

RESEM VIII (choice based) Summer 2026 ECS
(3 Hours)

[Total Marks 80]

1415120

- N.B:** 1) Question number 1 is compulsory.
2) Attempt **any three** out of the remaining questions.
3) Assume suitable data if **necessary** and justify the assumptions.
4) Figures to the **right** indicate full marks.

1. Attempt any **FOUR**.

- a) What is natural language processing? List down various challenges involved in NLP? [05]
- b) For each sentence, identify whether the different meanings arise from structural ambiguity, semantic ambiguity, or pragmatic ambiguity: [05]
i) The chicken is ready to eat.
ii) I saw her duck.
- c) List all bi-grams and compute first 6 bigram probabilities for the sentence given below: [05]
<s> the sun rises in the east <\s>
<s> the sun sets in the west <\s>
<s> the moon shines brightly <\s> Explain how spelling correction is done using N-grams
- d) Using the following CFG, Parse the sentence "**Book the flight**". [05]
S -> NP | VP
S -> VP
NP -> Det | N
NP -> Det | Adj | N
VP -> V
VP -> V | NP
- e) The following POS tagged Corpus is given [05]
<s> the/DT students/NN pass/V the/DT test/NN<\s>
<s> the/DT students/NN wait/V for/P the/DT pass/NN<\s>
<s> teachers/N test/V students/NN<\s>
Write down the transition and emission probabilities for a bigram HMM

2. a) Assume that the operation costs for computing the Levenshtein distance are modified as follows: Insertion: 3, Deletion: 2, Substitution: 1. Calculate the distance between the strings "sunday" and "saturday" using these costs. [10]
- b) How does derivational morphology differ from inflectional morphology in NLP? Illustrate both with examples, and explain the role of morphological analysis. [10]

3. a) Define Hidden Markov Model (HMM) and explain its application in POS tagging. [10]
Discuss one limitation with example.
- b) What is stemming in NLP? Explain the working principles and rules of the Porter Stemmer algorithm. [10]
4. a) Define Part-of-Speech (POS) tagging and explain the role of the Viterbi algorithm in determining the most probable tag sequence with example [10]
b) Define semantic analysis and lexical semantics. Explain the role of lexical semantics and discuss ambiguity with example.. [10]
5. a) What does Word Sense Disambiguation (WSD) mean in NLP? Provide an example and elaborate on any one WSD approach. [10]
b) Explain the syntactic versus semantic constraints that influence coreference resolution. Highlight key differences with examples. [10]
6. **Attempt any FOUR**
- a) Explain the role of Named Entity Recognition (NER) in NLP. [05]
- b) What is text normalization in NLP? Explain techniques like lowercasing, stemming, and number handling with examples. [05]
- c) Define collocations in NLP and discuss their importance in understanding natural language structure. [05]
- d) Describe key lexical semantic relationships such as synonymy, antonymy, hyponymy, and meronymy. Support with examples. [05]
- e) What is Reference resolution in NLP? What are types of Reference Resolution, Explain with example? [05]
