MASTER OF COMPUTER APPLICATIONS (MCA)

MCA/ASSIGN/SEMESTER-III

ASSIGNMENTS

(July - 2015 & January - 2016)

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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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/15-16**
Maximum Marks	**:**	**100**
Weightage	**:**	**25%**
Last Dates for Submission	**:**	**15th October, 2015 (For July 2015 Session)** **15th April, 2016 (For January 2016 Session)**

There are seven questions in this assignment, which carries 80 marks. Rest of the 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.

In response to the questions given in the assignment, illustrations and examples should be different from those given in the course material.

1. (a) Arrange the following growth rates in increasing order: *(2 Marks)*
$O((23)^n)$, $O(n^4)$, $O(1)$, $O(n\ ^3\log n)$

   (b) Show, through appropriate examples or otherwise, that the following three characteristics of an algorithm are independent of each other. *(i.e., a method may have one of these properties, without having the other two):* *(3 Marks)*
   (i) finiteness (ii) definiteness (iii) effectiveness.

   (c) Write a recursive procedure for the sum of first n natural numbers. Then explain how your algorithm computes product of first 6 natural numbers. *(2 Marks)*

   (d) In respect of understanding a problem for solving it using a computer, explain 'understanding the problem' step. *(3 Marks)*

2. Suppose that instead of binary or decimal representation of integers, we have ternary, along with 3's complement, representation of integers, i.e., integers are represented using three digits, viz., 0, 1,2. For example, the **integer 47** is represented as **01202 = (in decimal) $1.3^3 + 2.3^2 + 0.3^1 + 2.3^0$**, where, the leading zero indicates positive sign. And the **integer (- 47) in 3's complement is represented by 11021, the** leading 1 indicates negative sign. The other digits, except the right-most, in the representation of (− 47) are obtained by subtracting from 2 the corresponding digit in 47's representation, and then adding 1 (the representation of – 47 is obtained as 11020 + 00001). *(10 Marks)*

   Write a program for the arithmetic (negation of an integer, addition, subtraction and multiplication of two integers) of integers using 3's complement representation. The program should include a procedure for calculating each of negation of an integer, addition, subtraction and multiplication of two integers. The integers will use 8-ternary digit positions, in which the left-most position will be used for sign.

Using your program find the ternary representation of each of the decimal numbers 267 and – 503.

3. (a) Write a short note on each of the following: *(4 Marks)*

   (i) Average case analysis

   (ii) amortized analysis

   (b) Using one-by-one (i) insertion sort (ii)heap sort and (iii) merge sort, sort the following sequence in increasing order and analyze (i.e., find number of comparisons and assignments in each of) the algorithm: 94, 45, 57, 18, 82, 17, 56, 40, 12 ,107 *(6 Marks)*

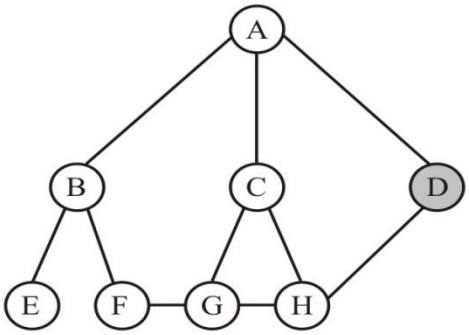
4. Explain the essential idea of each of the following *(10 Marks)*

   i) Divide and conquer

   ii) Dynamic Programming

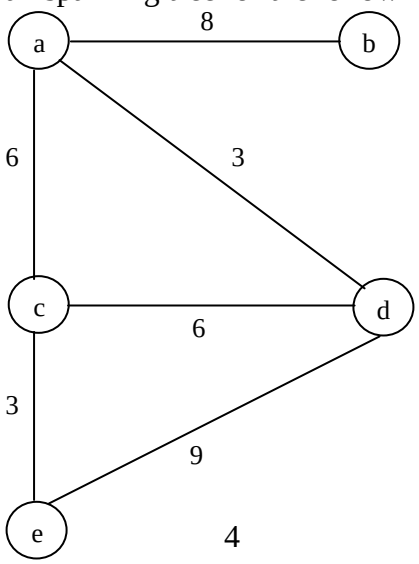
   iii) The Greedy Approach

5. (a) For the graph given in Figure below, use DFS to visit various vertices. The **vertex C** is taken as the starting vertex and, if there are more than one vertices adjacent to a vertex, then the adjacent vertices are visited in lexicographic order. *(5 Marks)*



   (b) In context of graph search, explain the minimax principle. *(5 Marks)*

6. Apply each of (i) Prim's and (ii)Kruskal's algorithms one at a time to find minimal spanning tree for the following graph *(10 Marks)*



7. Write note on each of the following: *(20 Marks)*

(i) Independent set problem

(ii) K-colourability problem

(iii) Unsolvability/ undecidability of a problem

(iv) Halting problem

(v) Reduction of a problem for determining decidability

(vi) Rice theorem

(vii) Post correspondence problem

(viii) NP-complete problem

Course Code	**:**	**MCS-032**
Course Title	**:**	**Object Oriented Analysis and Design**
Assignment Number	**:**	**MCA(III)/032/Assignment/15-16**
Maximum Marks	**:**	**100**
Weightage	**:**	**25%**
Last Dates for Submission	**:**	**15th October, 2015 (For July 2015 Session)** **15th April, 2016 (For January 2016 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 advantages of OOAD over structured analysis and design of system. *(10 Marks)*

2. What is class diagram ? Explain with an example, how Inheritance is shown in class diagram. *(10 Marks)*

3. What are characteristics of OOAD. Critically explain why "Object Identification is one of the major challenge in OOAD". *(10 Marks)*

4. Draw a sequence diagram for transferring fund from one account to another using online banking. *(10 Marks)*

5. (a) Generalization? How it is different from specialization with the help of an example. *(5 Marks)*

   (b) What is state diagram? Explain the characteristics of the system that can be identified by examination of the state diagram of that system. *(5 Marks)*

6. Briefly **e**xplain different types of UML Diagrams used in OOAD. *(10 Marks)*

7. Draw a DFD for Online Admission Management System for an University. Make necessary assumptions required. *(10 Marks)*

8. (a) How do you identify concurrency in system? Explain the important issues related to concurrency management. *(5 Marks)*

   (b) What is unidirectional implementation ? Explain how it is different than bi-directional implementation with an example. *(5 Marks)*

Course Code	**:**	**MCS-033**
Course Title	**:**	**Advanced Discrete Mathematics**
Assignment Number	**:**	**MCA(III)/033/Assignment/15-16**
Maximum Marks	**:**	**100**
Weightage	**:**	**25%**
Last Dates for Submission	**:**	**15th October, 2015 (For July 2015 Session)** **15th April, 2016 (For January 2016 Session)**

There are nine 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.

1. A person deposits Rs. 35, 000/-in a bank in a saving bank account at a rate of 7% per annum. Let P_n be the amount payable after n years, set up a recurrence relation to model the problem. Also using the recurrence relation, find amount payable after 6 years. *(7 Marks)*

2. For each of the following recurrences find, its order and degree and also tell whether it is homogeneous or non-homogeneous *(7 Marks)*

   (i) $a_n = a_{n-1} + a_{n-3}$.

   (ii) $a_n = \sqrt{a_{n-1} + (a_{n-2})^2}$

   (iii) $b_n = b_{n-1} + (n + 3)$

   (iv) $a_n = a_{n-1} a_1 + a_{n-2} a_2 + \ldots\ldots + a_1 a_{n-1}$ *(for $n \geq 2$)*

   (v) $a_n = (a_{n-1})^2 + a_{n-2} a_{n-3} a_{n-4}$

   (vi) $a_n = \sin a_{n-1} + \cos a_{n-2} + \sin a_{n-3} + \ldots + a_n$

   (vii) $a_n = n a_{n-2} + 2^n$

3. Find generating function for each of the following sequences: *(7 Marks)*

   (i) $a_k = (k + 1)$ for $k = 0, 1, 2, 3, \ldots\ldots$

   (ii) *(1, 5 k(k+1)/2, 25 k(k+1)(k+2)/6, 125k(k+1)(k+2) (k+3)/24, ……)*

4. Find the sequence with each of the following functions as its exponential generating function: *(7 Marks)*

   (i) $f(x) = 3x^{2x}$ (ii) $f(x) = (2 - x) + e^{-2x}$

5. What is the solution of the recurrence relation *(7 Marks)*

   $a_n = a_{n-1} + 2a_{n-2}$

   with $a_0 = 2$ *and* $a_1 = 7$*?*

6. Find all solutions of the recurrence relation $a_n = 3 a_{n-1} + 2n$. What is the solution with $a_1 = 3$? *(7 Marks)*

7. What is the solution of the recurrence relation *(7 Marks)*

   $a_n = 2a_{n-1} + 3a_{n-2}$

   with $a_0 = 5$ *and* $a_1 = 8$*?*

8. Find all solutions of the recurrence relation *(7 Marks)*

   $a_n = 5a_{n-1} - 6a_{n-2} + 7^n$

9. Define each of the following concepts from graph theory and give one suitable example for the concept: *(24 Marks)*

(i) Complete graph
(ii) Path
(iii) Cycle
(iv) Subgraph
(v) Complement of a graph
(vi) Connected components of a graph
(vii) Edge connectivity
(viii) Bipartite graph
(ix) Spanning tree of a graph
(x) Vertex cut-set
(xi) Eulerian circuit
(xii) Eulerian graph
(xiii) Hamiltonian graph
(xiv) Open trail
(xv) Edge traceable graph

Course Code	**:**	**MCS-034**
Course Title	**:**	**Software Engineering**
Assignment Number	**:**	**MCA(III)/034/Assignment/15-16**
Maximum Marks	**:**	**100**
Weightage	**:**	**25%**
Last Dates for Submission	**:**	**15th October, 2015 (For July 2015 Session)** **15th April, 2016 (For January 2016 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 **Examination Form Submission System (EFSS). EFSS** will have all necessary fields that are essential for generation of a Hall Ticket without any errors. After Examination Form is submitted, the data needs to be validated by EFSS. If the data is valid, then Hall Ticket should be generated. Appropriate e-mail should be sent to student in all cases. Make necessary assumptions.

   For developing **EFSS** 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/15-16**
Maximum Marks	**:**	**100**
Weightage	**:**	**25%**
Last Dates for Submission	**:**	**15th October, 2015 (For July 2015 Session)** **15th April, 2016 (For January 2016 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.

1. "Ratio analysis is only a technique for making judgements and not a substitute for judgements." Examine. *(10 Marks)*

2. Explain the concept of capital budgeting. Under what circumstances may NPV and IRR give conflicting recommendations? Which criteria should be followed in such circumstances and why? *(10 Marks)*

3. What do you understand by working capital? Explain various methods of working capital analysis. How will you measure working capital in a going concern? *(10 Marks)*

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

   (a) Outstanding Expenses
   (b) Expenses paid in advance
   (c) Accrued interest
   (d) Treatment of abnormal loss in final accounts

5. Following are the balance sheets of a limited company as on 31st December, 2013 and 2014. *(30 Marks)*

Liabilities	2013 Rs.	2014 Rs.	Assets	2013 Rs.	2014 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)	16,000	19800	Bank	……..	3100
			Cash		180
Reserve				150	
	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.

Course Code	**:**	**MCSL-036**
Course Title	**:**	**Laboratory Course (For Object Oriented Analysis and Design, Software Engineering and Accountancy and Financial Management)**
Assignment Number	**:**	**MCA(III)/L-036/Assignment/15-16**
Maximum Marks	**:**	**100**
Weightage	**:**	**25%**
Last Dates for Submission	**:**	**31st October, 2015 (For July 2015 Session)** **30th April, 2016 (For January 2016 Session)**

This assignment has three sections. Answer all the questions in each section. Section 1 is of 13 marks and Section 2 is of 25 marks. 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

1. The University wants to computerize its evaluation process. The students can submit examination form **on-line** providing details like enrolment no., study centre code and subjects. They can also apply manually. The concerned division verifies the form (i.e. valid registration, timely fee submission details,). The system maintain records of delivery of question papers and answer script to examinations centres, publish the result on-line and finally issues grade cards.

   (i) Define all the classes and at least two **use case** diagrams. *(2 Marks)*

   (ii) Draw the sequence and collaboration diagram. *(3 Marks)*

   (iii) Draw the class diagram *(3 Marks)*

   (iv) Draw the state transition diagram *(3 Marks)*

   (v) Draw the component model *(2 Marks)*

SECTION 2: MCS-034

1. A department wants to schedule meetings. There may be different kinds of meetings such as doctoral committee meeting, project planning and monitoring meeting, assignment monitoring, moderation committee meeting, school council and school board meeting. For each type of meeting there is a list of members. Few members are common for different meetings. Scheduling of meeting, booking of conference room, fixing date and time, informing members through email are the activities to be done before the meeting takes place. The system is manual. Perform

the following tasks in order to computerize the system:

(i) Develop SRS *(8 Marks)*

(ii) Draw DFS of level 0 and 1 diagrams. *(8 Marks)*

(iii) Draw an E-R diagram and its related tables with integrity constraints. The tables should be normalized. *(9Marks)*

SECTION C: MCS-035

1. Post the following transactions of a Computer Centre to prepare the journal, ledger and trial balance: *(30 Marks)*

Mar – 15	Transactions	Amount
5	Started the business with cash	6,00,000
10	Deposited in the bank	60,000
15	Purchased H/W and S/W for cash	2,00,000
20	Received amount for cash from users	60,000
25	Paid salary to staff	80,000
30	Paid for bandwidth and Rent	50,000