2nd Semester Regular/Back Examination: 2022-23
Computer Networks
BRANCH(S): MCA (2 Yrs)
Time: 3 Hour
Max Marks: 100
Q. Code: M122
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) Differentiate between IPv4 and IPv6.
b) What is a frame?
c) Differentiate between LAN and MAN.
d) What is the use of router?
e) What is WLAN?
f) Explain the usage of Ethernet.
g) Define the data rate limit.
h) Explain differences between UDP and TCP.
i) Why we use HTTP?
j) Explain the concept of periodic analog signal.

Part-II

Q2   **Only Focused-Short Answer Type Questions- (Answer Any Eight out**   **(6 × 8)**
         of Twelve)
a) What is the purpose of the OSI model and the TCP/IP protocol suite in computer networks?
b) Explain the differences between analog and digital signals in the context of data communication.
c) How do transmission impairments affect data transmission over guided media?
d) Define CRC codes and explain their role in error detection at the Data Link Layer.
e) Differentiate between random access and controlled access multiple access protocols.
f) Briefly describe the role of bridges, switches, and routers in a computer network.
g) What is the purpose of routing algorithms in the Network Layer?
h) Compare and contrast connectionless and connection-oriented networks.
i) Describe the functions and uses of ICMP, ARP, RARP, and DHCP in the context of internetworking.

j) Explain the concept of logical addressing and provide examples of internet protocols addresses.

k) Explain the role of DNS on the Internet Protocol.

l) What security is essential in the computer networks? Explain PGP – SSH in brief.

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

Q3 Discuss the TCP service model, the concept of TCP sliding window, and TCP congestion control mechanisms, emphasizing their roles in ensuring reliable data transfer and congestion avoidance. **(16)**

Q4 Discuss the working principles of ALOHA and CSMA protocols, highlighting their advantages and limitations. **(16)**

Q5 Discuss the optimality principle in routing and the differences between circuit and packet switching. Define flooding and multicast, and elaborate on their significance in network communication. **(16)**

Q6 What is the need of congestion avoidance in networks? Explain two congestion avoidance methods. **(16)**

2nd Semester Regular / Back Examination: 2022-23
SUBJECT: Analysis and Design of Algorithms
BRANCH(S): MCA
Time : 3 Hour
Max Marks : 100
Q.Code : M181
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)   Arrange the following functions from the lowest asymptotic order to the highest asymptotic order: 7n, 2n, 10n, log n, 4n^3, 5n^2, 2 log n, n! & log n.

   b)   How the Backtracking of algorithm differs from that of branch and bound algorithm?

   c)   State three properties of Greedy Method.

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

   e)   Differentiate between Deterministic and nondeterministic algorithm.

   f)   Differentiate between Dynamic Programming and Greedy methods

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

   h)   Define an Algorithm. Describe the different criteria that satisfy the algorithm

   i)   Show that given a maximum flow in a network with edge, a maximum cut of N can be computed in O(m) times

   j)   Define polynomial time reducibility

Part-II

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

   a)   Find an optimal solution with optimal value to the given knapsack instance n=7, m-18, (p1, p2, p3, p4, p5, p6, p7) = (10,15,12,5,16,18,20) and (w1, w2, w3, w4, w5, w6, w7) = (2,3,5,7,2,4,5)

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

   c)   Explain Activity Selection Problem along with algorithm.

Job	1	2	3	4	5	6
Start time	1	3	0	5	3	7
Finish Time	4	5	6	7	9	9

d) Construct a min-heap using the following elements and demonstrate each step:

   4, 5, 18, 13, 16, 35, 8, 26, 45.

e) What is single source shortest path problem? What its advantage?

f) Suppose that all characters in the pattern p are different. Show how to accelerate NAÏVE-STRING-MATCHING to run in time O(n) on an n-character text T.

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

h) Prove that the fractional knapsack problem has the greedy-choice property.

i) The directed Hamiltonian cycle is NP-complete. Prove that the undirected Hamiltonian cycle is reducible to the directed Hamiltonian cycle.

j) Solve the following recurrence relation:

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

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

k) Give the control Abstraction for divide-and-conquer. Use divide and conquer paradigm to devise recurrence relation for analysis of quick sort. use the same to find best case analysis for quick sort

l) Construct a Huffman tree for the following data obtain its Huffman code

Character	A	b	c	d	e	f
No. of Occurrences	2	3	3	4	6	10

Part-III

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

Q3 a) Describe and justify Kruskal's algorithm for finding the minimum spanning tree of an undirected graph **(8)**

b) Compute m and s table and find optimal parenthesis for multiplication of matrices parenthesis for the matrices $A1_{2X3}$, $A2_{3X5}$, $A3_{5X4}$, $A4_{4X6}$ using Matrix chain multiplications **(8)**

Q4 a) Explain the algorithm for finding length of LCS. Determine LCS of $<1,0,0,1,0,1,0,1>$ and $<0,1,0,1,1,0,1,1,0>$ **(8)**

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

G
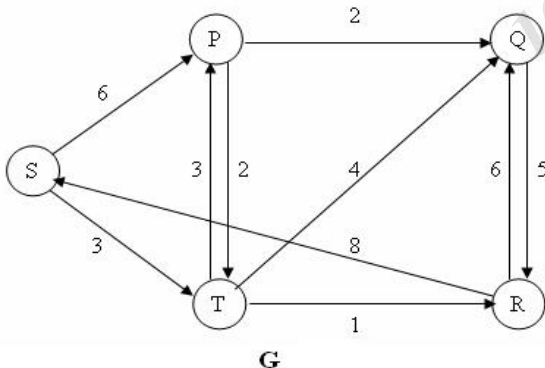
Q5 **a)** Explain the approximation algorithm for solving the TSP (Travelling Salesman **(8)** Problem) problem.

b) Discuss the concept of pattern matching algorithm? Write the Rabin-karp **(8)** 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.

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

b) Write short note on any (TWO) of the following **(8)**

    a) NP-Complete

    b) N-Queen's Problem.

    c) Vertex-Cover Algorithm

Registration No :

Total Number of Pages : 02

Course: MCA
Sub_Code: MCA02003

2ⁿᵈ Semester Regular/Back Examination: 2022-23
SUBJECT: Object Oriented Programming Using JAVA
BRANCH(S): MCA
Time: 3 Hour
Max Marks: 100
Q.Code : M237
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) Explain the concept of scope and lifetime of variables in Java.

b) Describe the difference between a constructor and a method in Java.

c) What is the meaning of 'static' keyword in Java? Explain the difference between a static method and an instance method.

d) Describe the usage of the 'final' keyword in Java. How does it apply to methods, classes, and variables?

e) Explain the difference between checked and unchecked exceptions.

f) Differentiate between AWT and Swing in Java.

g) What is a Configuration manager in Java AWT?

h) Compare the key differences between a Swing-based GUI application and an applet in Java.

i) What is dynamic method dispatch in Java? Give an example.

j) Explain the difference between a static method and an instance method.

Part-II

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

a) Explain the significance of the Java Virtual Machine (JVM) architecture in the context of Java programming. How does it contribute to Java's platform independence?

b) Write a Java program that takes user input for the radius of a circle and calculates its area. Explain the process of user input, variable declaration, and mathematical calculations in your program.

c) Explain the concept of method overloading in Java with an example.

d) Discuss the concept of dynamic method dispatch in Java. Provide an example scenario involving a base class and its derived classes.

e) Explain the significance of interfaces in Java and their role in achieving multiple inheritances. Create an example interface and demonstrate how classes can implement multiple interfaces.

f) Define abstract classes in Java and explain their purpose in object-oriented programming.

g) Explain the purpose of the try, catch, and finally blocks in handling exceptions.

h) Discuss the concept of multithreading in Java. Explain the advantages and challenges of multithreading.

i) Compare and contrast the Thread class and the Runnable interface for creating threads in Java.

j) Explain the AWT class hierarchy in Java and discuss the role of different container classes.

k) Write a Java program that demonstrates the use of adapter classes in event handling.

l) Write a simple Swing program that includes a JButton, a JLabel, and a JTextField.

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

Q3 Discuss the significance of constructors and methods in Java. Develop a Java class that includes constructors with different parameters and methods that perform user-specific tasks. **(16)**

Q4 Write Java code that demonstrates the usage of method overloading, method overriding, and dynamic method dispatch. **(16)**

Q5 Implement a comprehensive Java application that utilizes AWT controls to create an interactive user interface. Include various components such as buttons, labels, text fields, and menus. **(16)**

Q6 Compare and contrast Swing components and AWT components in Java. Implement a Swing-based application that incorporates various Swing controls and containers to create an intuitive and user-friendly graphical user interface. **(16)**

Registration No:

MCA
MCA02004

2nd Semester Regular/ Back Examination: 2022-23
SUBJECT: Object Oriented Analysis & Design
BRANCH(S): MCA (2 Yrs)
Time: 3 Hour
Max Marks: 100
Q.Code : M292
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) List out the two main advantages of object-oriented development.

b) Distinguish between method and message in an object.

c) What are the primary goals in the design of UML?

d) Differentiate between coupling and cohesion.

e) Define an interaction diagram.

f) Define system events and system boundary.

g) List the relationships used in class diagram.

h) How to connect the UI layer to the Domain layer?

i) How to apply the GRASP pattern?

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) Explain about the following features: abstraction, encapsulation, and inheritance.

b) Define and differentiate between static and dynamic binding with suitable examples.

c) Define and differentiate between aggregation and composition.

d) Compare between Activity and State chart Diagram.

e) What is a controller? Explain the concepts of Façade, session, and bloated controller.

f) Explain about association and attributes.

g) Explain logical architecture and UML package diagram.

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

i) What is object-oriented system testing? Provide a suitable scenario to explain.

j) Explain the process of mapping design to code.

k) Briefly explain about the system sequence diagram with appropriate example.

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 A University conducts examinations and the results are announced. Prepare a report for the following: **(16)**
• Print the marks in the register number order semester wise for each department
• Print the Arrear list semester wise.
• Prepare a Rank list for each department.
• Prepare the final aggregate mark list for final year students.
Identify the problem statement and design the classes for each sequence. Draw a detailed flow chart using state chart diagrams. Design this system using Rational Rose. Draw all the UML diagrams for designing this system.

Q4 Write a problem statement for Library management system. Draw the UML Use Case, Activity diagram, Class diagram, Sequence diagram, State Chart diagram, package diagram, Component and Deployment diagrams. **(16)**

Q5 Model a state transition diagram for the following scenario. Here is what happens in a microwave oven: **(16)**

• The oven is initially in an idle state with door open, where the light is turned on.
• When the door is closed it is now in idle but the light is turned off.
• If a button is pressed, then it moves to initial cooking stage, where the timer is set and the lights ae on and the heating starts.
• At any moment the door may be opened, the cooking is interrupted, the timer is cleared and the heating is stopped.
• Also, while cooking, another button can be pushed and extended cooking state starts, where the timer gets more minutes. At any moment the door can be opened here also.
• If the timer times out, then the cooking is complete, heating stops, lights are off and it sounds a beep.
• When the door is open, again the oven is in idle state with the door open.

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

2nd Semester Regular/ Back Examination: 2022-23
SUBJECT: Internet and Web Programming
BRANCH(S): MCA (2 Yrs)
Time : 3 Hour
Max Marks : 100
Q.Code : M379
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 WWW? Who is the inventor of WWW?

b) What is the difference between a web server and a web browser? Name two popular web server softwares and web browsers.

c) Draw a neat diagram for OSI reference model.

d) What is the difference between rowspan and columnspan property? Explain with an example.

e) Create two lists: one for flowers and another for fruits. While displaying the flowers, the bullet image should be an image of a flower, similarly for fruits list, the bullet image should be a fruit.

f) What is the difference between GET and POST methods in an HTML form? What value does the action attribute in a form holds?

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

h) What is the common gateway interface? With a neat diagram, show the mechanism of dynamic web page generation using CGI.

i) What is FTP? Which ports are used for FTP applications?

j) What is a digital signature? Which security aspects are fulfilled while using digital signature?

Part-II

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

a) (i) HTML is a markup language. Justify.
(ii) Describe the use of the following html tags: <title>,<base>,<link>,<style>,<meta>,<script>

b) Write the use of following functions available for string in Javascript providing an example for each.
    i.   trim()
    ii.   charAt()
    iii. concat()
    iv. split()
    v.   indexof()
    vi. substring()

c) Differentiate between padding and margin. Write code using HTML and CSS to create a paragraph with following CSS properties: Background color: blue, Top margin: 50px, Bottom margin: 50px, Right margin: 100px, margin-left: 100px.

d) What is a regular expression in JavaScript? Write the code using regular expression to do case insensitive search for a string "bput" in the source string "Workshop on IOT conducted in BPUT". What will be returned in the search?

e) (i) Write a function in javascript, that takes as input a year and displays whether it is a leap year or not.

(ii) Differentiate between the use of let, var and cons in javascript with an example of each.

f) HTTP protocol is used in which layer of the network? What is a stateful protocol? Whether HTTP protocol is stateful or stateless? Give reason. For a banking application, Which method: GET or POST is used for sending user authentication details to the server and why?

g) Differentiate between symmetric and asymmetric key encryption. Name two encryption algorithms for each category. For large files, which type of encryption is suitable and why?

h) What is an object in javascript? Create a javascript object named person with the following attributes:

First Name is "Priyanka", Last name is "Murmu",

Age is 50 and eye colour is blue.

Write code in html to display the details of the person on the web page.

i) **(i)** Write a program using html and javascript that takes an input string in a text field and displays the string in reverse order.

(ii) A positive integer is called a perfect number if it is equal to the sum of all of its positive divisors, excluding itself. For example, 6 is the first perfect number because 6 = 3 + 2 + 1. The next is 28 = 14 + 7 + 4 + 2 + 1. There are four perfect numbers less than 10,000. Write a function in javascript to find all these four numbers.

j) What is a firewall? What are the various types of firewall techniques? Write few lines about their working principle. How is firewall different from an IDS?

k) What is an event in javascript? Give examples of few events in JavaScript. Create an html form with a text field and a button. When the button is clicked after providing input in the text field, the contents of the text field should change to uppercase.

l) What is a layout in a webpage? Explain with example, how <DIV> tag is used to create layouts in html.

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

Q3   **(a)** Write code in HTML to create a table as shown below.   **(16)**

Day	Seminar		
	Schedule		Topic
	Begin	End	
Monday	8:00 a.m.	5:00 p.m.	Introduction to XML
			Validity: DTD and Relax NG
Tuesday	8:00 a.m.	11:00 a.m.	XPath
	11:00 a.m.	2:00 p.m.	
	2:00 p.m.	5:00 p.m.	XSL Transformations
Wednesday	8:00 a.m.	12:00 p.m.	XSL Formatting Objects

(b) Write HTML code to create the web page for your CV.

(c) What are the different types of lists available in HTML? Demonstrate the use of the different types of lists   through examples. Using CSS change bullet type for unordered list and start numbering for ordered list.

(d) Differentiate between different types of CSS. Provide example of each.

Q4   Design a webpage, for a Workshop to be conducted in BPUT. The webpage should have various sections, like information about the Workshop, Location map of the workshop, course details, registration process, committee members, Instructor details and a registration page where users can register for the workshop, contact us section etc.   **(16)**

Q5   **a)** Describe the document structure in HTML.   **(3+3 +5+5)**
          b) What is the advantages of using CSS in HTML document?
          c) Describe the use of following background properties in CSS through examples.
          - background-color
          - background-image
          - background-repeat
          - background-attachment
          - background-position
          d) Write a program using javascript, html and CSS which will change the color of a link (anchor) depending on visited, hover or active state.

Q6   The United States federal personal income tax is calculated based on filing status and taxable income. There are four filing statuses: single filers, married filing jointly or qualified widow(er), married filing separately, and head of household. The tax rates vary every year. Table below shows the rates for 2009. If you are, say, single with a taxable income of $10,000, the first $ 8,350 is taxed at 10% and the other $ 1,650 is taxed at 15%, so, your total tax is $ 1,082.50. Write a program using html and javascript to take input from user about their filling status and taxable income. After the user submits the details, the tax payable is calculated and displayed to the user.   **(16)**

TABLE 3.2   2009 U.S. Federal Personal Tax Rates

Marginal Tax Rate	Single	Married Filing Jointly or Qualifying Widow(er)	Married Filing Separately	Head of Household
10%	$0 – $8,350	$0 – $16,700	$0 – $8,350	$0 – $11,950
15%	$8,351 – $33,950	$16,701 – $67,900	$8,351 – $33,950	$11,951 – $45,500
25%	$33,951 – $82,250	$67,901 – $137,050	$33,951 – $68,525	$45,501 – $117,450
28%	$82,251 – $171,550	$137,051 – $208,850	$68,526 – $104,425	$117,451 – $190,200
33%	$171,551 – $372,950	$208,851 – $372,950	$104,426 – $186,475	$190,201 – $372,950
35%	$372,951+	$372,951+	$186,476+	$372,951+