PRESIDENCY UNIVERSITY

BENGALURU

End - Term Examinations – December 2025

Date: 19 / 12/ 2025   **Time: 01:00pm – 04:00pm**

School: SOCSE	**Program:** CSN	
Course Code: IST2001	**Course Name:** Fundamentals of Natural Language Processing	
Semester: 5th	**Max Marks**: 100	**Weightage**: 50%

CO - Levels	CO1	CO2	CO3	CO4	CO5
Marks	26	26	24	24	

Instructions:

(i) Read all questions carefully and answer accordingly.

(ii) Do not write anything on the question paper other than roll number.

Part A

Answer ALL the Questions. Each question carries 2marks.   **10Q x 2M=20M**

1.	What is part-of-speech tagging and why is it important?	**2 Marks**	**L1**	**CO1**
2.	Define Natural Language Processing	**2 Marks**	**L1**	**CO1**
3.	Define edit distance.	**2 Marks**	**L1**	**CO1**
4.	List the activation functions used in a neural network.	**2 Marks**	**L1**	**CO2**
5.	What is a feedforward neural network?	**2 Marks**	**L1**	**CO2**
6.	Define cross-lingual embeddings.	**2 Marks**	**L1**	**CO2**
7.	What is Named Entity Recognition (NER)?	**2 Marks**	**L1**	**CO3**
8.	Define Transition Probability	**2 Marks**	**L1**	**CO3**
9.	What is a lexical resource in NLP?	**2 Marks**	**L1**	**CO4**
10.	What is Machine Translation	**2 Marks**	**L1**	**CO4**

Part B

Answer the Questions.   **Total Marks 80M**

11.	a.	Explain *Minimum Edit Distance*	**5Marks**	L2	CO1
	b.	Solve the Minimum Edit Distance between the following strings: s_1 = "GEEXSFRGEEKKS" s_2 = "GEEKSFORGEEKS" Show the sequence of edits and the total cost.	**15Marks**	L3	CO1
Or					
12.	a.	Explain *Cosine similarity*	**5Marks**	L2	CO1
	b.	Solve the Minimum Edit Distance between the following strings: s_1 = "SUNDAY" s_2 = "SATURDAY" Show the sequence of edits and the total cost.	**15Marks**	L3	CO1

13.	a.	Explain the role of activation functions in neural networks	**5 Marks**	L2	CO2
	b.	The output of a neuron is given by: $net = w_1x_1 + w_2x_2 + b$ where $x_1 = 0.5, x_2 = -0.3, w_1 = 0.4, w_2 = 0.7$, and $b = 0.2$. Solve the neuron's output for each of the following activation functions: Sigmoid function, Tanh function, ReLU function	**15Marks**	L3	CO2
Or					
14.	a.	Explain Feed forward Neural Networks	**5 Marks**	L2	CO2
	b.	Consider a simple feedforward neural network with: - Inputs: x_1 = 0.05, x_2 = 0.10 - Target Output: t = 0.01 - Weights: Input → Output layer: w_1 = 0.15, w_2 = 0.20 - Bias: b = 0.35 - Activation Function: Sigmoid solve the net input and output during the forward pass.	**15Marks**	L3	CO2

15.	a.	Given transition and emission probabilities for a simplified Part-of-Speech (POS) tagging task. Use the Viterbi algorithm to solve the most likely sequence of POS tags for the sentence: **"will can spot mary"**	**20 Marks**	L3	CO3

	Noun	Modal	Verb	End
Start	3/4	1/4	0	0
Noun	1/9	3/9	1/9	4/9
Modal	1/4	0	¾	0
Verb	4/4	0	0	0

	Noun	Modal	Verb
Mary	4/9	0	0
Jane	2/9	0	0
Can	0	1/4	0
See	0	0	2 /4
will	1/9	3 /4	0
Spot	2/9	0	1 /4
pat	0	0	1 /4

Or

16.	a.	Consider a Hidden Markov Model describing from **Table 1** the weather conditions and corresponding human activities. The hidden states are: S_1 = Sunny S_2 = Rainy. The observations from **Table 2** are: painting, cleaning, shopping, cycling. Solve using Forward Algorithm to compute the probability of the observation sequence O = [painting, cleaning, shopping, cycling] **Table 1:**	**20 Marks**	**L3**	**CO3**

Table 1:

From / To	Sunny	Rainy
Sunny	0.8	0.2
Rainy	0.4	0.6

Table 2:

Weather	Painting	Cleaning	Shopping	Cycling
Sunny	0.4	0.1	0.2	0.3
Rainy	0.3	0.45	0.2	0.05

17.	a.	Explain Named Entity Recognition	10 Marks	L2	CO4
	b.	Write the phrase structure (constituency) rules for the sentence and construct parse tree: "**The boy eats an apple**."	10 Marks	L3	CO4
Or					
18.	a.	Explain the concept of sentence structure rules in NLP.	10 Marks	L2	CO4
	b.	Write the phrase structure (constituency) rules for the sentence and construct parse tree: "**the cat sleeps quietly**	10 Marks	L3	CO4