 = 5$ for $n > 1$ by applying a substitution method.   **(6 Marks)**

Q6. (a)   Explain the exponential generating function with the help of an example   **(5 Marks)**

   (b)   Find the generating function for the sequence $0^2, 1^2, 2^2, 3^2 \ldots ..$ **(6 Marks)**

Q7. (a)   Explain the process of solving a recurrence relation by iterations with the help of an example.   **(5 Marks)**
   (b)   Write a general form of linear homogenous recurrence relation and justify, whether or not the following recurrence relations are linear homogenous recurrence relation with constant coefficient and then write the order of each.   **(6 Marks)**

   (i) $a_n = 6an_{-1} - 8^{a_{n-1}}$
   (ii) $a_n = a_{n-1} + 1 + 2^{n-1}$

Q8.   State & prove the handshaking theorem.   **(4 Marks)**

Q9.   Show that for a subgraph H of graph G, $\Delta(H) \leq \Delta(G)$ **(5 Marks)**

Q10. Give an example of a graph having Euler's circuit & Hamiltonian circuit. **(5 Marks)**

Q11. Construct a graph with chromatic number 5. **(5 Marks)**

Q12. Perform an edge coloring of Peterson graph. **(5 Marks)**

Q13. If G is a connected planar (p, q) graph then the number r of the regions of G is given by $r = q - p + 2$ **(5 Marks)**

Course Code	:	**MCS-034**
Course Title	:	**Software Engineering**
Assignment Number	:	**MCA(III)/034/Assignment/2019-20**
Maximum Marks	:	**100**
Weightage	:	**25%**
Last Dates for Submission	:	**15th October, 2019 (For July, 2019 session)**
		15th April, 2020 (For January, 2020 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.

Q1.

Assume that you are assigned responsibility of developing an **University Information System (UIS)**. UIS will have all necessary fields that are essential for storing information about all departments, Faculty and the Programmes on offer by each Department. Also, each Department will have several Disciplines. Every programme is associated with one or more disciplines. UIS should also include the brief profile of every Faculty member as well as each every programme. UIS should also include the list of Study Centers where each Programme is offered along with address and other contact information. Stake holders should be in a position to generate reports. Make necessary assumptions.

For developing **UIS** 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/2019-20**	
Maximum Marks	:	**100**	
Weightage	:	**25%**	
Last Dates for Submission	:	**15th October, 2019 (For July, 2019 Session)**	
		15th April, 2020 (For January, 2020 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.

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

     a) Business Entity Concept
     b) Continuity Concept
     c) Accrual Concept
     d) Materiality Concept

Q2. Explain the various types of investment decisions and discuss the stages of Capital Budgeting Process. Explain the various Discounted Cash Flow techniques used for capital investment evaluation. **(16 Marks)**

Q3. Explain the Operating Cycle Concept and discuss the factors influencing the working capital requirements. **(16 Marks)**

Q4. What is Receivables Management? Discuss the various credit policy variables and explain the effect of relaxing these variables on the net profit of the firm. **(16 Marks)**

Q5. From the following particulars for the year ending 31st March, 2019 of M/s. ABC Company, Prepare Trading and Profit and Loss Account and Balance Sheet on that date: **(16 Marks)**

Stock (1-4-2018)	23,200	Advertisement	15,950
Capital (1-4-2018)	1,45,000	Apprenticeship premium	3,480
Purchases	58,000	Bill Receivable	10,150
Sales	2,32,000	Bill payable	7,250
Office Expenses	23,345	Sundry Debtors	58,000
Return Inward	4,350	Plant and Machinery	13,050
Interest on Loan	870	Sundry Creditors	45,820
Return Outward	1,160	Loan (Dr.), @ 10 % on 1-4-2018	14,500
Drawings	8,700	Investment	8,700
Wages	20,010	Cash at Bank	10,150
Land and Building	1,59,500	Cash in hand	725
Furniture and Fixtures	7,250	Stock (31-3-2019)	20,300

Adjustments:

(i)   Interest on capital to be allowed at 5% for the year.

(ii)   Interest on drawings to be charged to his as ascertained for the year Rs. 232.

(iii)   Apprenticeship premium is for three years received in advance on 1st April, 2018

(iv)   Stock valued at Rs. 8,700 destroyed by fire on 25-3-2019 but the insurance company admitted a claim of Rs. 5,800 only to be paid in the year 2020

(v)   Rs. 14,500 out of advertisement expenses are to be carried forward.

(vi)   The manager is entitled to a commission of 10% at the net profit calculated after charging such commission.

(vii)   The stock includes material worth Rs. 2900 for which the bill had not been received and therefore not yet accounted for.

Course Code   : **MCSL-036**
Course Title   : **Lab course for OOAD, S/E and Accountancy &**
              Financial Management
Assignment Number : **MCA(III)/L036/Assignment/2019-20**
Maximum Marks : **100**
Weightage   : **25%**
Last Dates for Submission : **15ᵗʰ October, 2019 (For July, 2019 session)**
              15ᵗʰ April, 2020 (For January, 2020 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. As online commerce is increasing, many organizations are setting up on-line digital payment system which works 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 (approval) or no (denial)

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

 Do the following tasks:

(1)	Draw an 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

Q2. For the digital payment problem discussed in a section A do the following tasks:

(1)	Develop SRS	**(4 Marks)**
(2)	Draw Data Flow Diagrams (Level0 and Level1)	**(4 Marks)**
(3)	Draw an E-R diagram and its related normalized tables	**(5 Marks)**

Section C: MCS-035: Accountancy and financial Management

Q3. 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