

MASTER OF COMPUTER APPLICATIONS (MCA_NEW)

**ASSIGNMENTS
OF MCA_NEW (2Yrs) PROGRAMME
SEMESTER-I**

(January - 2023 & July - 2023)

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 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_NEW(1)/211/Assign/2023
Maximum Marks	:	100
Weightage	:	30%
Last Dates for Submission	:	30thApril 2023 (for January Session) 31st October 2023 (for July Session)

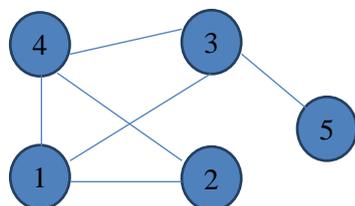
This assignment has twelve questions (80 Marks). Answer all questions. Rest 20 marks are for your viva voce examination. You may use illustrations and diagrams to enhance the explanations. Please go through the guidelines regarding assignments given in the Programme guide for the format of the presentation.

- Q1.** a) Develop an efficient algorithm to find a list of all the prime numbers up to a number n (say 100). **(3 Marks)**
- b) Explain the following types of problems in Computer Science with the help of an example problem for each: **(4 Marks)**
- Searching
 - String Processing
 - Geometric Problems
 - Numerical Problems
- Q2.** a) Using induction prove that, for all positive integers n, **(3 Marks)**
- $$1^2 + 2^2 + 3^2 + \dots + n^2 = \frac{n(n+1)(2n+1)}{6}$$
- b) What is the purpose of asymptotic analysis? What are the drawbacks of asymptotic analysis? Explain the Big-O notation with the help of an example. **(3 Marks)**
- Q3.** a) Evaluate the polynomial $p(x) = 5x^5 + 4x^4 - 3x^3 - 2x^2 + 9x + 11$ at $x=3$ using Horner's rule. Analyse the computation using Horner's rule against the Brute force method of polynomial evaluation. **(4 Marks)**
- b) Write the linear search algorithm and discuss its best case, worst case and average case time complexity. Show the best case, worst case and the average case of linear search in the following data: **(4 Marks)**
- 13, 15, 2, 6, 14, 10, 8, 7, 3, 5, 19, 4, 17.
- Q4.** a) Find an optimal solution for the knapsack instance $n=7$ and maximum capacity $(W) = 15$, **(4 Marks)**
- $(p_1, p_2, \dots, p_6) = (4, 5, 10, 7, 6, 8, 9)$
 $(w_1, w_2, \dots, w_6) = (1, 2, 3, 6, 2, 4, 5)$
- b) Make an optimal Huffman tree and design the Huffman code for the following set of frequencies: a:7, e:6, s:20, d:2, f:1, g:3, h:4, t:7. **(3 Marks)**
- Q5.** a) Write and explain the recursive binary search algorithm. Use this algorithm for searching an element in a sorted array of 7 elements. **(3 Marks)**
- b) Analyse the Quick sort algorithm using Master Method. Also draw the relevant recursion tree. **(2+2 Marks)**

(2+2 Marks)

c) Write the algorithm for the divide and conquer strategy for Matrix multiplication. Also, analyse this algorithm.

Q6. a) Write the adjacency list and draw ADJACENCY MATRIX for the graph given below. (2+2 Marks)



(3 Marks)

b) Write and explain the algorithm of Topological sorting. How can you compute time complexity for topological sorting?

Q7. a) Explain the working of Prim’s algorithm for finding the minimum cost spanning tree with the help of an example. Also find the time complexity of Prim’s algorithm. (3+2 Marks)

b) Explain the working of Bellman-Ford algorithm for finding the shortest path from a single source to all destinations with the help of an example. Also find the time complexity of this algorithm. (2+2 Marks)

Q8. a) Explain the process of creating a optimal binary search with the help of an example. (3 Marks)

b) Find an optimal parenthesizing of a matrix-chain product whose sequence of dimensions is as follows: (3 Marks)

Matrix	Dimension
A1	15 × 7
A2	7 × 30
A3	30 × 05
A4	05 × 15
A5	15 × 12

Q9. a) Using the Rabin Karp algorithm, find the pattern string in the given text. Pattern: “ten”, Text: “attainhtenbetan”. Write all the steps involved. (3 Marks)

b) Differentiate between **Knuth Morris Pratt** and **Naïve** String matching Algorithm. (3 Marks)

Q10. Differentiate between the following with the help of an example of each: (2+2 Marks)
(i) Optimization and Decision Problems
(ii) P and NP problems

Q11. What are NP Hard and NP complete problems? Explain any one problem of each type. (2+2 Marks)

Q12 Explain backtracking; and Branch and Bound techniques with the help of an example each. (2+3 Marks)

Course Code	:	MCS-212
Course Title	:	Discrete Mathematics
Assignment Number	:	MCA_NEW(1)/212/Assign/2023
Maximum Marks	:	100
Weightage	:	30%
Last Dates for Submission	:	30th April 2023 (for January Session) 31st October 2023 (for July Session)

This assignment has four questions of 20 Marks each, amounting to 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: Attempt the following, all questions are compulsory, and each question carries 2 marks for each

- Prove by mathematical induction that $\sum_{i=1}^n \frac{1}{i(i+1)} = n/(n+1)$
- Verify whether $\sqrt{11}$ is rational or irrational.
- What are Demorgan's Law? Explain the use of Demorgan's law with example.
- Make truth table for followings:
 - $p \rightarrow (\sim q \vee \sim r) \wedge (p \vee r)$
 - $p \rightarrow (\sim r \wedge q) \wedge (p \wedge \sim q)$
- Obtain the truth value of disjunction of "Water is essential for life" and "2+2=4".
- Write the following statements in the symbolic form.
 - Some students can not appear in exam.
 - Everyone can not sing.
- Draw logic circuit for the following Boolean Expression:
 $(x \vee y \vee z) + (x+y+z)' + (x'zy')$
- What is dual of a boolean expression? Explain with the help of an example.
- Show using truth table whether $(P \wedge Q \vee R)$ and $(P \vee R) \wedge (Q \vee R)$ are equivalent or not.
- Explain whether $(P \wedge Q) \rightarrow (Q \rightarrow R)$ is a tautology or not.

Q2: Attempt the following, all questions are compulsory, and each question carries 2 marks for each

- Set A, B and C are: $A = \{1, 2, 3, 5, 7, 9, 11, 13\}$, $B = \{1, 2, 3, 4, 5, 6, 7, 8, 9\}$ and $C = \{1, 2, 4, 5, 6, 7, 8, 10, 13\}$. Find $A \cap B \cap C$, $A \cup B \cup C$, $A \cup B \cap C$
- What is power set? Write power set of set $A = \{1, 2, 3, 4, 5, 6, 7, 9\}$.
- Give geometric representation for followings:
 - $\{-3\} \times \mathbb{R}$
 - $\{1, -2\} \times \{2, -3\}$
- What is proper subset? Explain with the help of example.

- e) What is relation? Explain properties of relations with example.
- f) Explain whether function: $f(x) = x^2$ posses an inverse function or not.
- g) Write the finite automata corresponding to the regular expression $(a + b)^*ab$
- h) If L_1 and L_2 are context free languages then, prove that $L_1 \cup L_2$ is a context free language.
- i) Explain Decidable and Undecidable Problems. Give example for each.
- j) What is equivalence relation? Explain use of equivalence relation with the help of an example.

Q3: Attempt the following, all questions are compulsory, and each question carries 2 marks for each

n

- a) Suppose we want to choose two persons from a party consisting of 35 members as Manager and Assistant Manager. In how many ways can this be done?
- b) There are three Companies, C_1 , C_2 and C_3 . The party C_1 has 4 members, C_2 has 5 members and C_3 has 6 members in an assembly. Suppose we want to select two persons, both from the same Company, to become president and vice president. In how many ways can this be done?
- c) Suppose there are five married couples and they (10 people) are made to sit about a round table so that neither two men nor two women sit together. Find the number of such circular arrangements.
- d) How many words can be formed using letter of DEPARTMENT using each letter at most once?
 - i) If each letter must be used,
 - ii) If some or all the letters may be omitted.
- e) What is the probability that a 13-card hand has at least one card in each suit?
- f) What is the probability that a number between 1 and 10,000 is divisible by neither 2, 3, 5 nor 7?
- g) Explain inclusion-exclusion principle and Pigeon Hole Principle with example.
- h) In a tennis tournament, each entrant plays a match in the first round. Next, all winners from the first round play a second-round match. Winners continue to move on to the next round, until finally only one player is left as the tournament winner. Assuming that tournaments always involve $n = 2^k$ players, for some k , find the recurrence relation for the number rounds in a tournaments of n players.
- i) 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.
- j) Find the solution of the recurrences relation $a_n = a_{n-1} + 2a_{n-2}$, $n > 2$ with $a_0 = 0$, $a_1=1$

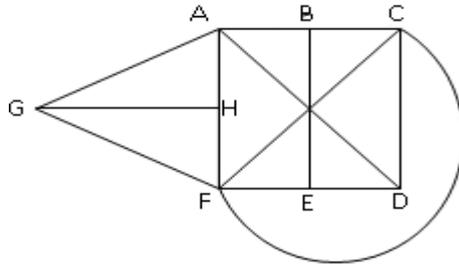
Q4: Attempt the following, all questions are compulsory, and each question carries 2 marks for each

n

- a) Draw 2-isomorphic graphs and 3 non- isomorphic graphs on five vertices.
- b) Prove that the complement of \bar{G} is G
- c) Draw the following graphs and state which of following graph is a regular graph?

(i) C5 (ii) W5 (iii) Q4 (iv) K5,5

d) What is a chromatic number of a graph? What is a chromatic number of the following graph?



- e) Determine whether the above graph has a Hamiltonian circuit. If it has, find such a circuit. If it does not have, justify it
- f) Explain and prove the Handshaking Theorem, with suitable example
- g) Show that C_6 is bipartite and K_3 is not bipartite.
- h) Explain the terms PATH, CIRCUIT and CYCLES in context of Graphs.
- i) What is the difference between an Eulerian graph and an Eulerian circuit?
- j) Explain the Dirac's Criterion and Ore's Criterion for Hamiltonian graphs

Course Code	:	MCS-213
Course Title	:	Software Engineering
Assignment Number	:	MCA_NEW(1)/213/Assign/2023
Maximum Marks	:	100
Weightage	:	30%
Last Dates for Submission	:	30thApril 2023 (for January Session) 31st October 2023 (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 Hall Ticket Generation System (OHTGS)** for a University. OHTGS should run both on PCs and Mobile Devices. **OHTGS** will have all fields such as Student's name, Student's Address, Examination Center Code and Address, AadhaarNumber, Programme Code, , Course Codes and Titles (Semester Wise), and Enrollment Number etc. Any student enrolled to any programmewho applied for Examinations should be able to generate and download the Hall ticket. Make necessary assumptions.

For developing **OHTGS** 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 OHTGS to run on both PCs and Mobile Devices **(10 Marks)**

Course Code	:	MCS-214
Course Title	:	Professional Skills and Ethics
Assignment Number	:	MCA_NEW(1)/214/Assign/23
Maximum Marks	:	100
Weightage	:	30%
Last date of Submission	:	30thApril 2023 (for January session) 31stOctober2023 (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 given below:

Time management has become one of the key issues of the second half of the twentieth century. Managers, grappling with work pressures and deadlines, have come to recognize that time is a precious commodity to be 'saved', 'gained', and not 'wasted' or 'lost'. But if time is a commodity, how then can we best describe, measure and manage it?

To describe and manage it, imagine a line that goes back to the beginnings of creation and continues into the mists of the future. And on that line are a number of significant marks-these separate the past from the present from the future. And within each time zone-past, present and future-we can differentiate periods of time from points of time. For example, the 1980s gave us a period of rapid economic growth; black Monday was a point of sudden financial catastrophe.

How can this brief analysis help the international manager? Firstly, there is the link between past, present and future. In other words, historical performance should be a guide to the future, and the present ought to represent last year's forecast. So change-that which normally differentiates any two periods on our continuum - can be seen as a gradual evolution rather than a dramatic revolution.

Secondly, the use of a time-planning system, on which key points and periods are plotted, enables managers to organize their activities so that bottlenecks can be avoided and deadlines can be met. So stress, where the jobs to be done exceed the available time, can be reduced to an acceptable and productive level.

- i. ***Tick the right choice:*** **(1 Mark)**
Time management was one of the major issues
 - a) in the beginning of the twentieth century
 - b) in the latter part of the twentieth century
 - c) in the twentieth century
- ii. Give two reasons why managers are giving so much importance to time management. **(2 Marks)**
- iii. Explain the difference between period of time and point of time giving your own examples. **(4 Marks)**
- iv. Do you think time management can reduce stress? Discuss. **(3 Marks)**

- Q2:** Pick out words/phrases from the passage which have the following meanings. **(10 Marks)**
- i. time when the world was made
 - ii. area
 - iii. latest time by which an activity must be completed.

- iv. step by step.
- v. article which can be bought and sold
- vi. make a division between two things
- vii. work very hard to solve a problem
- viii. unclear period of time
- ix. time or place when jobs cannot be carried out, usually because of other pressures
- x. terrible event.

Q3: Put the verbs in brackets in their correct form. **(10 Marks)**

We.....i.....(write) to tell you about the reorganization at Softsys. As youii.....(know), weiii.....(trade) for two years now andiv.....(establish) a reputation as a reliable local supplier of business software. On the one hand, the rapid growth in our business during this period.....v.....(give) us very good results; on the other, this increased business.....vi.....(now place) a lot of pressure on our organization. So, wevii.....(currently change) the structure of Softsys so that we can continue to provide the level of service and support that you, as a valued customer,viii.....(expect). Weix.....(not plan) any major changes; the company.....x.....(continue) to be owned and run by the three partners.

Q4: Write short notes on **any four** of the following: **(20 Marks)**

- i) Antivirus Software
- ii) Interpersonal Skill Development at Workplace
- iii) Do's and Don'ts during Presentations.
- iv) Importance of Visuals in Presentations.
- v) Do's and Don'ts on Social Media.

Q5: You have seen a job with a multinational company advertised in a newspaper. Write a letter in about 200-250 words to the company applying for the job. Include relevant factors such as the nature of the job and why you are interested in it, your qualifications and experience, what you are doing now and what you could contribute to the position. **(10 Marks)**

Q6: Read the advertisement below and write your Curriculum Vitae on the basis of it. **(10 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 S Rao
Personal Executive
XYZ Co.
P.O. Box: 3675

Q7: Mark the stress in the following words:

(10 Marks)

- i) attend attention
- ii) believe belief
- iii) assist assistance
- iv) lovely loveliness
- v) commerce commercial

Q8: Prepare a presentation *on any one* of the following:

(10 Marks)

- i) Any eCommerce portal
- ii) Any software product
- iii) A software project you have been involved in recently
- iv) Applications of Artificial Intelligence

The presentation must be about 20 slides.

Course Code	:	MCS-215
Course Title	:	Security and Cyber Laws
Assignment Number	:	MCA_NEW(1)/215/Assign/2023
Maximum Marks	:	100
Weightage	:	30%
Last date of Submission	:	30thApril 2023 (for January session) 31stOctober2023 (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 the presentation.

Q1: (3*4= 12 Marks)

- (a) Explain the pillars of digital security. What are the pros and cons of digital security?
- (b) Explain the breach of digital security due to malware and phishing.
- (c) What is meant by Cyber Security intrusion detection?
- (d) What are Social Engineering attacks? What are the laws related to it?

Q2: Explain the following terms with the help of an example of each. (3*6=18Marks)

- (a) Substitution Cyphers
- (b) Function-based Cryptography
- (c) Symmetric key cryptography
- (d) Data Encryption Standard
- (e) Electronic Signatures
- (f) Pseudorandom numbers and sequences

Q3: (3*4= 12 Marks)

- (a) Explain the data security requirements for a database.
- (b) What are the three core elements of data security? Explain.
- (c) List at least four most recent attacks relating to cyber security.
- (d) Explain the terms – security policy and security audit.

Q4: (3*4= 12 Marks)

- (a) List the reasons for regulating cyberspace.
- (b) What are the roles of filtering devices and rating systems in a cyberspace regulatory framework? Explain.
- (c) List the classification of policies and laws regulating the content of the Internet.
- (d) What are the regulations for cyberspace content in India?

Q5: (3*5= 15 Marks)

- (a) What is cybercrime? Explain with the help of examples. List the classification of cybercrimes.
- (b) What are the Penalties as per the Section 43 of the Information Technology Act 2000? Explain the word contaminant in this context.
- (c) Describe in brief the procedure for adjudication under the Information Technology Act, 2000.
- (d) List various offences as per Information Technology Act, 2000.
- (e) List and explain the functions of various cyber forensic investigation tools.

Q6:

(6+3+2= 11 Marks)

- (a) What are the different forms of IPR? Explain any five of these.
- (b) Briefly define the concept of linking, in-lining and framing in the context of IPR.
- (c) What is the abuse of search engines? Explain with the help of an example.

Course Code : **MCSL-216**
Course Title : **DAA and Web Design Lab**
Assignment Number : **MCA_NEW(1)/L-216/Assign/2023**
Maximum Marks : **100**
Weightage : **30%**
Last Dates for Submission : **30thApril 2023 (for January session)**
31stOctober2023 (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 Quick Sort's algorithm on your machine to sort the following list of elements

12 20 22 16 25 18 8 10 6 15

Also, compare the performance of Quick Sort algorithm implemented for the data given above with the performance of the Quick Sort algorithm when used to sort the data given below

6 8 10 12 15 16 18 20 22 25

Note :

- Performance Comparison is required in terms of a number of comparisons, exchange operations and the number of times the loop will iterate?
- Show step by step processes, and support your code with suitable comments for better readability.

Q2. Apply Huffman's algorithm to construct an optimal binary prefix code for the letters and its frequencies in the table given below (Show the complete steps).

Letters	A	B	C	D	E	F	G
Frequency	15	25	5	7	10	13	9

Find out an average number of bits required per character. Also, Implement Huffman's coding algorithm and run for the given problem instance. Support your code with suitable comments for better readability

Section-2

Q3. Design a form for the Patient Satisfaction Survey for a particular hospital having the following fields:

- Patient's name
- Patient's File number (Issued by the hospital)
- Which Unit of the hospital the patient was admitted Select V (Surgery, Medicine, etc.)
- Are you satisfied with overall treatment :

Very Satisfied	Satisfied	Not Satisfied
----------------	-----------	---------------
- Are you satisfied with medical facilities in the hospital :

Very Satisfied	Satisfied	Not Satisfied
----------------	-----------	---------------
- Overall Comments

- Submit
- Reset

Note : you are required judiciously choose the options for Text Box, Combo Box, Radio Button, Check Box, Buttons etc. for the respective fields required in the form

- 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.
- Use JavaScript to validate the fields.

Q4. Create an HTML web page, as shown below. The cookie1 and cookie2 will be set on pressing Set Cookie1 or Set Cookie2 button and the stored cookie value will be displayed on pressing Get Cookie1 or Get Cookie2 button respectively. On the other hand selectively cookie can be deleted by pressing Delete Cookie1 or Delete Cookie2 button. Display all cookies button will show all the stored cookies.



Course Code	:	MCSL-217
Course Title	:	Software Engineering Lab
Assignment Number	:	MCA_NEW(1)/217/Assign/2023
Maximum Marks	:	100
Weightage	:	30%
Last Dates for Submission	:	30thApril 2023 (for January session) 31stOctober2023 (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 Hall Ticket Generation System (OHTGS) for a University. OHTGS should run both on PCs and Mobile Devices. OHTGS will have all fields such as Student's name, Student's Address, Examination Center Code and Address, Aadhaar Number, Programme Code, , Course Codes and Titles (Semester Wise), and Enrollment Number etc. Any student enrolled to any programme who applied for Examinations should be able to generate and download the Hall ticket. Make necessary assumptions.

Now, Estimate (1) Cost and (2) Effort

Use appropriate techniques