MASTER OF COMPUTER APPLICATIONS

**Programme Code
MCA_NEW**

ASSIGNMENTS
OF
SEMESTER-I

(January - 2022 & July - 2022)

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) of respective learning modes.

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) of respective learning modes.

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/2022**
Maximum Marks	:	**100**
Weightage	:	**30%**
Last Dates for Submission	:	**31st May, 2022 (for January Session)**
		31st October, 2022 (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 presentation.

Q1. a) What are the desirable characteristics of an algorithm? Find the GCD of **(4 Marks)** p = 144 and q = 55 using Euclid's algorithm.

b) Differentiate between Greedy Technique and Dynamic Programming **(3 Marks)** approach of problem solving. Name few problems which are solved using these techniques.

Q2. a) Prove that, for all positive integers n, $1 + 2 + 4 + \cdots + 2^n = 2^{n+1} - 1$. **(3 Marks)**

b) What are asymptotic notations? Explain the significance of Big- O, **(3 Marks)** Omega and theta notations with suitable example.

Q3. a) Evaluate p(x)= $3x^4+2x^3$-5x+7 at x=2 using Horne's rule. Show step wise **(4 Marks)** iterations.

b) Sort the given sequence of numbers using Bubble sort. Write all the **(4 Marks)** steps involved.   13, 15, 2, 6, 14, 10, 8, 7, 3, 5, 19, 4.

Q4. a) Find an optimal solution for the knapsack instance n=6 and M=13, **(4 Marks)**
$(p_1, p_2,\ldots, p_6)$=(8, 5, 13, 7, 6, 15)
$(w_1, w_2,\ldots, w_6)$=(3, 2, 4, 6, 2, 5)

b) Write the Huffman code for the following set of frequencies of given **(3 Marks)** symbols. A:1, B:1, K:2, D:3, F:5, G:8 , H:13, E:21.

Q5. a) Write the steps involved in searching an element in a given array of **(3 Marks)** **sorted elements** using Binary search algorithm. Assume the searched element if not present in the sequence.

b) Analyse the merge sort algorithm Master Method. Also draw the relevant recursion tree. **(2+2 Marks)**

c) Explain divide and conquer strategy with an example of Matrix multiplication. **(4 Marks)**

Q6. a) Write the adjacency list and draw adjacency graph for the graph given below. **(2+2 Marks)**
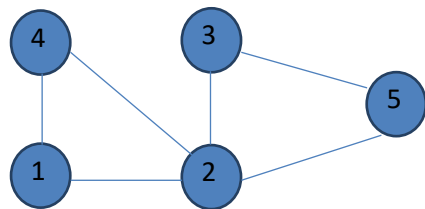
b) Explain Topological sorting using a suitable example of a graph. **(3 Marks)**

Q7. a) What is a minimum cost spanning tree? Explain the working of Kruskal's Algorithm with example. **(2+3 Marks)**

b) While dealing with the negative edge weights, the Dijkstra's algorithm is not considered best. Explain the alternate suitable algorithm for single source shortest path with an example. **(4 Marks)**

Q8. a) Explain the principle of optimality with respect to binary search. **(3 Marks)**

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

Matrix	Dimension
A1	10×15
A2	15×25
A3	25×8
A4	8×13
A5	13×10

Q9. a) Using the Rabin Karp algorithm, find the pattern string in the given text. Pattern: "fed", Text: "acfeddadfdec". Write all the steps involved. **(3 Marks)**

b) Differentiate between **Knuth Morris Pratt** and **Rabin Karp** Algorithm. **(3 Marks)**

Q10. Differentiate between NP, NP-Hard and NP-Complete problems with suitable example of each. **(4 Marks)**

Q11. Discuss about the techniques to show the NP- Hardness in brief. **(4 Marks)**

Q12 What is a vertex cover problem? Discuss Graham's algorithm in detail. **(2+3 Marks)**

| Course Code	:	MCS-212
Course Title	:	Discrete Mathematics
Assignment Number	:	MCA(1)/212/Assign/2022
Maximum Marks	:	100
Weightage	:	30%
Last Dates for Submission	:	31st May, 2022 (for January Session)
		31st October, 2022 (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 presentation.

Q1. a) What are laws related to equivalence propositions ? Give example for each of equivalence proposition laws. **(4 Marks)**

b) With respect to rule of precedence, write the truth table for the following expression: $p \leftrightarrow q \lor {\sim}r \leftrightarrow r \oplus q$ **(3 Marks)**

Q2. a) What are modus ponens and modus tollens? Give example for each. **(2 Marks)**

b) Show that the number $\sqrt{11}$ is irrational. **(2 Marks)**

c) Using mathematical induction prove that $n! > 2^n$ for $n >= 4$. **(2 Marks)**

Q3. a) Using Boolean laws, reduce the Boolean expression to simple form. $(p, q, r) = (p \land q) \lor (p \land q \land r) \lor (p \land r)$. **(4 Marks)**

b) Draw the gate circuit for the following Boolean expression $(p' \land q \land r') \lor ((q' \lor p) \land r)$ **(4 Marks)**

Q4. a) Define set, power set, subset, superset and proper set with suitable examples. **(4 Marks)**

b) Differentiate between symmetric relation and transitive relation with example. **(3 Marks)**

Q5. a) Using the properties pf closure for any set s of strings prove that $s^* = (s^*)^* = s^{**}$ **(3 Marks)**

b) What is regular expression? How it differs from regular language? **(2+2 Marks)**

c) Consider an NFA given in figure below. Check whether the strings 001, 010111,01110,110 are accepted by the machine, or not? **(4 Marks)**
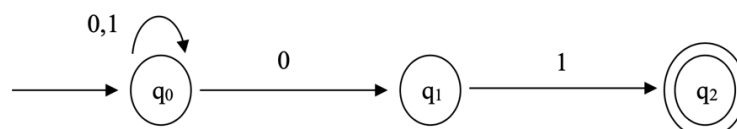
Q6. a) What is a Turing Machine ? Define Turing Acceptable Language and Turing Decidable Language with example. **(2+2 Marks)**

b) Construct an non deterministic Turing Machine which accepts the language $\{ b^n a^m : n \geq 1, m \geq 1 \}$, i.e., the language of all strings over $\{b, a\}$, in which there is at least one b and one a and all b's precede all a's. **(3 Marks)**

Q7. a) Rohan rolled two dice red and blue. Calculate the probability of Rohan getting a big number on red dice than the number on blue dice. **(2 Marks)**

b) Calculate the total number of words that can be formed using the letters of the word "MISSIPPI" if two 'S' and two 'I' are adjacent to each other. **(3 Marks)**

c) State and prove Pascal's Formula w.r.t binomial coefficients. **(4 Marks)**

Q8. a) State and prove Pigeonhole principle. **(3 Marks)**

b) Explain the application of inclusion-exclusion to Surjective Functions with example. **(3 Marks)**

Q9. a) Using recurrence relation, solve the merge sort problem to sort a list of $n = 2^k$ elements in ascending order. **(3 Marks)**

b) In how many ways can 30 students be grouped into 7 groups? **(3 Marks)**

Q10. a) Given two graphs, calculate the degree of each vertex in both graphs. Also comment on the regularity of both the graphs. **(4 Marks)**
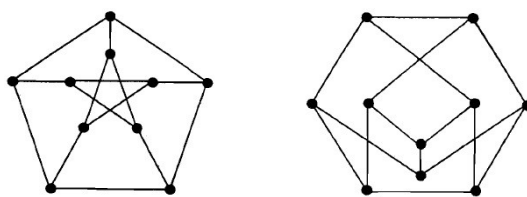
Q11. Differentiate between path, walk, circuit and cycle in a graph with example. **(4 Marks)**

Q12 Differentiate between Eulerian and Hamiltonian graphs with suitable examples. **(2 Marks)**

Q13. For the given graph, calculate the chromatic number of the graph. **(3 Marks)**
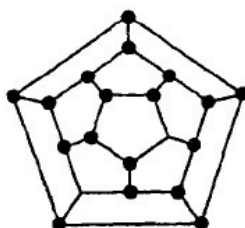
Course Code   :   MCS-213
Course Title   :   Software Engineering
Assignment Number   :   MCA(1)/213/Assign/2022
Maximum Marks   :   100
Weightage   :   30%
Last Dates for Submission : 31st May, 2022 (for January Session)
                              31st October, 2022 (for July Session)

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 Grade Card Generation System (OGCGS)** for a University. OGCGS should run both on PCs and Mobile Devices. **OGCGS** will have all fields such as Student's name, Student's Address, Learner Support Center Code and Address, Aadhaar Number, Programme Code, Month (January/July) and Year of Admission , Course Codes and Titles (Semester Wise), Marks obtained, Maximum and Minimum Marks, Pass/Fail (Course Wise), Percentage Course Wise, Aggregate Percentage, Programme Successfully Completed/Not Completed, Division (First/Second/Third) secured etc. Any student enrolled to any programme should be able to generate Grade Card any time. Make necessary assumptions.

For developing **OGCGS** 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/22**
Maximum Marks	:	**100**
Weightage	:	**30%**
Last Date of Submission	:	**31ˢᵗ May, 2022 (for January Session)**
		31ˢᵗ October, 2022 (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 you ………ii…………(know), we …………..iii………..(trade) for two years now and …………iv…………..(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, we ……………vii……………..(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). We ……..ix……(not plan) any major changes; the company……….x………(continue) to be owned and run by the three partners.

Q4:

Your prospective employer asked you to prepare a presentation on *any one* of the following: **(10 Marks)**

You may use visual aids to support your presentation. Presentation should consist of atleast 20 slides.

- i.   Role of Artificial Intelligence in Education
- ii.   Cloud Computing Applications

Q5:

You have seen a job with a multinational company advertised in a newspaper for the post of *Software Engineer (Trainee)*. Prepare your own Resume/Biodata to apply for the post.   **(10 Marks)**

Q6:

You were told by the Project-Lead to organize an official meeting to invite suggestions from the Experts regarding the use latest technologies for a proposed project. In this context, do the following: **(10 Marks)**

(a) Write an invitation through email to invite the Experts.

(b) Prepare the minutes of the meeting.

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:
Write short notes on the following: (10 Marks)

    i)   Work Ethics in an Organisation
    ii) Etiquette while using (a)Twitter and (b) Facebook

Course Code   :   **MCS-215**
Course Title   :   **Security and Cyber Laws**
Assignment Number   :   **MCA (1)/215/Assign/2022**
Maximum Marks   :   **100**
Weightage   :   **30%**
Last date of Submission : **31st May, 2022 (for January session)**
                          31st October, 2022 (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: List and explain any ten security breaches in the Cyberspace. How can these breaches be handled with the use of technology?   **(10 Marks)**

Q2: Explain the following terms with the help of an example: **(20 Marks)**

    (i)   Steganography
    (ii)   Different types of cipher used in cryptography
    (iii)   RSA algorithm
    (iv)   Authentication and authorisation
    (v)   Use of Hash function in security

Q3: Explain the security measures and security policies of an online systems.   **(10 Marks)**

Q4: Why is Cyberlaws needed? How can cyberspace be regulated? Explain the cyberspace regulation in India.   **(10 Marks)**

Q5: Explain the following with the help of suitable examples   **(20 Marks)**

   (i) Cybercrimes and its classification
   (ii) Penalties and Compensation against cyber crimes
   (iii) Cyber forensic
   (iv) Cybercrime investigation

Q6: Explain the copyright issues in the context of digital medium, music and goods with the help of an example.   **(10 Marks)**

Course Code	:	MCSL-216
Course Title	:	DAA and Web Design Lab
Assignment Number	:	MCA(1)/L-216/Assign/2022
Maximum Marks	:	100
Weightage	:	30%
Last Dates for Submission	:	31st May, 2022 (for January Session)
		31st October, 2022 (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 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 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.
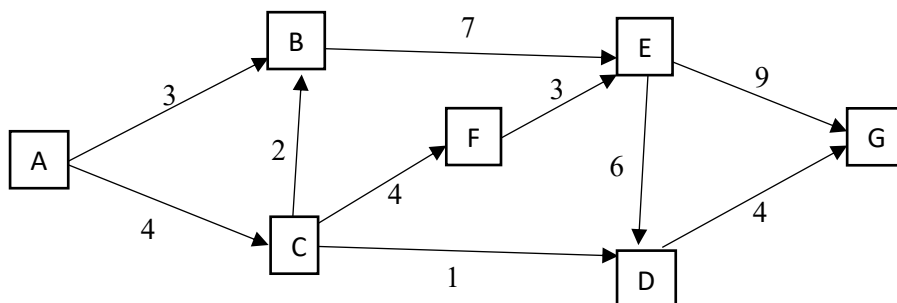
Section – 1

Q1. Explain Huffman's coding algorithm. Apply Huffman's algorithm to construct an optimal binary prefix code for the given letters andits frequencies in the following table. **(12 Marks)**

Letters	P	R	E	Q	A	I	O
Frequency	11	7	14	8	9	5	3

Implement Huffman's coding algorithm and run on the above given problem.

Q2. Implement Dijkstra's algorithm for the below given graph to find shortest path from node A tot node G. **(8 Marks)**

Section – 2

Q3. As a developer, design the following web form for guest house reservation at IGNOU. The requirements should include the following fields. **(20 Marks)**

First Name   :

Last Name   :

Email Address   :

Govt. Issued- ID   :

Date of Arrival   :

Date of Departure   :

Country   :

Number of Persons   :

Any special Request   :

Payment Method   : ◯ Debit   ◯ Credit

[Submit]   [Cancel]   [Reset]

Note:

1. All the fields should be validated using Java Script.
2. Use appropriate input boxes (text, dropdown, button, checkbox etc.)
3. Submit button should enter all the field's data to the database.
4. Show error message if required field is left blank.

Course Code	:	MCSL-217
Course Title	:	Software Engineering Lab
Assignment Number	:	MCA(1)/L-217/Assign/2022
Maximum Marks	:	100
Weightage	:	30%
Last Dates for Submission	:	31st May, 2022 (for January Session)
		31st October, 2022 (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 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 presentation.
Question 1:

ABC is a University which is having Learner Support Centers (LSCs) across the World. It also had Regional Centers (RCs) across the World. ABC also includes many departments which offer various programmes. However, not all LSCs offer all the Programmes. Counseling sessions normally take place during weekends. Minimum attendance of 75% is essential in Practical Counseling Sessions. Every LSC is having a Code. Every RC is having a code. Every Department is having a Code. Every Programme is having a Code. Every Course is having a Code. Any person who takes admission to any of the Programmes is also having an enrollment number. All codes and enrollment number are unique. Semester End Examinations are held at designated Examination Centers and every Examination Center is having a code. Every students is assigned to a LSC where he attends counseling sessions. A student can seek transfer from one LSC to another.

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

(1) List the Entities	**(10 Marks)**
(2) For each Entity, list Attributes	**(10 Marks)**
(3) Define relationships between the Entities	**(10 Marks)**
(4) Finally, draw the Entity Relationship Diagram	**(10 Marks)**