Course Code	BCSL[illegible]	Slot	
Course Title	Natural Language Processing	Class Nbr	CH2024250101603
		Max. Marks	100
Time	3 hours		

General Instructions

- Write only Register Number in the Question Paper where space is provided (right-side a
  not write any other details.

Course Outcomes

1. Understand the fundamental concepts of Natural Language Processing.
2. Develop useful systems for language processing and related tasks involving text pro
3. Demonstrate text-based processing of natural language with respect to morphology.
4. Check the syntactic and semantic correctness of natural language.
5. Select a suitable language modelling & Feature Representation to develop real-world applications
6. Develop computational methods for real-world applications using deep learning.

Section - I

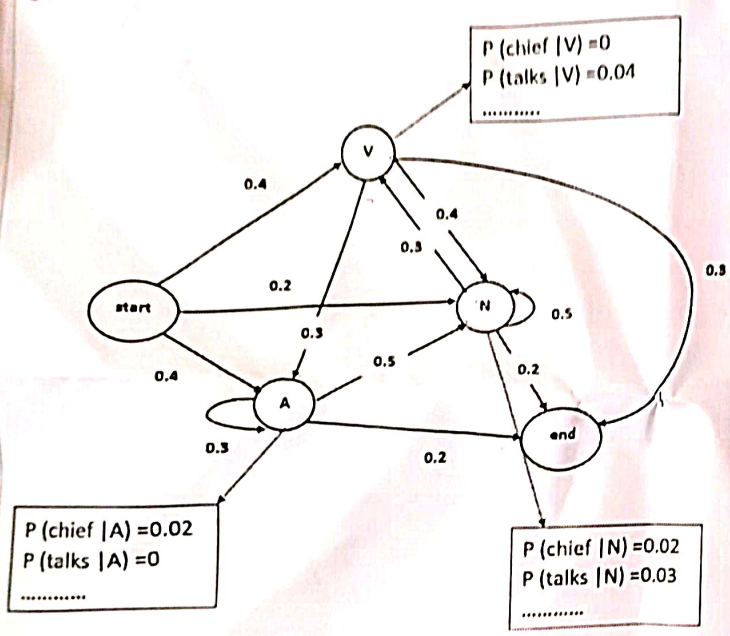
Answer all Questions (10 × 10 Marks)

Q.No	Question	*M
		*M
01.	Analyze the ambiguities in the following sentences. Discuss the interpretations for the same. (5*2=10 Marks) a) The coach saw the player with the binoculars. b) The cake is too light c) They are hunting dogs d) The manager told the employee that he was going to get a promotion e) We saw her duck	10
02.	Apply Porter's stemming algorithm to the highlighted words in the given paragraph. List the resulting stems and explain the specific rules used for each transformation. (10 Marks) "Imagine you are the head chef in a **renowned** restaurant, guiding a food critic through your kitchen as you prepare **exquisite** dishes. As you showcase the **meticulously** crafted plates and the fresh, **vibrant ingredients**, the critic expresses a keen interest in **replicating** your culinary **techniques** in their own cooking endeavors."	10
03.	Imagine you are a computational linguist working on a natural language processing (NLP) system designed to understand sentences by analyzing word relationships. Using the sentence **"The cat chased a mouse,"** demonstrate how transition-based parsing works. Elucidate each step with transitions and include a diagram of the parsing structure at each steps in the parsing **structure.** (10 Marks)	10

04. Demonstrate the process of determining the grammatical validity for the sentence, **"Did the cat chase the dog in the park with the ball?"**. Construct the Cocke Kasami Younger (CKY) parsing table and analyze it with the grammar rules given below. (10 Marks) 10 3 3

S → Aux NP VP
VP → V NP | V NP PP | VP PP
NP → Det N | NP PP
PP → P NP
Aux → "Did"
Det → "the"
N → "cat" | "dog" | "park" | "ball"
V → "chase"

05. Consider the following Hidden Markov Model (HMM) for Part-of-Speech (POS) tagging: 10 2 3



a) Calculate the probability **P (chief talks, N N).** (3 Marks)

b) Calculate the probability of observing the sequence "chief talks" with a POS tag **A** for "chief". (4 Marks)

c) Determine the probability of the POS tag sequence N V occurring. (3 Marks)

06. Analyze the context of the word 'pined' in the given sentences with Lesk algorithm to disambiguate its meaning and demonstrate the same 10 3 4

a) "Rani pined for her lost wallet". (5 Marks)

b) "After her sister's loss rani pined away, especially her health". (5 Marks)

07. Consider a sentiment analysis task with two classes: Good (G) and Bad (B). Use the following miniature training and test documents, simplified from actual movie reviews. Apply text classification using Laplace smoothing to predict the class of the test document. (10 Marks) 10 4 3

	Class	Document
Training	G	Harry Potter movie was awesome movie and awesome experience
	G	The movie is well-organized and the songs in the movie are mind-blowing
	B	Continuity is missing in the Harry Potter movie
	G	Very Powerful
	B	The plot was predictable and boring
Testing	?	With a lot of fun

08.	a) Analyze the following pairs of sentences with a common noun phrase (NP) that has the same grammatical function but different thematic roles. Identify the grammatical function and thematic roles of the NP in each pair. Justify your answers. (6 Marks)	10	4	4

i)	John hit the nail on the head.
	John was hit by the nail on his head.
ii)	They have no doubts about this matter.
	They expressed no doubts in this matter.
iii)	He handed all the documents over to me.
	It seemed to me that he had handed over all the documents

b) Construct the Predicate argument structure for the sentence. (4 Marks)
"The Indian researcher published a special edition around noon yesterday".

09.	Consider the given sentences in the given corpus and predict the next word by using bigram model for the sentence "Thank you for your _____" (10 Marks) • <s>Thank you so much for your help </s> • <s> I truly appreciate all your support </s> • <s>I really appreciate your help </s> • <s>Thank you so much for the wonderful gift </s> • <s>I'm sorry for being late to the meeting </s> • <s>I really like your shoes </s>	10	4	3
10.	Consider the given original texts as, "Natural Language Processing (NLP) is a field that enables machines to understand and generate human language effectively for various applications. As an NLP student, your task is to evaluate the given summaries using ROUGE-1, ROUGE-2 and ROUGE-L metrics: (10 Marks) • **Generated Summary:** "NLP enables machines to understand and generate human language effectively." • **Reference Summary 1:** "NLP allows machines to understand and generate human language." • **Reference Summary 2:** "NLP helps machines process and create human language for multiple applications."	10	5	5

BL-Bloom's Taxonomy Levels - (1.Remembering, 2.Understanding, 3.Applying, 4.Analysing, 5.Evaluating, 6.Creating)

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