

MASTER OF COMPUTER APPLICATIONS

(A 2 years MCA programme from January, 2021 admission Cycle)

Programme Code: MCA_NEW

**ASSIGNMENTS
OF
SEMESTER-I**

(January - 2021 & July - 2021)

MCS-211, MCS-212, MCS-213, MCS-214, MCS-215,

MCSL-216, MCSL-217



**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 (OR as instructed by your RC) 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 Programme Guide of MCA (2Yrs).
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 Programme Guide of MCA (2yrs).
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-211
Course Title	:	Design and Analysis of Algorithm
Assignment Number	:	MCA(1)/211/Assign/21
Maximum Marks	:	100
Weightage	:	30%
Last date of Submission	:	31st May, 2021 (for January session) 31st October, 2021(for July session)

This assignment has eleven questions of 80 Marks. Answer all questions. 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.

Q1: (4+4 marks)

- (a) Write a brute force method and Horner's algorithm to evaluate a polynomial expression and compute their complexities
- (b) Evaluate the following polynomial expression using Horner's rule. Assume the value of x is 3.

$$P(x) = 10x^5 + 6x^4 + 3x^3 - 6x^2 + 8x + 15$$

Show all the intermediate steps.

Q2: Calculate the time complexity of the following program fragments. (2+2 marks)

- (a) *for* ($i = 1; i \leq n; i * = 2$)

```
{
  x = x + 1
}
```

- (b) *for* ($i = 1; i \leq n; i + +$)
for ($j = 1; j \leq n; j = j * 2$)

```
{
  ...
  ...
}
```

Q3: (i) Identify two problems in each category of the following time complexities and derive the complexity of these identified problems. (4+6 marks)

$O(n \log n)$, and $O(n^2)$.

- (ii) Suppose you are given n sets: S_1, S_2, \dots, S_n . Each set is having n elements. The problem is to find whether some pairs of these sets are disjoint, i.e. there are no common elements in these sets. Write pseudo code and calculate its time complexity.

Q4: (3+5 marks)

- (i) Define a recurrence relation using Divide and Conquer technique and describe its elements
- (ii) Solve the following recurrence relation using Recurrence Tree Method.

$$T(n) = \begin{cases} 1 & \text{if } n = 1 \\ T(n/2) + n & \text{if } n > 1 \end{cases}$$

Show all the steps.

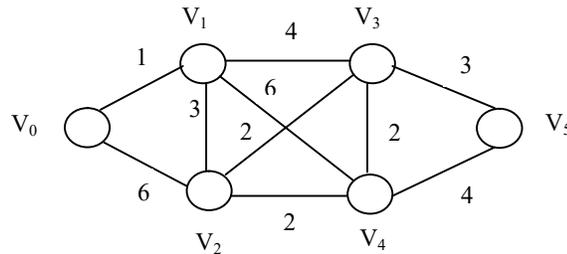
Q5: Differentiate between the followings with the help of examples: **(2+2 marks)**
 (a) Deterministic and Stochastic Algorithms
 (b) Local and Global optima.

Q6: **(5+4 marks)**
 (i) Formulate the Knapsack problem and write the pseudo code for solving a fractional Knapsack problem. Also calculate its time complexity.
 (ii) Find an optimal solution for the knapsack instance n (number of objects) = 7 and W (total weight) = 15. Profits and weights of each object are shown below:
 $(p_1, p_2, \dots, p_7) = (10, 5, 15, 7, 6, 18, 3)$
 $(w_1, w_2, \dots, w_7) = (2, 3, 5, 7, 6, 4, 1)$
 Show all the steps.

Q7: **(6+4marks)**
 (i) Which is the most suitable graph representation scheme for a dense graph? Draw its representation with the help of an example. What is the space complexity of a such graph representation scheme?
 (ii) How does DFS graph traversal scheme work? Explain.

Q 8: Define and write some applications of Topological Ordering. Write its pseudo code and calculate its time complexity. **(6 marks)**

Q9: Formulate a shortest path algorithm and find the shortest paths from two vertices (i) V_0 and (ii) V_3 to the rest of the vertices in the following graph using Dijkstra's single source shortest path Algorithm. **(8 marks)**



Q10: State the principle of optimality? What are the steps to be followed in solving a problem using Dynamic Programming technique? What kinds of problems can be solved through dynamic programming technique? Elaborate. **(7 marks)**

Q11: Suppose $T(n)$ and $f(n)$ and two functions. Write asymptotic notations (O, Ω, Θ) using these two functions and explain the growth rate of these functions in each notation. **(6 marks)**

Course Code : **MCS-212**
Course Title : **Discrete Mathematics**
Assignment Number : **MCA(1)/212/Assign/2021**
Maximum Marks : **100**
Weightage : **30%**
Last Dates for Submission : **31st May, 2021 (for January session)**
31st October, 2021(for July session)

This assignment has eleven questions of 80 Marks. Answer all questions. 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.

Q1. Write down the mathematical notations for the following: (2+2 marks)

- (a) The set of all even numbers.
- (b) The set of all natural number whose square is more than 21.

Q2.(a) Define the following terms using mathematical notations. Also provide example for each term (6+4 marks)

- Subset
 - Universal set
 - Power set
- (b) Show the following operations on set(s)
- Complement of a set
 - Symmetric difference of two sets

Q3. Suppose that p and q are any statements. By constructing the truth tables, show that the statement $\neg(p \vee q)$ & $(\neg p) \wedge (\neg q)$ are logically equivalent (9 marks)

Q4. Use the principle of induction to prove that (8 marks)

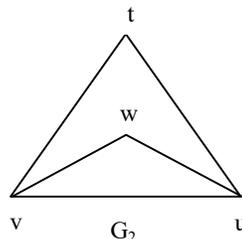
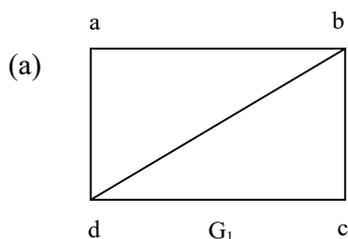
$$1^2 + 2^2 + \dots + n^2 = \frac{1}{6}n(n+1)(2n+1)$$

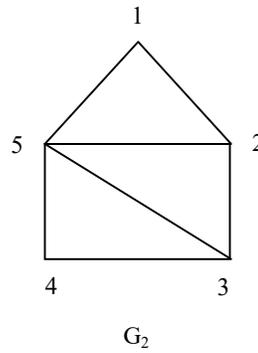
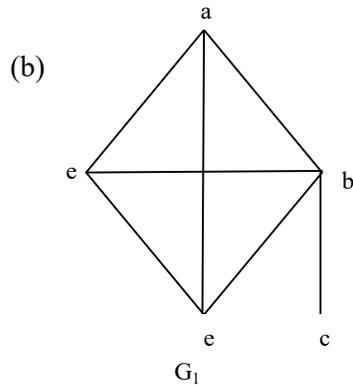
Q5. What are the two types of indirect proofs? Explain through an example for each type. (6 marks)

Q6. The sum of the values of the degree $\sigma(v)$ taken over all the vertices v of a graph (8 marks)
 $G=(V, E)$, is equal to twice the number of edges i.e.
 $\sum_{v \in V} \sigma(v) = 2|E|$

Write a proof to validate the equation.

Q7. State whether the following graphs G_1 & G_2 in (a) and (b) are isomorphic or not? (6 marks)





Q8. Consider the simple problem of placing four coloured balls: red, blue, green and white in 15 boxes. What are the numbers of distinct ways in which the balls can be placed in these boxes, if each box can hold only one ball? Also write the generalized formula of this numerical result. **(8 mark)**

Q9. Define K -edge colouring and K -vertex colouring of a graph. Find the edge chromatic numbers to colour the edges of the complete graph with four and five vertices. **(8 mark)**

Q10. Describe the following properties of a binary relation with the help of examples. **(4 mark)**

- Antisymmetry
- Transitivity

Q11. (a) What is the difference between Eulerian graph and Eulerian circuit? **(3+6 marks)**

(b) Write a proof for the following theorem:

Theorem- A connected graph is Eulerian if and only if the degree of each of its vertices is even.

Course Code : **MCS-213**
Course Title : **Software Engineering**
Assignment Number : **MCA(1)/213/Assign/2021**
Maximum Marks : **100**
Weightage : **30%**
Last Dates for Submission : **31st May, 2021 (for January session)**
31st October, 2021(for July 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.

Question 1:

Assume that you are assigned responsibility of developing an **Online Student Admission System (OSAS)** for a University. OSAS should run both on PCs and Mobile Devices. OSAS will have all fields such as Student's name, address, Mobile number, email, Aadhaar Number, PAN Number, Educational Qualifications, etc. OSAS will also have provision for student to upload the copies of all relevant documents. OSAS should generate a provisional Enrollment number of 10 digits and also assign a Study Center to the student. There should be provision for generation of reports. Make necessary assumptions.

For developing **OSAS** as specified above,

- (a) Which SDLC paradigm will be selected? You may also suggest a SDLC paradigm that is proposed by you and non-existent as on date. Justify your answer. **(10 marks)**
- (b) List the functional and non-functional requirements. **(10 marks)**
- (c) Estimate cost. **(15 marks)**
- (d) Estimate effort. **(15 marks)**
- (e) Develop SRS using IEEE format. **(15 marks)**
- (f) List queries for whom Reports can be generated **(5 marks)**
- (g) List specific requirements which enables OSAS to run on both PCs and Mobile Devices **(10 Marks)**

Course Code	:	MCS-214
Course Title	:	Professional Skills and Ethics
Assignment Number	:	MCA(1)/214/Assign/21
Maximum Marks	:	100
Weightage	:	30%
Last date of Submission	:	31st May, 2021 (for January session) 31st October, 2021(for July session)

This assignment has eight questions. Answer all questions. 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.

Q1:

Read the following passage and answer the questions below:

MEETINGS

Do you ever feel as though you spend all your time in meetings?

Henry Mintzberg, in his book *The Nature of Managerial Work*, found that in large organizations managers spent 22 per cent of their time at their desk, 6 per cent on the telephone, 3 per cent on other activities, but a whopping 69 per cent in meetings. There is a widely held but mistaken belief that meetings are for “solving problems” and “making decisions”. For a start, the number of people attending a meeting tends to be inversely proportional to their collective ability to reach conclusions and make decisions. And these are the least important elements.

Instead hours are devoted to side issues, playing elaborate games with one another. It seems, therefore, that meetings serve some purpose other than just making decisions. All meetings have one thing in common: role-playing. The most formal role is that of chairman. He (and it is usually a he) sets the agendas, and a good chairman will keep the meeting running on time and to the point. Sadly, the other, informal, role-players are often able to gain the upper hand. Chief is the “constant talker”, who just loves to hear his or her own voice.

Then there are the “can’t do” types who want to maintain the status quo. Since they have often been in the organisation for a long time, they frequently quote historical experience as a ploy to block change: “It won’t work, we tried that in 1984 and it was a disaster”. A more subtle version of the “can’t do” type, the “yes, but...”, has emerged recently. They have learnt about the need to sound positive, but they still can’t bear to have things change.

Another whole-sub-set of characters are people who love meetings and want them to continue until 5.30 p.m or beyond. Irrelevant issues are their speciality. They need to call or attend meetings, either to avoid work, or to justify their lack of performance, or simply because they do not have enough to do.

Then there are the “counter-dependents”, those who usually disagree with everything that is said, particularly if it comes from the chairman or through consensus from the group. These people need to fight authority in whatever form.

Meetings can also provide attenders with a sense of identification of their status and power.

A popular game is pinching someone else’s suggestions. This is where someone, usually junior or female, makes an interesting suggestion early in the meeting, which is not picked up. Much later, the game is played, usually by some more senior figure that propounds the idea as his own. The suggestion is of course identified with the player rather the initiator.

Because so many meeting ends in confusion and without a decision, another more common game is played at the end of meetings, called reaching a false consensus. Since it is important for the chairman to appear successful in problem-solving and making a decision, the group reaches a false consensus. Everyone is happy, having spent their time productively. The reality is that the decision is so ambiguous that it is never acted upon, or, if it is, there is continuing conflict, for which another meeting is necessary.

In the end, meetings provide the opportunity for social intercourse, to engage in battle in front of our bosses, to avoid unpleasant or unsatisfying work, to highlight our social status and identity. They are, in fact, a necessary though not necessarily productive psychological sideshow. Perhaps it is our civilized way of moderating, if not preventing, change.

Answer the following questions:

- i) What is the purpose of a meeting according to the writer? **(2 Marks)**
- ii) The “can’t do” type wants to maintain a status grow. Elaborate. **(2 Marks)**
- iii) Why do some people love attending meetings? **(2 Marks)**
- iv) What is the position in the organization of those who steal others’ ideas? How do they do it? **(2 Marks)**
- v) What does the writer mean by reaching a “false consensus”? **(2 Marks)**
- vi) Complete the following table: **(6 Marks)**

	People	Role at Meetings
1		Keep the meeting running on time & to the point
2		
3	Can’t Do type	
4		Sound positive but resist change
5		
6	Counter dependents	

- Q2:** Write a telephone conversation on the basis of cues given below: **(8 Marks)**
- A: Ask to speak to Mr. Andrew (*Hint: May I speak to.....?*)
 - B: He’s in a meeting
 - A: Ask when he’ll be free
 - B: You don’t know. Offer to find out
 - A: Say you’ll wait
 - B: He won’t be free till after 6 p.m.
 - A: You want him to call you first thing tomorrow.
 - B: Find out caller’s name and number.
 - A: Give your (real) name and number
 - B: Note down the information and say you’ll leave the message on his desk
 - A: Say thanks and goodbye.

- Q3:** Write short notes on **any four** of the following: **(16 Marks)**
- i) Plagiarism Check Software
 - ii) Interpersonal Skill Development at Workplace
 - iii) Do’s and Don’ts during Group Discussions.
 - iv) Importance of Visuals in Presentations.
 - v) Do’s and Don’ts on Social Media.

- Q4:** You work for a company, which manufactures computers and laser printers. You are visiting another company, Soft Cell, to buy some computer software for your department. They have expressed an interest in your company’s laser printers. You would like to take twenty brochures and three sample printers with you. **(10 Marks)**
- Write a memo to Mr. Jacob Tharu, the sales manager.
 - Ask for his permission to take these items.
 - Explain the time and date when you want to collect them.
 - Say what you hope to achieve

Q5: Read the advertisement below and write your Curriculum Vitae on the basis of it. **(8 Marks)**

Computer Sales Executives (South)
For a
Leading Multinational Company

We are looking for young, dynamic males/females interested in selling Computers.
The position is based in Chennai and the candidates will be responsible for sales in the South of India.

No experience required but working knowledge of Computers is essential.

Remuneration is comparable with the best in the industry, and will be linked to performance.

Apply to Ms. Lalita Rao
Personal Executive
XYZ Co.
P.O. Box: 3675

Q6: Fill in the blanks with suitable prepositions: **(4 Marks)**

Last year, The Indian Trade Fair 2004 was held.....the Pragati Maidan.....November 10.....20. The fair was organized by the Trade Fair Authority of India. The fair, was open.....10 a.m.8 p.m.all the days.

It was an all India fair. Traders and manufactures.....all the states participatedit. The aim of the fair was to bring together the buyers and sellers of goods manufactured.....different parts of India and promote trade and industry.....the country.

Q7: These are the answers to ten questions. Write the Wh- questions. **(10 Marks)**

Example: Who does Rafiq Andani for? Rafiq Andani works for JTN.

- i) He is the Marketing Director.
- ii) There are five directors at JTN.
- iii) He lives in Mumbai.
- iv) He starts work at 8.30 a.m.
- v) Next week he's going to a trade fair in Frankfurt.
- vi) He joined the company six years ago.
- vii) He has been Marketing Director since 2001.
- viii) Before joining JTN, he worked for Computer India.
- ix) He was with them for seven years.
- x) He left because of a misunderstanding.

- Q8:** Prepare a presentation on any one of the following: **(8 Marks)**
- i) Presentation on any organisation (or else the company where you work)
 - ii) Any software product
 - iii) A software project you have been involved in recently
 - iv) New developments in your field.

Before you begin, indicate:

- i) you and audience
- ii) who they are
- iii) if it's a formal or informal occasion.

Indicate any props you may need, *e.g.*, White board, Overhead projector, Power point, etc. The presentation must be in about 200 words.

Course Code : **MCS-215**
Course Title : **Security and Cyber Laws**
Assignment Number : **MCA(1)/215/Assign/21**
Maximum Marks : **80**
Weightage : **30%**
Last date of Submission : **31st May, 2021 (for January session)**
31st October, 2021(for July session)

This assignment has two questions. Answer all questions. 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.

Q1: Explain the following with the help of an example. (30 Marks)

- (i) Steganography
- (ii) Need to regulate cyberspace.
- (iii) Security audit

Q2: What are the three pillars of digital security? Explain the pros and cons of digital security. (10 Marks)

Q3: Describe in brief commonly used crypto algorithms. (10 Marks)

Q4: Discuss security threats and attacks. (10 Marks)

Q5: Discuss the penalties and compensation as provided under information technology act for damage to computer, computer system and network. (10 Marks)

Q6: Discuss the intellectual property issues in cyberspace. (10 Marks)

Course Code : **MCSL-216**
Course Title : **DAA and Web Design Lab**
Assignment Number : **MCA(1)/L-216/Assign/2021**
Maximum Marks : **100**
Weightage : **30%**
Last Dates for Submission : **31st May, 2021 (for January session)**
31st October, 2021(for July session)

This assignment has two sections. Answer all questions in each section. Each Section is of 20 marks. Your Lab Records will carry 40 Marks (20 Marks for each section). 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.

Note: You must execute the program and submit the program logic, sample input and output along with the necessary documentation. Assumptions can be made wherever necessary.

Section-1

Q1. Implement Prim's algorithm on your system. Process the result step by step and study the performance of the algorithm on different graphs. **(20 marks)**

Section-2

Q2. Design a form for booking accommodation through a rental website **(20 marks)**

The form should have the following fields:

First Name	<input type="text"/>
Last Name	<input type="text"/>
email	<input type="text"/>
Arrival Date	<input type="text"/>
Departure Date	<input type="text"/>
Country	<input type="text" value="Select"/>
Payment mode	Debit card Credit card
	<input type="radio"/> <input type="radio"/>
	<input type="button" value="Submit"/> <input type="button" value="Reset"/>

- Use Java script to validate all the fields.

- Submit button should enter all the fields' data to the database.
- Error message should be shown if a text field is left blank.
- Reset button resets all the fields to the blank.
- Design a check box for selecting a payment mode.
- Design a drop down list for selecting a country field.

Course Code : **MCSL-217**
Course Title : **Software Engineering Lab**
Assignment Number : **MCA(1)/L-217/Assign/2021**
Maximum Marks : **100**
Weightage : **30%**
Last Dates for Submission : **31st May, 2021 (for January session)**
31st October, 2021(for July session)

This assignment has one section. Answer all questions in the section. The Section is of 40 marks. Your Lab Records will carry 40 Marks. 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.

Question 1: **(10+10+10+10=40 marks)**

ABC is a Company which is having branches spread across the World. The company is having a strength of 1000+ employees. Each employee works in a Branch. At the time of joining, the person needs to provide personal and professional information such as Name, Address, Passport Number, Mobile Number, E-mail address, etc. After this information is furnished, a unique ID is generated for each employee. Then the employee is assigned to a Branch in which S/he will work. Every branch is having a Name. However, one or more branches may have the same name. However, every branch is having a unique ID.

Now, with reference to the above, answer the following:

- (1) List the Entities
- (2) For each Entity, list Attributes
- (3) Define relationships between the Entities
- (4) Finally, draw the Entity Relationship Diagram