Registration No.: | | | | | | | | | | |

Total Number of Pages: 02 **Course: MCA**

Sub_Code: MCA02001

2nd Semester Regular/Back Examination: 2023-24

SUBJECT: Computer Networks

BRANCH(S): MCA

Time: 3 Hour

Max Marks: 100

Q.Code: P138

Answer Question No.1 (Part-1) which is compulsory, any eight from Part-II and any two from Part-III.

The figures in the right-hand margin indicate marks.

Part-I

Q1 **Answer the following questions:** **(2 x 10)**

a) Define the term 'protocol' in the context of computer networks.

b) Describe the key difference between analog and digital signals.

c) What is the OSI model and how does it differ from the TCP/IP model?

d) Explain the concept of 'Layering' in computer networks.

e) List two common transmission impairments in data communication.

f) What are CRC codes and what is their purpose in data communication?

g) Define the term 'multiplexing' in network communication.

h) Describe the purpose of a 'hub' in networking.

i) What is meant by 'store and forward packet switching'?

j) Explain the term 'sliding window protocol' and its use in networking.

Part-II

Q2 **Only Focused-Short Answer Type Questions- (Answer Any Eight out of Twelve)** **(6 × 8)**

a) Discuss the historical development of the Internet and its standardization process.

b) Compare and contrast guided and unguided transmission media.

c) Explain how the sliding window protocol works on noiseless channels.

d) Describe how the ALOHA and CSMA protocols manage multiple access on a network.

e) Differentiate between repeaters, hubs, bridges, and routers in the context of connecting devices.

f) Outline the optimality principle in routing algorithms and its significance.

g) Compare circuit switching and packet switching in terms of efficiency and use cases.

h) Discuss the impact of flooding in network communication and how it is controlled.

i) Explain the purpose of the shortest path routing protocol and where it is best applied.

j) Describe the Internet Protocol (IP) address mapping process, including ICMP, IGMP, ARP, RARP, and DHCP.

k) Analyze the differences between connectionless and connection-oriented networks.

l) Detail the key components and functions of the Transport Layer in the OSI model.

Part-III

Only Long Answer Type Questions (Answer Any Two out of Four)

Q3	Provide an in-depth analysis of the TCP/IP Protocol Suite, including a detailed comparison with the OSI Model and their implications on network architecture and communication.	**(16)**
Q4	Describe the entire process of error detection and correction in the Data Link Layer, including a detailed explanation of CRC codes and how they are applied in practice.	**(16)**
Q5	Discuss the design issues of the Network Layer, including packet switching and routing algorithms, and analyze their impact on the performance and reliability of network communication.	**(16)**
Q6	Conduct a comprehensive examination of TCP, including its service model, sliding window, congestion control, and how it ensures reliable process-to-process delivery in the Transport Layer.	**(16)**

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Total Number of Pages: 03 **Course: MCA**

Sub_Code: MCA02002

2nd Semester Regular/Back Examination: 2023-24

SUBJECT: Design Analysis and Algorithms

BRANCH(S): MCA

Time: 3 Hour

Max Marks: 100

Q.Code: P186

Answer Question No.1 (Part-1) which is compulsory, any eight from Part-II and any two from Part-III.

The figures in the right hand margin indicate marks.

Part-I

Q1 **Answer the following questions:** **(2x10)**

a) Is $f(n) = 3n^2 + 5n + 6 = o(n^3)$?

b) Write two advantages of depth first search over breadth first search.

c) Assume that a merge sort algorithm in the worst case takes 30 seconds for an input size 64. Find out the most closely approximates the maximum input size of a problem that can be solved in 6 minutes.

d) Define Dis-joint set. Write the operation supported by the dis-joint set.

e) Differentiate between Decision problem and optimization problem.

f) Find the minimum number of comparisons required to determine if an integer appears more than n/2 times in a sorted array of n integers.

g) What is the time required for finding the shortest path in a graph with n-vertices and e-edges?

h) Differentiate between Greedy approach and Dynamic programming.

i) What are the constraints required for a Backtracking method?

j) Determine whether the following problems are P, NP or NP-Complete, Satisfiability problem, Hamiltonian cycle, TSP problem, Knapsack problem, Clique, Set partitioning.

Part-II

Q2 **Only Focused-Short Answer Type Questions- (Answer Any Eight out of Twelve)** **(6 × 8)**

a) State the Greedy Knapsack? Find an optimal solution to the Knapsack instance n = 3, m = 20, (P1, P2, P3) = (25, 24, 15) and (W1, W2, W3) = (18, 15, 10)

b) Explain the Divide-and Conquer technique. Design a recursive algorithm for binary search.

c) Differentiate between Prim's and Kruskal algorithm. Let G be the complete undirected graph on 4 vertices having 6 edges weights 1, 2, 3, 4, 5, 6. What is the maximum possible weight that a minimum weight spanning tree of G can have?

d) Arrange following elements by using heap sort and demonstrate each step:

22,34, 57,20,81,14,47,43, 48,61

e) Determine Longest Common Subsequence of <1,0,0,1,0,1,0,1> and <0,1,0,1,1,0,1,1,0>

f) Apply the Bottom up Dynamic Approach to the following instance of 0/1 knapsack problem. The maximum capacity of the knapsack is 10.

Item	Weight	Profit
1	7	42
2	3	12
3	4	40
4	5	25

g) Define Big-Oh and Big-omega notation. Find Big-Oh for the function $f(n) = 4n^2 + 2n + 7$.

h) Sort the following elements by using merge sort 34, 67, 10, 33, 65, 88, 13, 23.

i) Design a polynomial time algorithm that verifies whether a graph is 4-colourable. The algorithm should read a string s, where i^{th} character of the string represents the colour of node i. The output of the algorithm is TRUE or FALSE.

j) Solve the following recurrence relation:

$T(n) = 2T(n/2) + n^3$

$T(n) = 16T(n/4) + n$

k) Find the minimum number of scalar multiplications required to multiply 5 matrices described by (p_0, p_1, p_5) = (15, 20, 5, 10, 25, and 10). Determine the order of matrices to be multiplied so that this minimum can be achieved.

l) Find the time complexity of below Psuedocode.

```
A()
 {
    Int i,j,k,n;
    For(i=1; I<=n; i++ )            - n times
    {
          For(j=1; j<=i; j++ )
          {
            For(k=1; k<=100; k++ )    100 times
          (
            Printf("Hello")
          }
```

Part-III

Only Long Answer Type Questions (Answer Any Two out of Four)

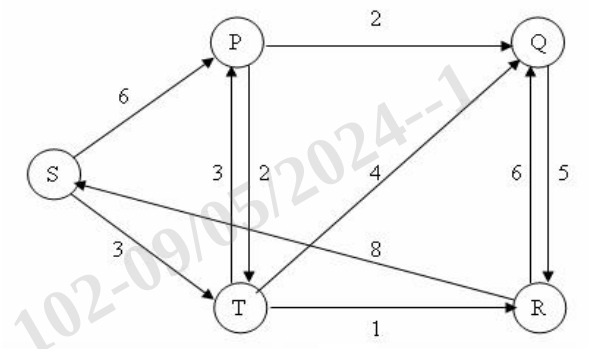
Q3 **a)** Sort the following elements using Quick sort algorithm. Analyze the time complexity. **(8)**
54, 26, 93, 17, 7731, 44, 55, 20

b) The characters a to h has the following set of frequencies based on Fibonacci numbers as follows: **(8)**
a:1, b:1, c:2, d:3, e:5, f:8, g:13, h:21
A Huffman code is used to represent the characters. What is the sequence of characters corresponding to following code?
110111100111010

Q4 **a)** We are given 9 tasks T_1, T_2, T_3……T_9. The execution of each requires 1 unit of times. What is the maximum profit earned? Consider the following table: **(8)**

TASK	T_1	T_2		T_3	T_4	T_5	T_6	T_7	T_8	T_9
Profit (P_i)	15	20		30	18	18	10	23	16	25
Deadline (D_i)	7	2		5	3	4	5	2	7	3

b) Find out the shortest path from following graph G using Bellman Ford algorithm taking source vertex S. What its time complexity? **(8)**



G

Q5 **a)** What is a branch and bound technique? How the TSP can be solved using this technique? **(8)**

b) Discuss the concept of pattern matching algorithm? Write the Rabin-Karp algorithm for the string matching. Suppose T = 2 5 6 3 1 5 8 9 0 4, P = 6 3 1, q = 13 then Find the position where Pattern matching occurs **(8)**

Q6 **a)** Discuss the relation between P, NP, NP-complete and NP-Hard problem with suitable example. **(8)**

b) Discuss the 4 - queen's problem. Draw the portion of the state space tree for n = 4 queens using backtracking algorithm. **(8)**

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Total Number of Pages: 02 **Course: MCA**

Sub_Code: MCA02003

2nd Semester Regular/Back Examination: 2023-24

SUBJECT: Object Oriented Programming Using Java

BRANCH(S): MCA

Time: 3 Hour

Max Marks: 100

Q.Code: P281

Answer Question No.1 (Part-1) which is compulsory, any eight from Part-II and any two from Part-III.

The figures in the right-hand margin indicate marks.

Part-I

Q1 **Answer the following questions:** **(2 x 10)**

a) What is byte code and JVM?

b) Why is Java known to be multithreading?

c) Compare Swing API and AWT API.

d) Define any three-character stream classes in Java.

e) Differentiate between String Buffer and String Builder.

f) Explain multi catch statement with an example.

g) How can we pause the execution of a Thread for specific time?

h) Differentiate between Panel and Frame with examples.

i) Write the difference between Applets and Applications.

j) Differentiate between JButton and JToggle Button containers.

Part-II

Q2 **Only Focused-Short Answer Type Questions- (Answer Any Eight out of Twelve)** **(6 × 8)**

a) What is compile time polymorphism and its importance? Use the compile time polymorphism in a Java program to create the objects.

b) Discuss method loading and overriding with example in Java.

c) Why cannot we pass an object by value to a copy constructor? Explain with example.

d) What are the subclasses of JButton class of swing package? Give an example.

e) Write an AWT program to create a Frame and close the frame using event Delegation model.

f) With the help of Java programs, explain the different use of 'super' keyword.

g) Discuss the methods for String comparison with examples.

h) Develop a Java package named 'even package', with a class Even containing a static method that checks whether a number is even or not. and returns that information. Import this package in another class and use to check a number is Even or not.

i) Create a user defined exception as 'InvalidAgeException'. Write Java program That takes age as a Command Line Argument. Raise the Exception 'InvalidAgeException' if age is less than 18.

j) What do you understand by thread? Describe the complete life cycle of a thread.

k) Override the following applet methods with example: init(), stop() , paint(), start(), destroy()

l) Discuss the opening and reading of a user defined text file in Java with suitable example.

Part-III

Only Long Answer Type Questions (Answer Any Two out of Four)

Q3 **a)** Differentiate between Interface and abstract class. When Interface is preferred over abstract class? **(5+6+5)**

b) Differentiate between: i) Class and Interface ii) String and StringBuffer class.

c) Generate 100 random integers from 0 to 9. If the sum is 300 keep these integers in an array. In this way, generate integer array 100 times. Print a histogram saying how many times each digit occurs.

Q4 **a)** What is thread synchronization? What are the different ways of thread Synchronization? Write a java program to explain synchronized method. **(8+8)**

b) Write a Java program to demonstrate Run time polymorphism using interfaces using Fixed stack and Dynamic stack classes.

Q5 **a)** What are the Java's Built-in exceptions? How to create custom / user-defined Exception class. Discuss mechanism of Exception handling in Java. **(8+8)**

b) What are checked and unchecked Exceptions? Write the differences between checked and unchecked exceptions.

Q6 **a)** Explain life cycle of an applet in detail with schematic diagram. Also, Explain passing parameter values from HTML file to applet. **(8+8)**

b) Create an applet for Tic-Tac-Toe game. Use 9 (3×3) buttons to represent X and O symbols. Create a text field to collect player name and a button to start a new game.

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Total Number of Pages: 02 **Course: MCA**

Sub_Code: MCA02004

2nd Semester Regular/ Back Examination: 2023-24
SUBJECT: Object Oriented Analysis & Design
BRANCH(S): MCA
Time: 3 Hour
Max Marks: 100
Q.Code: P359

Answer Question No.1 (Part-1) which is compulsory, any eight from Part-II and any two from Part-III.
The figures in the right-hand margin indicate marks.

Part-I

Q1 **Answer the following questions:** **(2 x 10)**

a) How is an object's state and behavior represented?
b) What is a multi-valued attribute? Give an example.
c) "Multiple inheritance is a boon" – Comment and justify.
d) What is coupling? Identify the type of coupling in the following:
The print routine of the customer billing accepts a customer data structure as an argument, parses it, and prints the name, address, and billing information.
e) Define an interaction diagram.
f) Define system events and system boundary.
g) Represent the relationship and justify your answer for the following:
A single employee cannot belong to multiple companies. If we delete the company, employee object will not be destroyed.
h) How to connect the UI layer to the Domain layer?
i) What are CRC cards?
j) What are the advantages of factory objects?

Part-II

Q2 **Only Focused-Short Answer Type Questions- (Answer Any Eight out of Twelve)** **(6 × 8)**

a) How does the object-oriented approach differ from the traditional top-down approach? Explain with examples.
b) Define and differentiate between static and dynamic binding with suitable examples.
c) Define and differentiate between aggregation and composition.
d) With a suitable example, explain about the noun-phrase approach for identifying classes.
e) What is a controller? Explain the concepts of Façade, session, and bloated controller.
f) State the importance of modeling in UML.

g) Explain logical architecture and UML package diagram.

h) What is object-oriented integration testing? Explain with suitable example.

i) How to apply constraints in Class Diagram?

j) What are design patterns? What is their purpose? How are they classified? Give one example from each.

k) Draw a Class diagram for issuing and returning books from library.

l) Enumerate the different type of coupling that might exist between two modules.

Part-III

Only Long Answer Type Questions (Answer Any Two out of Four)

Q3 List and explain the object-oriented design axioms and corollaries. **(16)**

Q4 Draw Sequence and Activity diagram for withdrawing money from ATM. Provide proper explanation to justify the diagrams. **(16)**

Q5 Explain the concept of Generalization and Inheritance with suitable example. Develop a generalization-specialization hierarchy for the following scenario: A car rental company maintains a vehicle database for all vehicles in its current fleet. For all vehicles, it includes the vehicle identification number, license number, manufacturer, model, date of purchase, and color. Special data are included for certain type of vehicles: **(16)**
Trucks: Cargo capacity
Sports cars: Horsepower, renter age requirement
Vans: Number of passengers
Off-road vehicles: Ground clearance, Drivetrain (four or two-wheeler drive)

Q6 Explain about adapter, factory method, behavioral and observer patterns. **(16)**

Registration No.: | | | | | | | | | | |

Total Number of Pages: 03 **Course: MCA**

Sub_Code: MCA02005

2nd Semester Regular/Back Examination: 2023-24

SUBJECT: Internet and Web Programming

BRANCH(S): MCA

Time: 3 Hour

Max Marks: 100

Q.Code: P443

Answer Question No.1 (Part-1) which is compulsory, any eight from Part-II and any two from Part-III.

The figures in the right hand margin indicate marks.

Part-I

Q1 **Answer the following questions:** **(2 x 10)**

a) Name the protocol and the software used to access web pages.

b) Name and explain the tags presents in head tag of aHTML document.

c) What are the uses of meta tag in HTML? Explain with examples.

d) What is <DIV> tag in HTML? What are its uses?

e) Differentiate between web browser and web server.

f) What are the uses of CSS in HTML document?

g) Write the code to link an external JavaScript to an HTML document.

h) Differentiate between telnet and FTP.

i) Name two symmetric key algorithms used for security and comment on their key sizes.

j) What are arrays in JavaScript? The index of first element in array starts from which number?

Part-II

Q2 **Only Focused-Short Answer Type Questions- (Answer Any Eight out of Twelve)** **(6 × 8)**

a) What is the difference between a switch and router?

b) Provide the syntax of following HTML tags:
image, paragraph, division, span, bold, headings with examples.

c) Describe the use of following attributes in an html table with an example.

1. align
2. border
3. bgcolor
4. cellspacing
5. cellpadding
6. background

d) What is an operator in JavaScript? What is the difference operator precedence and associativity?

e) Differentiate between external CSS and internal CSS.

f) What is DOM in JavaScript?
Explain the use of following DOM methods with suitable examples.

1. document.getElementById(),
2. document.getElementsByTagName()
3. document.getElementsByClassName()
4. document.createElement(element)
5. element.setAttribute()

g) What is the difference between pseudo-class and pseudo-element in CSS? Explain each with an example.

h) Using a combinator select the paragraph occurring immediately after the <h1> element and style it to have text color as blue, text size 25 and bold. Use the codesnippet given below.

```
<body>
<h1>Use of combinators in CSS</h1>
<p>It is the first paragraph element which will get affected. </p>
<div> It is the div element
<p> It is the paragraph under the div element </p>
</div>
<p>It is the paragraph element after the div</p>
<p>It is the paragraph element which will also get affected</p>
</body>
```

i) What is a block element and inline element in HTML? Give examples of each. Using CSS change a link element (<a>) to a block element and remove the underline from it.

j) The CSS position property is used to set position for an element. it is also used to place an element behind another. There are five different position values: Static, relative, fixed, absolute, and sticky. Explain their use with examples.

k) Differentiate between padding and border property in CSS through diagram. Show their use through examples.

l) Write the HTML code to create the following table.

ID	Name	Subject	Marks
1	David	Maths	80
		Physics	90
		Computers	70
2	Alex	Maths	80
		Physics	70
		Computers	90

Part-III

Only Long Answer Type Questions (Answer Any Two out of Four)

Q3

a. What is a selector in CSS? What are the various types of selectors in CSS. Explain each with examples. **(16)**

b. Write the CSS to create a vertical navigation bar as shown below.

Home
News
Contact
About

c. Create a list in HTML and using CSS change the bullet to be lower alphabet andstarting with c.

d. When do we submit data through a form using GET method?How the data is sent to the server? Which attribute in form tag holds the server address?

Q4

i. What are the various types of lists that can be created with HTML? Explain with examples. **(16)**

ii. Write the use of following functions available for arrays in Javascript providing an example for each.
   shift()
   slice()
   concat()
   push()

iii. Write code in JavaScript to create an array of five numbers and sort them ascending order.

iv. What CGI stands for? Write a sample code to connect a CGI script from a HTML page.

Q5

i. Design a form using HTML, CSS and Javascript for an online Grocery shop. The User can view the catalogue of available items and select the no of items required and click on the order button. When order button is clicked, call a javascript function to calculate the total amount payable and ask the user to provide the shipping address and a confirm button to place the order. **(16)**

ii. Create an HTML page listing the states of India in alphabetical order. The names of the states shall appear as links which when clicked shall display the details about the state like area, capital, population, important places (with photos) in a new tab. Use CSS as an external CSS file to style the HTML document.

Q6

i. Write a form that will collect information from a visitor and send it to be processed by JavaScript in the page summary.html. The form should collect the following information: petName (the name of a pet), petType (which can be either Dog, or Cat, or Bird) and pedigreed (which is either true or false, and should start out checked). Your form should include a Submit button, and should demonstrate proper use of the tag. In the summary page display the details entered by the visitor. **(16)**

ii. What is a digital signature? Explain how it useful for secure communication over Internet?