

B. Tech (Honours) (Data Science/Artificial Intelligence)

Class Test - II, June, 2023

(AICTE Scheme)

(Computer Science and Engineering Branch)

Subject- Computer Network

(B127471(022))

Time Allowed: 2 hours

Maximum Marks: 40

Minimum Pass Marks: 14

Roll NO - 300012821042

- Note: (iii) Each question contains four parts. Part (a) of each question is compulsory.  
Attempt any two parts from (b), (c), and (d) of each question.  
(iv) The figure in the right-hand margin indicates marks.

I.	(a) Given the CIDR representation 20.10.30.35 / 27. Find the range of IP Addresses in the CIDR block.	[2]
	(b) Explain routing algorithms: Distance Vector and Link State.	[3+3]
	(c) Explain IPv4 and IPv6 header format with detail?	[3+3]
	(d) Assigned the IP address block 192.168.10.0/24 for the organization's network. So, create four subnets, each with at least 30 hosts. Design the subnets and provide the following information for each subnet: • Network ID                      First and last usable IP address                      Broadcast address  Or Assume that allocated IP address blocks 192.168.10.0/25, 192.168.10.128/26, and 192.168.10.192/26 from the ISP. Design a Supernet for these blocks and provide the following information: • Network ID                      First and last usable IP address                      Prefix length in CIDR notation	[2+2+2]
II.	(a) What is Socket address?	[1]
	(b) Draw TCP 3-handshaking method with explanation?	[6]
	(c) Draw UDP header format with explanation?	[6]
	(d) List the approaches to improve the QoS (Quality of Service) with Leaky bucket method in detail.	[1+5]
III.	(a) What is the difference between User agent (UA) and Mail transfer agent (MTA)?	[1]
	(b) Explain DNS (Domain Name System) with its types?	[6]
	(c) Short notes on: 1. SNMP                      2. SMTP	[3+3]
	(d) Short notes on: 1. DHCP                      2. RIP	[3+3]



**B. Tech (Honours) (Artificial Intelligence)**

**Class Test - II, JUNE, 2023**

**(AICTE Scheme)**

**(Computer Science and Engineering Branch)**

**Subject- Artificial Intelligence: Principles and Applications**

**Subject Code: B127472(022)**

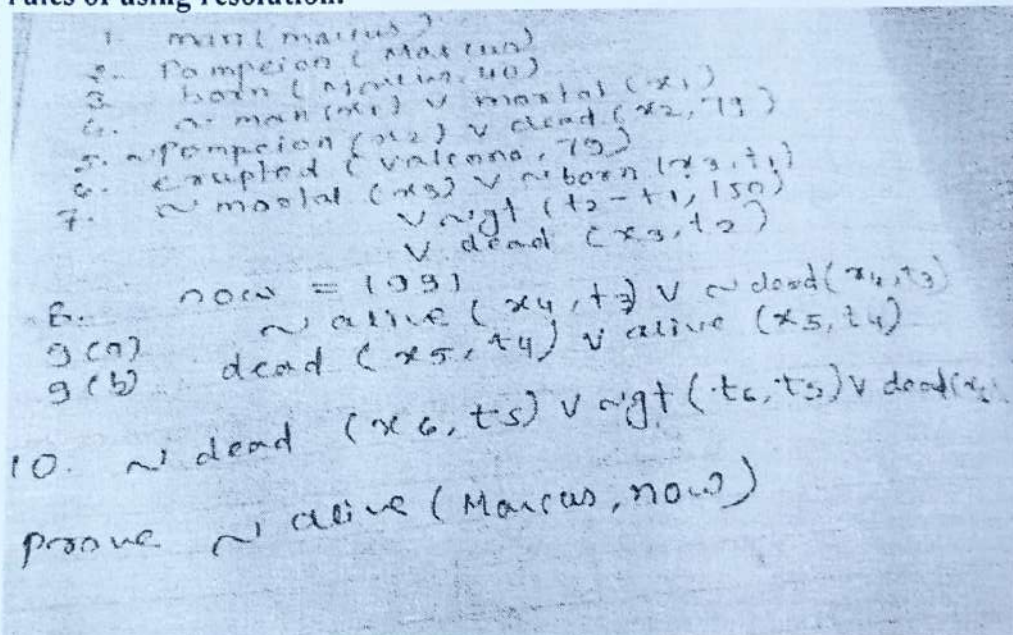
*Time Allowed: 2 hours*

*Maximum Marks: 40*

*Minimum Pass Marks: 14*

Roll No - 300012821072

- Note: (i) Each question contains four parts. Part (a) of each question is compulsory. Attempt any two parts from (b), (c), and (d) of each question.  
(ii) The figure in the right-hand margin indicates marks.

I.	(a) What is Skolemization ? Explain it with proper example.	[2]
	(b) Use resolution principle to prove this below example. Also explain some rules of using resolution.	[6]
		
	(c) Explain Bays Theorem in detail with proper example.	[6]
	(d) Explain HMM Model in details with proper example.	[6]
II.	(a) Define Clustering and its types.	[1]
	(b) Explain KNN Algorithm with suitable graph and example.	[6]
	(c) Explain Machine learning and its types.	[6]
	(d) Explain k-means Algorithm with proper example.	[6]
III	(a) Why do we need Box plot Analysis?	[1]
	(b) What is Data Visualization (DV)? Explain Different plots used in DV.	[6]
	(c) Explain Over-fitting and Under-fitting in Regression and classification	[6]
	(d) Explain Fuzzy set theory with proper example.	[6]



B. Tech (Honours) (Data Science/Artificial Intelligence)

4th Semester, Class Test - 2, Jun, 2023

(AICTE Scheme)

(Computer Science and Engineering Branch)

**Operating System**

**B127473 (022)**

Time Allowed: 2 hours

Maximum Marks:40

Minimum Pass Marks:14

Roll No - 300012821042

- Note: (iii) Each question contains four parts. Part (a) of each question is compulsory. Attempt any two parts from (b), (c), and (d) of each question.  
(iv) The figure in the right-hand margin indicates marks.

I.	a)	What is address binding? Describe its 3 stages.	4
	b)	Explain Swapping.	8
	c)	Explain Demand Paging.	8
	d)	Consider the following reference string... <b>2,7,7,4,0,2,3,0,1,6,7,1,6,2,3,3,7,6,5,1,2,3,0,1,3,2</b> For four (4) frames, find the number of page faults each of the following algorithm produces. 4. FIFO 5. Optimal 6. LRU	8
II.	a)	What is "Thrashing"? Why does it occur?	4
	b)	What is a file? Describe various file attributes and operations.	8
	c)	Describe the various Directory Structures.	8
	d)	Write short notes on: iii. DMA iv. Polling	8



Chhattisgarh Swami Vivekanand Technical University

University Teaching Department

B.Tech (Honours) (Data Science/ Artificial Intelligence)

Class Test - II, May, 2023

Subject: Theory of Computation

B127474 (022)

Time Allowed: 2 hours

Maximum Marks: 40

Minimum Pass Marks: 14

Roll No - 300012821072

Note: Each question contains four parts. Part (a) of each question is compulsory.

Attempt any two parts from (b), (c), and (d) of each question.

The figure in the right-hand margin indicates marks.

### UNIT- 3

Q.1. (a) Define Ambiguity. [1]

(b) If  $g$  is the grammar  $S \rightarrow SbS/a$ . Show that  $g$  is ambiguous and Find the reduce grammar that is equivalent to the CFG given below:

$S \rightarrow aC/SB$ ,  $A \rightarrow bSCa$ ,  $B \rightarrow aSB/bBC$ ,  $C \rightarrow aBC/ad$  [6]

(c) Define GNF. Convert the given grammar into GNF. [6]

$S \rightarrow AB$ ,  $A \rightarrow BS/b$ ,  $B \rightarrow SA/a$

(d) Explain in brief null production. Eliminate null production of given grammar. [6]

$S \rightarrow aS/AB$ ,  $A \rightarrow \wedge$ ,  $B \rightarrow \wedge$ ,  $D \rightarrow b$ .

### UNIT-4

Q.2. (a) Define PDA. [1]

(b) Construct a PDA A equivalent to the following CFG: [6]

$\rightarrow S \rightarrow 0BB$

$\rightarrow B \rightarrow 0S/1S/0$

Test whether 0104 is in  $N(A)$ .



(c) Construct a PDA accepting by empty store for the following language: [6]

$$L = \{a^n b^{2n} / n \geq 1\}$$

(d) Show that  $L = \{a^i b^j / j \geq i\}$  is not CFL. [6]

### UNIT-5

Q. 3. (a) Difference between Recursive Languages and Recursively enumerable languages. [2]

(b) Design a TM that accepts  $\{0^n 1^n / n > 0\}$  and show the transition table & Transition diagram of TM. [6]

(c) Design a TM to recognize the language  $\{1^n 2^n 3^n / n > 0\}$  [6]

(d) Write Short notes on (any 2) [6]

(1) Universal TM (2) Multitape TM (3) NFA TM

**Chhattisgarh Swami Vivekanand Technical University**

**University Teaching Department**

**B.Tech (Honours) (Data Science/ Artificial Intelligence)**

**Class Test - II, Jun, 2023**

**R for Data Science (B127475(022))**

<i>Time Allowed: 2 hours</i>	<i>Maximum Marks: 40</i>
	<i>Minimum Pass Marks: 14</i>

Note:	<ul style="list-style-type: none"><li>Each question contains four parts. Part (a) of each question is compulsory. Attempt any two parts from (b), (c), and (d) of each question.</li><li>The figure in the right-hand margin indicates marks.</li><li>Showing outputs are compulsory in all questions that includes programing.</li></ul>
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• **PART1-**

(a) Fill in the blanks:

In the R language, explain the concepts of "Inf", "NaN", "NULL", and "NA". Give examples to illustrate each concept. [4]

(b) Create a Nested list for the following table using R language:

Student ID	Name	Age	Gender	Contact Info			Courses	
				Phone	Address:	Email	Complusary	Optional
1	John Doe	20	Male	123-456-7890	123 Main St	john@example.com	Mathematics	Physics
2	Jane Smith	19	Female	123-456-7891	456 Elm St	jane@example.com	English	History
3	Alex Brown	21	Male	123-456-7892	789 Oak St	alex@example.com	Chemistry	Biology

(add your information as a 4th row).

[8]

(c) Using R language, create a data frame with the following dummy table:

to add ↩

Department	Name	Age	Gender	Salary
HR	Alice	25	Female	50000
Finance	Bob	30	Male	60000
IT	Charlie	35	Male	70000
Marketing	David	40	Male	80000
Operations	Eve	45	Female	90000

(add your information in next row (use your roll no as your salary, your branch as your department)).



add a new column to the data frame called "department" with the following dummy table: (use the column add method as well as cbind/rbind method to do the same)

Finally, create a subset of the data frame where the age is greater than or equal to 35 and the salary is less than 80000. [8]

(d) Consider a list called **myList** that contains elements of various types (e.g., numeric, character, logical). Write a recursive function in R that traverses the list and returns the sum of all the numeric elements in the list, including those nested within sublists.

For example, given the following list:

```
myList <- list(1, 2, list(3, 4), list(5, list(6, 7)), "eight", TRUE)
```

The expected output of the function should be 28, as it sums up all the numeric values ( $1 + 2 + 3 + 4 + 5 + 6 + 7 = 28$ ) while ignoring non-numeric elements. Write the recursive function in R that accomplishes this task. [8]

- PART 2-

(a) write the names of the symbols used for pch values = 1,2,3,4. [4]

(b) You have been given a data frame, **df**, in R language (not a CSV file), containing information about employees in a company. The data frame consists of the following columns: **employee\_id**, **name**, **department**, **age**, **salary**, and **years\_of\_experience**. You need to perform real-life problem-solving using the **ggplot2** package to visualize the data and apply queries in R to extract useful insights.

i) Apply a query in R to filter employees who have more than 10 years of experience, earn a salary greater than \$80,000, and belong to the "Sales" department. Save the filtered data as **filtered\_df**.

ii) Using the **filtered\_df** obtained from the previous step, visualize the distribution of employee ages using a histogram plot. Include appropriate labels and formatting options to enhance readability.

iii) Generate a bar plot showing the average salary for each department in the **filtered\_df**. The bars should be sorted in descending order based on the average salary.

Provide the solution code for each part of the question. [8]

(c) To practice setting appearance constants with geoms in the R language, let's explore different scenarios based on the last digit of your roll number. Consider your roll number's last digit as a

single-digit number, ranging from 0 to 9. Using your roll number, create a scatter plot using the ggplot2 package in R, where each point's color and shape are determined by the following rules:

Last Digit	Color	Shape
0	Blue	Circle
1	Red	Triangle
2	Green	Square
3	Orange	Diamond
4	Purple	Cross
5	Yellow	Star
6	Pink	Plus
7	Brown	Asterisk
8	Cyan	Circle
9	Gray	Triangle

Please write the R code that generates the scatter plot according to the rules described above, based on your roll number. [8]

(d) Let's practice reading and writing files in R, specifically focusing on reading in external data files and writing out data files. Imagine you have been provided with a dataset in CSV format called "students.csv" containing information about students. The dataset has the following columns:

Name: Student's full name

Roll Number: Unique identifier for each student

Age: Student's age

Grade: Student's grade level (e.g., 10th, 11th, 12th)

GPA: Student's grade point average

Your task is to read in the "students.csv" file, perform some data analysis or manipulation of your choice, and write out the modified dataset to a new CSV file called "modified\_students.csv".

Please write the R code to accomplish the above task

[8]





**Chhattisgarh Swami Vivekanand Technical University, University Teaching  
Department**

**B. Tech (Honours) (Data Science/ Artificial Intelligence)**

**Class Test - II, June, 2023**

**Subject Name-Data Visualization**

**Subject Code-B127476(0222)**

*Roll No - 300012821042*

<i>Time Allowed: 2 hours</i>	<i>Maximum Marks: 40</i>
	<i>Minimum Pass Marks: 14</i>

**Part – 1(a is compulsory and b, c and d are optional attempt any two)**

- Write short notes on density plots. [4 marks]**
- How do you visualize Nested proportions? [8 marks]**
- What are trends? With different examples (any 2) explain the importance of visualizing trends? [8 marks]**
- State the importance of time series visualization with example. [8 marks]**

**Part – 2 (a is compulsory and b, c and d are optional attempt any two)**

- Write notes on Geo-Spatial data visualization [4 marks]**
- Write about common mistakes during use of colour in data visualization [8 marks]**
- How would you handle overlapping data in a plot?[8 marks]**
- Write short note on any two from following sections**
  - Colour vision deficiency**
  - Uncertainty of curve fits**
  - Dimensionality reduction**
  - Mosaic plots**