Unit 1

1. Present the step-by-step procedure of the Unification-Based Morphological Model and demonstrate its working with an appropriate example. CO1 BTL3

2. Analyze how various morphological types influence Natural Language Processing systems, supporting your explanation with relevant examples. CO1 BTL4

3. Describe the different approaches used in TextTiling for topic segmentation and explain their working principles. CO1 BTL2

4. Explain the concept of morphological typology and describe how it categorizes natural languages, providing suitable examples. CO1 BTL2

5. Describe the role of generative probabilistic models in document segmentation within Natural Language Processing and explain their functioning. CO1 BTL26.

6. Explain the **Dictionary Lookup approach** in morphological analysis with example.

7. Explain how a **Finite State Machine (FSM)** can be used for morphological analysis with example.

8. Describe the Functional Morphology approach in computational linguistics with example.

9. Design a **Finite State Machine (FSM)** to recognize the following English plural forms:

cat → cats
bus → buses
baby → babies

10. Illustrate the necessity of word type and word class in Functional Morphological Analysis with a suitable example, explaining how they contribute to morphological structure and meaning interpretation.

UNIT 2

11. Explain the need for a **Treebank** in syntactic parsing and justify its importance with a suitable example.
5M CO2 BTL3

12. Describe the mechanism of a **shift-reduce parser** and illustrate its operation with an example.
CO2 BTL2

13. Using the given grammar, demonstrate the application of the **chart parsing algorithm** to the sentence *"a pilot likes flying plane"* and calculate the overall score of the generated parse tree.

Production Rule	Score	Production Rule	Score
S → NP VP	2.0	NP → DT NN	1.5

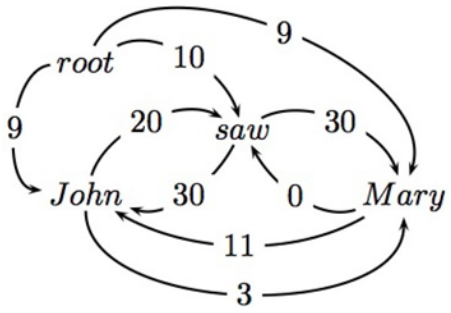
VP → VBG NNS	1.6	NP → JJ NNS	1.4
VP → VBZ VP	1.7	DT → a	0.5
VP → VBZ NP	1.8	NN → pilot	0.6
VBZ → likes	0.7	VBG → flying	0.6
JJ → flying	0.5	NNS → plane	0.6

14. Describe how discriminative models are employed to resolve syntactic ambiguity in parsing and explain their underlying principles.

15. Examine the functioning of the Perceptron learning algorithm in discriminative syntax parsing and discuss how it contributes to selecting the correct parse.16. Explain how a Maximum Spanning Tree (MST) based parser is used in dependency parsing with example.

17. Consider the weighted directed graph for the sentence:

John saw Mary



Construct the maximum spanning dependency tree for the sentence.

18. Explain how the Perceptron Learning Algorithm is applied in a discriminative parsing model to resolve syntactic ambiguity in Natural Language Processing.

19. Explain why the Voted Perceptron Algorithm is preferred over the standard Perceptron Learning Algorithm in discriminative parsing models in terms of generalization, stability, and performance in resolving syntactic ambiguity.

20. Explain why the Averaged Perceptron Algorithm is preferred over the standard Perceptron Learning Algorithm in discriminative NLP models, highlighting how weight averaging contributes to greater training stability, better generalization, reduced overfitting, and improved performance in tasks such as syntactic parsing and ambiguity resolution.

Unit 3

21. Describe the concept of Predicate–Argument Structure in semantic analysis and illustrate it with a suitable example.

5M CO3 BTL3

22. Examine how thematic roles and selectional restrictions contribute to resolving semantic ambiguity, supporting your explanation with appropriate examples.

5M CO3 BTL4

23. Represent the following statements using Predicate–Argument Structure and apply logical inference to determine whether Meera's train is cancelled:

"Meera reserved a train ticket to Delhi. All trains to Delhi are cancelled today."

Formally represent the statements and justify your conclusion using logical reasoning.

24. Apply Lambda Calculus to derive the semantic representation of the sentence:

"Rahul admires science."

Construct appropriate lambda expressions for each lexical item and show how functional application leads to the final semantic representation of the sentence.5M CO3 BTL3

25. Discuss the significance of **Lambda Calculus** in semantic composition within Natural Language Processing and explain with an example.