

**MCA (INTEGRATED)**  
**(SEM V) THEORY EXAMINATION 2022-23**  
**DESIGN & ANALYSIS OF ALGORITHMS**

Time: 3 Hours

Total Marks: 70

**Note:** Attempt all Sections. If require any missing data: then choose suitably.

**SECTION A**

1. Attempt all questions in brief.

2 x 7 = 14

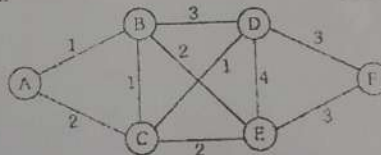
- (a) Write down all the 3 cases of master method to solve the recurrence of following type  
 $T(n) = aT(n/b) + f(n)$
- (b) Define algorithm and its characteristics.
- (c) Discuss the properties of binomial tree.
- (d) Differentiate structure of a node of binomial heap and Fibonacci heap with proper diagram.
- (e) What do you understand by greedy approach
- (f) Discuss Naive algorithm for string matching.
- (g) Differentiate backtracking approach in comparison of branch and bound technique.

**SECTION B**

2. Attempt any three of the following:

7 x 3 = 21

- (a) Describe Insertion Sort algorithm and analyze its complexity
- (b) Explain the B-Tree and differentiate between B-tree and Red Black Tree.
- (c) Differentiate between the working of prim's and kruskal algorithm for finding the minimum spanning tree. Also give the minimum spanning tree by using Kruskal algorithm of given graph.



- (d) Illustrate Breadth First Search and Depth First Search by taking suitable example.
- (e) What is the relationship among P, NP and NP complete problems? Show with the help of a diagram.

**SECTION C**

3. Attempt any one part of the following:

7 x 1 = 7

- (a) Illustrate master theorem with all three cases. Apply Master theorem on following recurrence to get their solution.

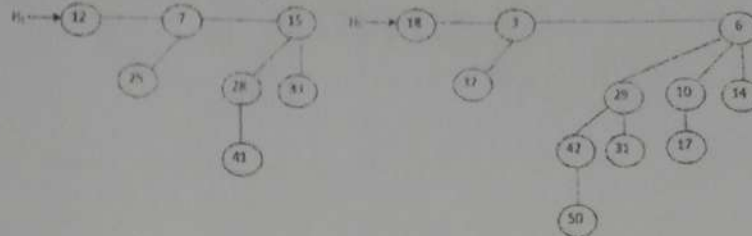
$$T(n) = 4T\left(\frac{n}{2}\right) + \theta(n^3)$$

- (b) What do you mean by Asymptotic notation? Define  $\Omega$ -notation,  $O$ -notation and  $\theta$ -notation with examples.

4. Attempt any *one* part of the following:

7 x 1 = 7

- (a) Illustrate RB-Tree insertion algorithm on following data. Draw neat and clean diagram after each modified step (10, 7, 9, 8, 14, 11, 13)
- (b) What do you understand by Binomial Heap? Merge following Binomial Heaps using Binomial Heap Union Algorithm-



5. Attempt any *one* part of the following:

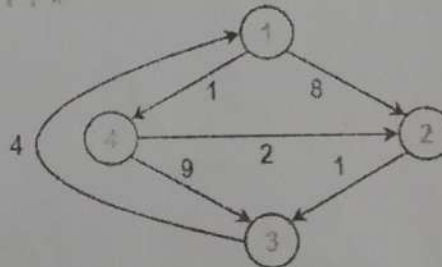
7 x 1 = 7

- (a) Why Strassen's technique better than classical divide and conquer technique of matrix multiplication? Evaluate following matrix multiplication using Strassen's algorithm.
- $$\begin{bmatrix} 2 & 1 \\ 1 & 1 \end{bmatrix} \text{ and } \begin{bmatrix} 2 & 2 \\ 2 & 1 \end{bmatrix}$$
- (b) Differentiate between Greedy and Dynamic Programming Algorithms. Solve the 0-1 knapsack problem by greedy strategy.
- Item  $n=7$  Knapsack capacity  $m=15$ ,  $(P_1, P_2, P_3, \dots, P_7) = (10, 5, 15, 7, 6, 18, 3)$  and  $(w_1, w_2, \dots, w_7) = (2, 3, 5, 7, 1, 4, 1)$ .

6. Attempt any *one* part of the following:

7 x 1 = 7

- (a) Describe Merge Sort algorithm with suitable example and also write its complexities for all three cases
- (b) Demonstrate Floyd Warshall's algorithm to solve All Pairs Shortest Path problem for following graph to find the shortest distance between all the pairs of vertices.



7. Attempt any *one* part of the following:

7 x 1 = 7

- (a) Write short notes on
- Approximation Algorithm
  - Backtracking Algorithm
- (b) Discuss KMP algorithm for string matching with suitable example

**MCA (INTEGRATED)**  
**(SEM V) THEORY EXAMINATION 2022-23**  
**PROGRAMMING WITH MATLAB**

Time: 3 Hours

Total Marks: 70

Note: Attempt all Sections. If require any missing data; then choose suitably.

**SECTION A**

1. Attempt all questions in brief.

2 x 7 = 14

- (a) What are the components of MATLAB desktop?
- (b) How comments are written in MATLAB?
- (c) Differentiate between one-dimensional and multidimensional array.
- (d) How do you declare a single line and multiline string?
- (e) What is a sub-function? Briefly explain with example.
- (f) What do you mean by mesh grid and mesh plot?
- (g) Write a script to solve a linear equation.

**SECTION B**

2. Attempt any three of the following:

7 x 3 = 21

- (a) Explain the use of input(), sprintf() and disp() with proper example.
- (b) Write commands to perform the following -
  - (i) Create a matrix of size 4X4
  - (ii) Print the diagonal elements
  - (iii) Change the size of matrix to 8X2
  - (iv) Add a row at the end of the matrix
  - (v) Delete the first column of the matrix
  - (vi) Print transpose of the matrix
  - (vii) Flip the matrix from left to right
- (c) Discuss various decision making statements with example.
- (d) Describe any five graph plotting functions with example.
- (e) Define terms - Eigen value and Eigen vector. Write script to find Eigen values and Eigen vectors of a matrix.

**SECTION C**

3. Attempt any one part of the following:

7 x 1 = 7

- (a) Define and compare local, global and persistent variables with example.
- (b) Explain the following-
  - (i) sign()
  - (ii) round()
  - (iii) abs()
  - (iv) ceil()
  - (v) fix()
  - (vi) real()
  - (vii) angle()

4. Attempt any one part of the following:

7 x 1 = 7



- (a) Write steps to copy contents of one string to another, compare two strings, count the number of characters of a string and find substring of a string.
- (b) Write script to print the following of a 3X3 matrix-
  - (i) Print sum of all elements
  - (ii) Lower triangular matrix
  - (iii) Upper triangular matrix

5. Attempt any *one* part of the following:

7 x 1 = 7

- (a) Explain the steps to create and use a function file with proper example.
- (b) Differentiate between for loop and while loop with example. Also write a script to print sum of all prime numbers from 1 to 50.

6. Attempt any *one* part of the following:

7 x 1 = 7

- (a) Discuss steps to draw a two-dimensional plot with example. Also write steps to draw a pie chart.
- (b) Write a script to demonstrate the use of multiple plots with example.

7. Attempt any *one* part of the following:

7 x 1 = 7

- (a) Explain steps to solve a polynomial equation with proper example.
- (b) What is MATLAB ODE suite? Why is it used? Explain ODE suite solvers.

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**MCA (INTEGRATED)**  
**(SEM V) THEORY EXAMINATION 2022-23**  
**JAVA PROGRAMMING**

Time: 3 Hours

Total Marks: 70

**Note:** Attempt all Sections. If require any missing data; then choose suitably.

**SECTION A**

1. Attempt all questions in brief.

2 x 7 = 14

- (a) Explain the different way of using thread?
- (b) Discuss with Socket.
- (c) What is Enterprise Java Bean?
- (d) Discuss FTP, HTTP and POP protocols.
- (e) What is Object Oriented Programming?
- (f) Why we use Layout Manager in AWT?
- (g) What is String in Java?

**SECTION B**

2. Attempt any three of the following:

7 x 3 = 21

- (a) What are the requirements in participating in audio video conferencing?
- (b) What is an instance variable? Explain how an instance variable of a class can have different value for each object of that class.
- (c) Write short notes on the following:
  - (i) JLabel
  - (ii) JButton
  - (iii) Inner frame
- (d) Explain the principles of Remote Method Invocation with block diagram.
- (e) Write a Java Program to create an employ class and calculate a employ Grouse salary using inheritance.

**SECTION C**

3. Attempt any one part of the following:

7 x 1 = 7

- (a) Define cookies? How they are used in retrieving the information from clients?
- (b) In Java only a single class can be extends. If there is a need to extend more than one class, how can this be achieved?

4. Attempt any one part of the following:

7 x 1 = 7

- (a) What is Java Bean? Discuss the advantages of Java Bean?
- (b) What constitutes an internet? Explain in brief the role of Domain Name System (DNS) over internet with suitable block diagram.

5. Attempt any one part of the following:

7 x 1 = 7

- (a) What is meant by package? How it is created and implemented in Java?
- (b) Explain in detail the concepts of Applet in java.

6. Attempt any *one* part of the following:

7 x 1 = 7

- (a) Write a Java Program Draw the line, Rectangle, oval, text using the graphics method.
- (b) Explain life cycle of Servlet with neat diagram.

7. Attempt any *one* part of the following:

7 x 1 = 7

- (a) What are the components of BDK? Give any five beans available in BDK? Discuss the steps required for creating user defines beans.
- (b) Write short notes on the following:
  - (i) charAt()
  - (ii) equals()
  - (iii) toString()

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MCA (INTEGRATED)  
(SEM V) THEORY EXAMINATION 2022-23  
SYSTEM ANALYSIS & DESIGN

Time: 3 Hours

Total Marks: 70

Note: Attempt all Sections. If require any missing data; then choose suitably.

SECTION A

1. Attempt all questions in brief. 2 x 7 = 14
- (a) What do you understand by DFD?
  - (b) Define System and its characteristics.
  - (c) Give the difference between Structured Interview and Unstructured Interview.
  - (d) Define IPC.
  - (e) What do you understand by Pair Programming?
  - (f) Define System Analyst.
  - (g) What do you meant by SRS? Why it is needed?

SECTION B

2. Attempt any three of the following: 7 x 3 = 21
- (a) What do you mean by System Design? Explain the various types of System Design.
  - (b) Define CBIS? Explain SDLC with suitable diagram.
  - (c) Define system testing and its characteristics? Explain the role of system testing in IT Sector.
  - (d) What do you mean by Information? Explain its types?
  - (e) Define Planning? Explain the various steps for developing system.

SECTION C

3. Attempt any one part of the following: 7 x 1 = 7
- (a) Discuss the various types of system.
  - (b) What do you meant by Information System? Explain various types of Information System.
4. Attempt any one part of the following: 7 x 1 = 7
- (a) What do you meant by System Analyst? Explain the role of system analyst in IT professional.
  - (b) Write short notes on ( any two ) :
    - (i) Decision Table
    - (ii) Data Dictionary
    - (iii) Decision Tree
5. Attempt any one part of the following: 7 x 1 = 7
- (a) Compare and Contrast Performance Analysis and Fact Analysis.
  - (b) What do you mean by System Review? Explain the various types of System Review?
6. Attempt any one part of the following: 7 x 1 = 7
- (a) Write short notes on ( any two ) :
    - (i) Questionnaires
    - (ii) Interview
    - (iii) SQA
  - (b) Discuss the concept of clean room process.
7. Attempt any one part of the following: 7 x 1 = 7
- (a) Explain Feasibility Study? Discuss the various types of Feasibility Study?
  - (b) Discuss the criteria for selection of software?

**MCA(INTEGRATED)**  
**(SEM V) THEORY EXAMINATION 2022-23**  
**CYBER SECURITY**

Time: 3 Hours

Total Marks: 70

Note: 1. Attempt all Sections. If require any missing data; then choose suitably.

**SECTION A**

1. Attempt *all* questions in brief.

2 x 7 = 14

- (a) What are the various types of Information Systems?
- (b) Explain Archival Storage.
- (c) Define Macro viruses.
- (d) Explain Access Control.
- (e) Explain E-Cash.
- (f) Why security policy should be developed.
- (g) Define Software License.

**SECTION B**

2. Attempt any *three* of the following:

7 x 3 = 21

- (a) What are the various threats to Information Systems?
- (b) Explain various Security Threats to E-Commerce.
- (c) Explain Digital Signature.
- (d) Explain Security Architecture issues in Hardware.
- (e) Explain Semiconductor law in detail.

**SECTION C**

3. Attempt any *one* part of the following:

7 x 1 = 7

- (a) What do you understand by Cyber Bullies and Cyber Predators?
- (b) What are the basic principles of Information Systems?

4. Attempt any *one* part of the following:

7 x 1 = 7

- (a) Explain Data Backup.
- (b) What do you understand by Firewall? What is the Packet filter?

5. Attempt any *one* part of the following:

7 x 1 = 7

- (a) Explain the concept of EDI. Discuss the benefits of EDI.
- (b) What is Smart Card? Differentiate between debit card and credit card.

6. Attempt any *one* part of the following:

7 x 1 = 7

- (a) What are the process of application development security?
- (b) What is Information Security Governance?

7. Attempt any *one* part of the following:

7 x 1 = 7

- (a) Explain Provisions in IT Act, 2000
- (b) Explain IPR(Intellectual Property Rights) and its types.