MASTER OF COMPUTER APPLICATIONS (MCA)

MCA/ASSIGN/SEMESTER-III

ASSIGNMENTS

(July - 2016 & January - 2017)

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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CONTENTS

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/16-17**
Maximum Marks	**:**	**100**
Weightage	**:**	**25%**
Last Dates for Submission	**:**	**15th October, 2016 (For July 2016 Session)** **15th April, 2017 (For January 2017 Session)**

There are ten 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. Not attending the viva leads to non evaluation of assignment.

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

1. Discuss some real world problems, to which the techniques given below are applicable *(12 Marks)*

(i) Divide & Conquer
(ii) Dynamic Programming
(iii) Greedy Approach

2. Two algorithms A_1 and A_2 run on the same machine. The running time of A_1 is 100 n and running time of A_2 is 2^n. For what value of n^2, A_1 runs faster than A_2 ? If running time of A_1 is changed to 100 n^{30}, then what could be the possible value of n. You can use any spreadsheet software to plot the graph nV_S A_1 &A_2 running time, to analyse the results. *(5 Marks)*

3. Use Principle of Mathematical induction to show that the polynomial $P(X) = X^3 – X$, is divisible by 6, where X is a non-negative integer. *(5 Marks)*

4. Verify the expression $n! = 0(n^n)$. *(5 Marks)*

5. Determine the complexity of following sorting algorithms *(16 Marks)*

(i) Quick sort
(ii) Merge sort
(iii) Bubble sort
(iv) Heap sort

Show all steps, performed to determine the complexity, with suitable example for each.

6. Find the product of two numbers $X_1 = 732912$ and $X_2 = 1026732$ by using Karatsuba's Method. *(5 Marks)*

7. Write Strassen's Algorithm ? What are the limitation of Strassen's Algorithim. Apply Strassen's Algorithm to multiply two matrices A1 & A2 given below *(10 Marks)*

$A_1 = \begin{bmatrix} 5 & 6 \\ -4 & 3 \end{bmatrix}$ and $A_2 = \begin{bmatrix} -7 & 6 \\ 5 & 9 \end{bmatrix}$

8. Perform following tasks *(5 Marks)*

(a) Write Kleene closure of {aa, b}
(b) Find regular expression for language
{Λ, a, abb, abbbb, ….}

9. Write short note on NP complete and NP Hard problems, give suitable example for each. *(5 Marks)*

10. Discuss the following with suitable example *(12 Marks)*

(i) Halting problem,
(ii) Turing machine,
(iii) Push down automata.

Course Code	**:**	**MCS-032**
Course Title	**:**	**Object Oriented Analysis and Design**
Assignment Number	**:**	**MCA(3)/032/Assignment/16-17**
Maximum Marks	**:**	**100**
Weightage	**:**	**25%**
Last Dates for Submission	**:**	**15th October, 2016 (For July 2016 Session)** **15th April, 2017 (For January 2017 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? Critically evaluate advantage of OOAD over structured analysis and design of system. *(10 Marks)*

2. What is class diagram ? Draw class diagram for Library Management System. *(10 Marks)*

3. What is advantage of use case diagram? Draw use case diagram for Online Railway Reservation System. *(10 Marks)*

4. Draw a sequence diagram for online university admission system. *(10 Marks)*

5. (a) What is generalization? Explain generalization and inheritance with the help of an example. *(5 Marks)*

(b) What is advantage of state diagram ? Draw state diagram for ATM system. *(5 Marks)*

6. Describe concept of system design optimization. Also explains how design optimization may be achieved. *(10 Marks)*

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

8. Write short note on followings (minimum in 300 words) *(10 Marks)*

(a) Inheritance Adjustment

(b) Concurrency Control

Course Code	**:**	**MCS-033**
Course Title	**:**	**Advanced Discrete Mathematics**
Assignment Number	**:**	**MCA(3)/033/Assignment/16-17**
Maximum Marks	**:**	**100**
Weightage	**:**	**25%**
Last Dates for Submission	**:**	**15th October, 2016 (For July 2016 Session)**
		15th April, 2017 (For January 2017 Session)

There are thirteen 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. Solve the following recurrence relation through substitution. *(8 Marks)*

(i) $a_n = a_{n-1} + 5$, subject to initial condition $a_1 = 2$

(ii) $S_n = 5\ S_{n-1}$, subject to initial condition $S_0 = 1$

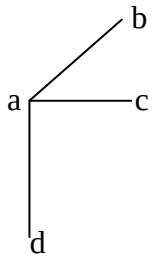
2. Draw these graphs *(5 Marks)*

(i) C6, (ii) W6 (iii) Q3 (iv) K4,4 (v) K6

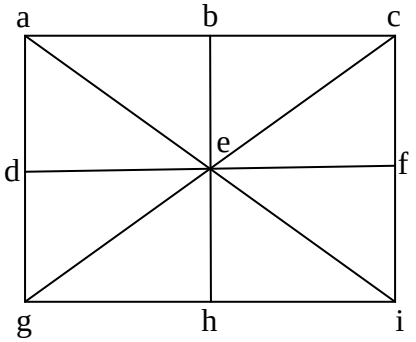
3. For which value of n are these graph regular ? *(5 Marks)*

(a) K_n (b) C_n (c) W_n (d) Q_n

4. Draw five subgraphs of the following graph *(5 Marks)*



5. Determine whether the given graph has a Hamilton circuit. If it does, find such a circuit. If it does not, give an argument to show why no such circuit exists. *(5 Marks)*



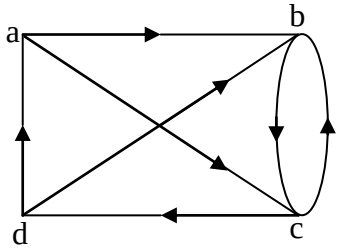
6. Find the order and degree of the following recurrence relation. Also, determine whether they are homogeneous or non-homogeneous. Constant coefficient and non constant coefficient. *(10 Marks)*

(i) $a_n = na_{n-1} + n^2a_{n-2} + a_{n-1}\, a_{n-2}$
(ii) $a_n = 5\, a_{n-1} + n3$
(iii) $a_n = C\, a_{n/m} + b$
(iv) $a_n = na_{n-1} + n2a_{n-2} + a_{n-1}\, a_{n-2}$
(v) $a_n = C_1\, a_{n-1} + C_2\, a_{n-2} + \ldots.. C_{n-k}\, a_{n-k}$

7. A person invests Rs. 10,000 at 10 percent interest compounded annually. If An represents the amount at the end of n years, find a recurrence relation and initial condition that define the sequence $\{A_n\}$. Using the recurrence relation find amount payable after five years. *(7 Marks)*

8. State Dirac's and Ore's Theorem. *(6 Marks)*

9. Determine whether the directed graph shown below has an Euler circuit. Construct an Euler circuit if one exists, if no Euler circuit exists, determine when the directed graph has Euler path. If yes, construct an Euler path if one exists. *(5 Marks)*



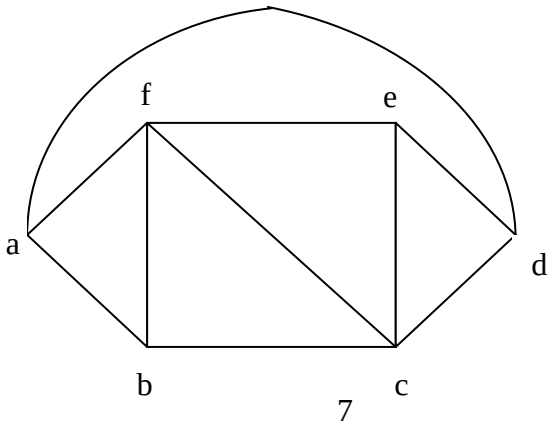
10. What is the solution of the recurrence relation *(7 Marks)*

$A_n = a_{n-1} + 2\, a_{n-2}$

With $a_0 = 2$ and $a_1 = 7$

11. Define bipartite graph. Also given an example of it, where do you use this type of graph. *(5 Marks)*

12. What is the chromatic number of the following graph ? *(5 Marks)*



13. Solve the following recurrence relation by substitution *(7 Marks)*

$t_n = t_{n-1} + n$ for $n > 1$

$t_1 = 1$

Course Code	**:**	**MCS-034**
Course Title	**:**	**Software Engineering**
Assignment Number	**:**	**MCA(3)/034/Assignment/16-17**
Maximum Marks	**:**	**100**
Weightage	**:**	**25%**
Last Dates for Submission	**:**	**15th October, 2016 (For July 2016 Session)** **15th April, 2017 (For January 2017 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 a **Study Center Allocation System (SCAS). SCAS** will have all necessary fields that are essential for allocation of Study Center to the student without any errors. After Application Form for Admission is submitted, the data in the **address field** needs to be validated by SCAS. If the data is valid, then SCAS should allocate a Study Center which is offering the Programme in which the student sought admission as well as nearest to the Residence of the student among the available Study Centers. Appropriate e-mail should be sent to student in all cases. Make necessary assumptions.

For developing **SCAS** 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/16-17**
Maximum Marks	**:**	**100**
Weightage	**:**	**25%**
Last Dates for Submission	**:**	**15th October, 2016 (For July 2016 Session)** **15th April, 2017 (For January 2017 Session)**

This assignment has five questions. Attempt any four. 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. From the following Trial Balance of Raghu Ram, prepare Trading and Profit & Loss Account for the year ended 31st December, 2015 and a Balance Sheet as on that date:- *(20 Marks)*

Dr. Balances	Rs.	Cr. Balances	Rs.
Opening Stock	25,000	Sales	2,90,000
Purchases	75,000	Purchase Return	4,000
Sales Return	5,000	Discount	5,000
Carriage Inwards	2,000	Sundry Creditors	20,000
Carriage Outwards	1800	Bills Payable	2000
Wages	42,000	Capital	60,000
Salaries	27,500		
Plant & Machinery	100,000		
Furniture	5,000		
Sundry Debtors	55,000		
Bills Receivable	2,500		
Cash in Hand	1,300		
Travelling Expenses	4200		
Lighting	2000		
Rent and Taxes	7,200		
General Expenses	9,000		
Insurance	1,500		
Drawings	15,000		
	3,81,000		3,81,000

Adjustments:-

1. Stock on 31st December, 2015 was valued at Rs. 25,000 (Market Value Rs. 35,000).
2. Prepaid insurance amounted to Rs. 600.
3. Salaries outstanding for December, 2015 amounted to Rs. 3000.
4. Wages outstanding for December, 2015 amounted to Rs.4,000.
5. Provide depreciation on Plant and Machinery at 5% and on Furniture at 20%.

2. Following are the balance sheets of a limited company as on 31st December, 2014 and 2015. *(20 Marks)*

Liabilities	2014 Rs.	2015 Rs.	Assets	2014 Rs.	2015 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	25,000	---	Stock	25,500	18,800
(Long-term)			Debtors	42,000	36,200
Creditors	38,000	34,000	Cash	150	450
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/-

3. "Return on Investment is a single comprehensive measure that contains everything happening within the organisation" Explain the statement and illustrate its computations with imaginary figures. *(20 Marks)*

4. What are the basic components of capital budgeting analysis? Explain the difference between IRR and NPV Methods. *(20 Marks)*

5. Efficient cash management will aim at maximising the availability of cash inflows by decentralising collections and decelerating cash outflows by centralising disbursements." Discuss. *(20 Marks)*

Course Code	**:**	**MCSL-036**
Course Title	**:**	**Laboratory Course (For Object Oriented Analysis and Design, Software Engineering and Accountancy and Financial Management)**
Assignment Number	**:**	**MCA(3)/L-036/Assignment/16-17**
Maximum Marks	**:**	**100**
Weightage	**:**	**25%**
Last Dates for Submission	**:**	**31st October, 2016 (For July 2016 Session)** **30th April, 2017 (For January 2017 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 respectively. The rest 20 marks are for Vive voce.

SECTION A: MCS-034

1. On line cab management system works like this: You request a car through an app. An available driver located nearby accepts your request, send a text message notifying you a car is on its way (along with it's estimated arrival time) and another text message once it has arrived at your address. Once you enter in the cab, inform the driver about the destination. After you reach your destination, there's no need to give any money to your driver and your fare is automatically deducted from your credit card. All you need is to open an account with the company and a working cell phone!
Here's the how it works:

You can download the company app from the designated Store. Once you have the app, open it up and sign up for your account. The app will find your location via GPS and show you a map. All you need to do is set your pickup location by moving the red pin to where you are and then tap the green "set pickup location" button followed by the green "request pickup here" button. Once you've done that, a driver will accept your request – you'll receive a text telling you the driver's name and how long until they arrive. You'll get one more text telling you when your driver has arrived at your location. Get into the car, tell the driver where to go . No need to pay. Your fare is automatically deducted from the credit card you provided when you set up your account.

Do the following tasks:

(i) Draw use case diagram *(2 Marks)*

(ii) Define all classes and class diagram *(4 Marks)*

(iii) Draw a simple object model *(4 Marks)*

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

SECTION B: MCS-034

2. For the on line cab management problem discussed in Q1 do the following tasks:

(i) Develop SRS *(4 Marks)*

(ii) Draw Data Flow Diagrams (level 0, level 1) *(4 Marks)*

(iii) Draw an E-R diagram and its related normalized tables *(5 Marks)*

SECTION C: MCS-035

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

Feb 2016	Transaction	Amount
5th Feb	Started business with cash Deposited In the bank	1,20000.00
10 Feb	Purchased medicines for cash	40,000.00
15 Feb	Purchased Furniture for cash	50,000.00
20 Feb	Sold medicines for cash	30,000.00
25 Feb		40,000.00
27 Feb	Paid salary to staff	15,000.00
28 Feb	Paid rent	20,000.00