

CHHATTISGARH SWAMI VIVEKANAND TECHNICAL UNIVERSITY

Department of Computer Science & Engineering

CT2 – Session- Jan – June, 2025 Month-April

Sem- BTech(H) 4th(AI/DS) Subject- CN Code- B127471(022)

Time Allowed: 2 hrs Max Marks: 40

Min Marks: 14

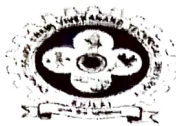
Note: - Q1 is compulsory, attempt any two questions from Q2, Q3, and Q4.

CO3: The learner understands the algorithms and protocols of the network layer.

CO4: The learner understands the service and protocols of the transport layer.

CO5: The learner understands the protocols of the application layer.

Q.N.	Questions	Marks	Levels of Bloom's Taxonomy	COs																									
Unit III																													
Q1	What are the Internetworking devices and their functions?	[4]	L1	CO3																									
Q2	<p>Explain Shortest Path Routing and Link State Routing algorithm.</p> <p>Routing Table given below:</p> <table border="1"> <thead> <tr> <th>Destination</th><th>Netmask</th><th>Gateway</th><th>Interface</th><th>Metric</th></tr> </thead> <tbody> <tr> <td>192.168.1.0</td><td>255.255.255.0</td><td>0.0.0.0</td><td>eth0</td><td>1</td></tr> <tr> <td>10.0.0.0</td><td>255.0.0.0</td><td>0.0.0.0</td><td>eth1</td><td>1</td></tr> <tr> <td>172.16.0.0</td><td>255.240.0.0</td><td>0.0.0.0</td><td>eth2</td><td>1</td></tr> <tr> <td>0.0.0.0</td><td>0.0.0.0</td><td>192.168.1.1</td><td>eth0</td><td>10</td></tr> </tbody> </table> <p>On which interfaces will the router forward packet have addressed to destination 8.8.8.8?</p>	Destination	Netmask	Gateway	Interface	Metric	192.168.1.0	255.255.255.0	0.0.0.0	eth0	1	10.0.0.0	255.0.0.0	0.0.0.0	eth1	1	172.16.0.0	255.240.0.0	0.0.0.0	eth2	1	0.0.0.0	0.0.0.0	192.168.1.1	eth0	10	[8]	L2	CO3
Destination	Netmask	Gateway	Interface	Metric																									
192.168.1.0	255.255.255.0	0.0.0.0	eth0	1																									
10.0.0.0	255.0.0.0	0.0.0.0	eth1	1																									
172.16.0.0	255.240.0.0	0.0.0.0	eth2	1																									
0.0.0.0	0.0.0.0	192.168.1.1	eth0	10																									
Q3	Draw the IPv4 header format and explain each of its fields.	[8]	L2	CO3																									
Q4	What is Congestion Control Algorithms? Explain Hop-by-Hop Choke Packets and Load Shedding algorithms.	[8]	L2	CO3																									
Unit IV & V																													
Q1	What are the types of connection in FTP?	[4]	L3	CO5																									
Q2	Explain all the elements of Transport protocols in detail.	[8]	L2	CO4																									
Q3	Describe the fields of the TCP segment header. How is a TCP connection established under normal circumstances?	[8]	L3	CO4																									
Q4	Discuss Management Information Base in SNMP. Explain the components of Simple Mail Transfer Protocol.	[8]	L2	CO5																									



CHHATTISGARH SWAMI VIVEKANAND TECHNICAL UNIVERSITY

Department of Computer Science & Engineering

Class Test – II Session- Jan – June, 2025 Month- April

Sem- CSE 4th Artificial Intelligence/Data Science

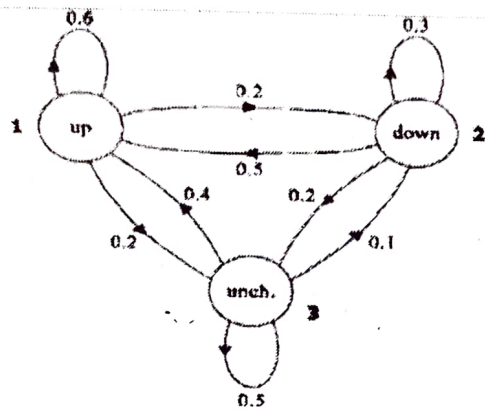
Subject- Artificial Intelligence: Principles and Applications

Code- B127472(022)

Time Allowed: 2 hrs Max Marks: 40

Note: - Note: All questions are compulsory, attempt all questions from part A and B.

Questions are compulsory, attempt all questions from part A and B.																												
Q.N.	Questions	Marks	Bloom's Level	COs																								
Part A																												
Q1 (a)	Which evaluation metric is commonly used for classification tasks when class imbalance is present? a) Mean Squared Error (MSE) b) Accuracy c) F1-score d) R-squared	[2]	Understand	CO3																								
Q1 (b)	Whenever a Teacher threatnes the punishment of not submitting assignment, he is using.....? I. Positive reinforcement II. Negative reinforcement a) Only I b) Only II c) Both I and II d) Neither I nor II	[2]	Understand	CO3																								
Q2	What is zero conditional probability? Imagine that you have given following set of training examples.Each feature can take up to three nominal values a, b and c. <table><tr><th>F₁</th><th>F₂</th><th>F₃</th><th>Class</th></tr><tr><td>a</td><td>c</td><td>a</td><td>+</td></tr><tr><td>c</td><td>a</td><td>c</td><td>+</td></tr><tr><td>a</td><td>a</td><td>c</td><td>-</td></tr><tr><td>b</td><td>c</td><td>a</td><td>-</td></tr><tr><td>c</td><td>c</td><td>b</td><td>-</td></tr></table> How would the Naive system classify the following test example- a) F ₁ = a, F ₂ = c, F ₃ = b b) F ₁ = b, F ₂ = a, F ₃ =c	F ₁	F ₂	F ₃	Class	a	c	a	+	c	a	c	+	a	a	c	-	b	c	a	-	c	c	b	-	[6]	Understand	CO3
F ₁	F ₂	F ₃	Class																									
a	c	a	+																									
c	a	c	+																									
a	a	c	-																									
b	c	a	-																									
c	c	b	-																									
Q3	Consider following diagram-	[5]	Apply	CO3																								



Initial state probability matrix

$$\pi = (\pi_i) = \begin{pmatrix} 0.5 \\ 0.2 \\ 0.3 \end{pmatrix}$$

State-transition probability matrix

$$A = \{a_{ij}\} = \begin{bmatrix} 0.6 & 0.2 & 0.2 \\ 0.5 & 0.3 & 0.2 \\ 0.4 & 0.1 & 0.5 \end{bmatrix}$$

Figure from Huang et al. via

What is the probability of 5 consecutive up days?

1. Sequence is Up-Up-Up-Up-Up
2. Sequence is Up-Up-Up-Up-Up-Up-Down-Up-unch-Up

Q4 Explain supervised, unsupervised and reinforcement learning?

[5]

Apply

CO3

Part B

Q1(a)

The main component that converts crisp input into a fuzzy value is called:

- a) Defuzzifier
- b) Fuzzifier
- c) Rule Base
- d) Inference Engine

[2]

Understand

CO4

(b)

What are the components of a Hidden Markov Model (HMM)?

- a) States, transition probabilities, rewards, observations
- b) States, state transition probabilities, observations, emission probabilities
- c) States, observations, reward function, discount factor
- d) States, actions, rewards, discount factor

[2]

Apply

CO4

Q2

What is fuzzy logic. Explain membership function and different operation used in fuzzy logic.

[5]

Apply

CO4

Q3

Explain different statistical measure used in machine learning.

[5]

Apply

CO4

Q4

Use the k-means algorithm and Euclidean distance to cluster the following 8 examples into 3 clusters:

A1=(2,10), A2=(2,5), A3=(8,4), A4=(5,8), A5=(7,5), A6=(6,4), A7=(1,2), A8=(4,9).

Suppose that the initial seeds are A1, A4 and A7. Run the k-means algorithm for

1 epoch only. At the end of this epoch show:

- a) The new clusters (i.e. the examples belonging to each cluster)
- b) The centers of the new clusters

[6]

Apply

CO4

Note: - 1) From Unit - III attempt any Two Questions.

2) From Unit- IV & V Question No. 1 is compulsory, attempt any two questions from Question No. 2, 3 and 4.

CO1: Understand basics, services of Operating System and concept of deadlock in Operating System.

CO2: Understand the basics of memory Partitioning, paging and segmentation.

CO3: Understand the concept of file and disk system.

CO3: Understand the concept of file and disk system.																																
Q.N	Questions	Marks	Levels of Bloom's Taxonomy	COs																												
Unit-III																																
Q1	Explain recovery from Deadlock.	[6]	Understand	CO1																												
Q2	<p>Consider the following snapshot of a system:</p> <table><tr><td></td><td>Allocation</td><td>Request</td><td>Available</td></tr><tr><td></td><td>A B C</td><td>A B C</td><td>A B C</td></tr><tr><td>P₀</td><td>0 1 0</td><td>0 0 0</td><td>0 0 0</td></tr><tr><td>P₁</td><td>2 0 0</td><td>2 0 2</td><td></td></tr><tr><td>P₂</td><td>3 0 3</td><td>0 0 0</td><td></td></tr><tr><td>P₃</td><td>2 1 1</td><td>1 0 0</td><td></td></tr><tr><td>P₄</td><td>0 0 2</td><td>0 0 2</td><td></td></tr></table> <p>Total resources A = 7, B = 2 & C = 6,</p> <p>a) Using Deadlock Detection algorithm check whether the system is safe or in Deadlock state.</p> <p>b) Suppose that process P₂ makes one additional request of resource type C, can the request be granted or not. Calculate request matrix and check whether the system is safe or not.</p>		Allocation	Request	Available		A B C	A B C	A B C	P ₀	0 1 0	0 0 0	0 0 0	P ₁	2 0 0	2 0 2		P ₂	3 0 3	0 0 0		P ₃	2 1 1	1 0 0		P ₄	0 0 2	0 0 2		[6]	Analyze	CO1
	Allocation	Request	Available																													
	A B C	A B C	A B C																													
P ₀	0 1 0	0 0 0	0 0 0																													
P ₁	2 0 0	2 0 2																														
P ₂	3 0 3	0 0 0																														
P ₃	2 1 1	1 0 0																														
P ₄	0 0 2	0 0 2																														
Q3	<p>Consider the following snapshot of a system:</p> <table><tr><td></td><td>Allocation</td><td>Max Allocation</td><td>Available</td></tr><tr><td></td><td>A B C D</td><td>A B C D</td><td>A B C D</td></tr><tr><td>P₀</td><td>0 0 1 2</td><td>0 0 1 2</td><td>1 5 2 0</td></tr><tr><td>P₁</td><td>1 0 0 0</td><td>1 7 5 0</td><td></td></tr><tr><td>P₂</td><td>1 3 5 4</td><td>2 3 5 6</td><td></td></tr><tr><td>P₃</td><td>0 6 3 2</td><td>0 6 5 2</td><td></td></tr><tr><td>P₄</td><td>0 0 1 4</td><td>0 6 5 6</td><td></td></tr></table> <p>Answer the following question using the banker's algorithm:</p> <p>a) Calculate Need matrix.</p> <p>b) Is the system in safe state if yes then provide safe sequence.</p> <p>c) If a request from process P₁ arrives for (0, 4, 2, 0) can the request be granted immediately.</p>		Allocation	Max Allocation	Available		A B C D	A B C D	A B C D	P ₀	0 0 1 2	0 0 1 2	1 5 2 0	P ₁	1 0 0 0	1 7 5 0		P ₂	1 3 5 4	2 3 5 6		P ₃	0 6 3 2	0 6 5 2		P ₄	0 0 1 4	0 6 5 6		[6]	Apply	CO1
	Allocation	Max Allocation	Available																													
	A B C D	A B C D	A B C D																													
P ₀	0 0 1 2	0 0 1 2	1 5 2 0																													
P ₁	1 0 0 0	1 7 5 0																														
P ₂	1 3 5 4	2 3 5 6																														
P ₃	0 6 3 2	0 6 5 2																														
P ₄	0 0 1 4	0 6 5 6																														

Unit- IV

Q1✓	What are the types of Memory fragmentation?	[2]	Understand	CO1, CO2
Q2✓	Explain various Memory Partitioning.	[6]	Understand	CO2
Q3	Explain Paging and Segmentation Hardware support.	[6]	Analyze	CO2
Q4✓	Using FIFO, Optimal and LRU algorithm for the following reference string with four page frames. Calculate page faults. 1,2,3,4,5,3,4,1,6,7,8,7,8,9,7,8,9,5,4,5,4,2	[6]	Apply	CO2

Unit -V

Q1	What are the attributes of file?	[2]	Understand	CO3
Q2	What are the various allocation methods of Disk?	[6]	Understand	CO3
Q3✓	What are the various levels of directory?	[6]	Understand	CO3
O4✓	Suppose the head of moving head disk is currently servicing a request at track 60. If the queue of request is kept in FIFO order, what is the total head movement to satisfy these request for following disk scheduling algorithm: (i) FCFS (ii) SSFT (iii) SCAN Track number – 65, 170, 35, 120, 10, 140	[6]	Apply	CO3



Chhattisgarh Swami Vivekanand Technical University
University Teaching Department
Class Test-II (July-December 2024)
B.Tech(H)-4th Semester
Branch: Artificial Intelligence/ Data Science

Subject Name: Theory of Computation

Max Marks: 40

Min Marks: 14

Subject Code: C127474(022)

Times: 2 hrs

Note: part a is compulsory. Attempt any two questions from part b,c and d.

CO1: Explain the fundamental concepts of Context-Free Grammars (CFG), derivation techniques, and Chomsky Hierarchy including grammar simplification and normal forms.

CO2: Analyze ambiguous grammars and apply suitable techniques for ambiguity removal, grammar simplification, and transformation into equivalent normal forms and regular grammars.

CO3: Design Push Down Automata (PDA) for given Context-Free Languages and differentiate between acceptance by empty stack and final state, as well as between deterministic and non-deterministic PDAs.

Bloom's Taxonomy Levels: Apply – Level 3, Evaluate – Level 5

Q.No.	Questions	Marks	BL	CO
UNIT 1				
1	a ✓ Explain ambiguity of a grammar with an example.	4	L2	1
	b ✓ Explain the Chomsky Hierarchy of the grammar with examples.	8	L2	1
	c ✓ Find a grammar in the Chomsky Normal Form equivalent to $S \rightarrow aAbB, A \rightarrow aA a, B \rightarrow bB b$	8	L3	2
	d Convert the grammar $S \rightarrow AB, A \rightarrow BS b, B \rightarrow SA a$ in GNF.	8	L4	2
UNIT 2				
2	a ✓ Differentiate DPDA and NPDA.	4	L2	1
	b ✓ Construct PDA with empty store for the language $L = \{wcw^R \mid w \in (0+1)^* \text{ and } w^R \text{ is the reverse of } w.\}$	8	L4	2
	c Construct a PDA for the following content free grammar. $S \rightarrow aSb \mid a, A \rightarrow bSa \mid A \mid \Lambda$ to a PDA and check the acceptability of string abbaab .	8	L4	3
	✓ d Construct a Context free grammar G equivalent to the following PDA. $A = (\{q_0, q_1\}, \{a, b\}, \{Z_0, Z\}, \delta, q_0, Z_0, \emptyset)$ and δ is given by $\delta(q_0, b, Z_0) = \{(q_0, ZZ_0)\}$ $\delta(q_0, \Lambda, Z_0) = \{(q_0, \Lambda)\}$ $\delta(q_0, b, Z) = \{(q_0, ZZ)\}$ $\delta(q_0, a, Z) = \{(q_1, Z)\}$ $\delta(q_1, b, Z) = \{(q_1, \Lambda)\}$ $\delta(q_1, a, Z_0) = \{(q_0, Z_0)\}$	8	L5	3



**CHHATTISGARH SWAMI VIVEKANAND
TECHNICAL UNIVERSITY**
Department of Computer Science & Engineering
Class Test – II Session- JAN – JUN, Month-April
Sem- CSE 4th (AI/DS)

Subject Name – R for Data Science

Max Marks: 40

Min Marks:14

Subject- Code-B127475(022)

Time Allowed:2 hrs

Note: -Q1 is compulsory, attempt any questions from Q2, Q3, and Q4.

CO1: Understand and apply R's non-numerical data types and basic data structures.

CO2: Analyze and manipulate R data structures (lists and data frames) using subsetting and merging techniques.

CO3: Master file handling and data visualization techniques using R and ggplot2.

Q.N.	Questions	Marks	Levels of Bloom's Taxonomy	COs
Unit I				
Q1	<p>a) Which data type in R is ideal for categorical data? A. Logical B. Character C. Factor D. Numeric</p> <p>b) In R, which function converts a character vector into a factor? A. as.factor() B. factorize() C. convert() D. levels()</p> <p>c) When subsetting a list using [] versus [[]], which returns the element itself (not as a list)? A. [] B. [[]] C. Both D. Neither</p> <p>d) In a data frame, when you subset using df\$column, what type of structure is returned? A. Data frame B. List C. Vector D. Matrix</p>	4	Remembering	CO1
Q2	<p>Given a list and a data frame defined as follows:</p> <pre>my_list <- list(numbers = 1:10, colors = c("red", "green", "blue")) df <- data.frame(id = 1:5, value = c(3.4, 2.1, 5.6, 4.0, 3.3))</pre> <p>Write R code to:</p> <ol style="list-style-type: none"> Extract the second element from my_list using both [] and [[]] and explain the difference in outputs. Subset df to obtain rows where value is greater than 3.5. Display the code and expected output. 	8	Analyzing	CO2
Q3	<p>Given the following R vectors:</p> <pre>log_vec <- c(TRUE, FALSE, TRUE, TRUE, FALSE, FALSE, TRUE) char_vec <- c("red", "green", "blue", "red", "green", "blue", "red")</pre> <p>Write R code to:</p> <ol style="list-style-type: none"> Count the number of TRUE values in log_vec. Convert char_vec into a factor and display its levels. <p>Provide both the code and the expected output.</p>	8	Applying	CO1

Q4	<p>Consider two data frames:</p> <ul style="list-style-type: none"> • df1 has columns Name, Age, and Gender • df2 has columns Name and Score <p>Write R code to:</p> <ol style="list-style-type: none"> 1. Merge df1 and df2 by the common column Name. 2. Rename the merged Score column to TestScore. 3. Filter the merged data frame to include only records where Age is above 20 and TestScore exceeds 75. <p>Provide the R code along with expected outcomes.</p>	8	Evaluating	CO2
Unit II				
Q1	<p>a) Which R function opens a file dialog to allow users to select a file? A. setwd() B. file.choose() C. list.files() D. read.table()</p> <p>b) To read a CSV file in R, which function is most appropriate? A. read.table() B. read.csv() C. read.delim() D. readLines()</p> <p>c) Which function is used to write data to a text file in R? A. write.table() B. write.csv() C. Both A and B</p> <p>d) Which plotting function is part of the ggplot2 package? A. plot() B. qplot() C. hist() D. barplot()</p>	4	Remembering	
Q2	<p>Given two numeric vectors:</p> <pre>foo <- c(1.1, 2.3, 3.5, 4.7, 5.9) bar <- c(2.0, 2.8, 3.6, 4.4, 5.2)</pre> <p>Write R code to produce a scatter plot of foo vs. bar. Your code should include customizations for:</p> <ul style="list-style-type: none"> • Plot title • X- and Y-axis labels • Plot symbol shape and color <p>Additionally, explain how these customizations help in data interpretation.</p>	8	Analyzing	CO3
Q3	<p>Assume you have a CSV file named data.csv located in your working directory. Write R code to:</p> <ol style="list-style-type: none"> 1. Read the CSV file into an R data frame ensuring that the header is read and strings are not converted to factors. 2. Export the resulting data frame to a new file named output.txt using "@" as the separator and "???" to represent missing values. <p>Provide the code and describe the expected outcomes.</p>	8	Applying	CO3
Q4	<p>Using the ggplot2 package in R, create a multi-layered plot based on a sample data frame containing columns x, y, and group. Your plot should:</p> <ol style="list-style-type: none"> 1. Plot points with different shapes and colors based on group. 2. Add a line layer connecting the points for each group. 3. Include a custom legend that explains the aesthetics used. <p>Provide the complete R code and explain how each layer contributes to the overall visualization and improves understanding of the data trends.</p>	8	Evaluating	CO3

Chhattisgarh Swami Vivekanand Technical University Bhilai
University Teaching Department

Class Test II

Branch : CSE-AI/DS

Semester : 4th

Subject : Data Visualization

Subject Code : B127476(022)

Max Mark : 40

Min Pass Marks : 14

Note : Attempt any two question on Q2,Q3&Q4

PART -1

- Question 1. What do you mean by Dimension Reduction.(4 Marks)
- Question 2. Explain Scatter plot with suitable example.(8 Marks)
- Question 3. Write short notes on:
(a) Correlogram (b) Paired data(8 Marks)
- Question 4. Explain Time series of two or more response variable with suitable example.
.....(8 Marks)

PART - 2

- Question 1. Define Cartogram with suitable Example.....(4 Marks)
- Question 2. Explain various Visualizing Uncertainty(8 Marks)
- Question 3. Explain Various Visualizing Geospatial data.(8 Marks)
- Question 4. Explain Common pitfalls of color use.(8 Marks)