Dr. A.P.J. Abdul Kalam Technical University (AKTU) · B.Tech Theory Examination

Natural Language Processing

BCA1052 · Jan 2026

Time: 3 Hours **Max. Marks: 70**

Attempt all Sections.
In case of any missing data; choose suitably.

SECTION A

1(a)	Discuss early grammar based language models.	2	U1
1(b)	What is tokenization?	2	U1
1(c)	Compare different smoothing methods.	2	U2
1(d)	How does math help extract meaning from word counts?	2	U2
1(e)	Define Context Free Grammars.	2	U3
1(f)	What are word senses?	2	U4
1(g)	Discuss real world NLP challenges.	2	U5

SECTION B

2(a)	Describe Regular Expressions and Finite State Automata. Explain how they are used in real NLP tasks such as pattern matching, tokenization, and lexical analysis.	7	U1
2(b)	What is Zipf's Law? Explain its significance in natural language. Discuss how it influences vocabulary distribution and language modeling.	7	U2
2(c)	Explain Chart Parsing and Transition Network Grammars. Describe how Top Down Chart Parsing improves parsing efficiency.	7	U3
2(d)	Explain selectional restrictions. How do they help reduce semantic ambiguity in sentence interpretation?	7	U4
2(e)	Describe speech distortion measures. Compare mathematical and perceptual distortion techniques used in speech analysis.	7	U5

SECTION C

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3(a)	Explain English morphology in detail. Discuss how finite state transducers are used to model lexicon and morphological rules in NLP systems.	7	U1
3(b)	Explain the concept of Minimum Edit Distance. Describe its algorithm, cost operations, and role in spelling correction and speech recognition.	7	U1
4(a)	Explain N gram language models. Describe unsmoothed N grams and discuss why smoothing techniques are necessary in real world NLP applications.	7	U2
4(b)	Provide an overview of English syntax and semantics. Explain how linguistic background helps bridge word level statistics with semantic interpretation.	7	U2
5(a)	What are feature systems in NLP? Explain morphological features and their role in parsing with examples from English grammar.	7	U3
5(b)	Discuss ambiguity in natural language. Explain statistical methods and probabilistic parsing techniques used for ambiguity resolution.	7	U3
6(a)	Discuss different approaches to Word Sense Disambiguation. Compare supervised, dictionary based, and bootstrapping methods.	7	U4
6(b)	Describe syntax driven semantic analysis. Explain semantic attachments and their role in mapping syntax to meaning.	7	U4
7(a)	Explain Short Time Fourier Transform, Filter Bank, and LPC methods. Compare their role in speech feature extraction.	7	U5
7(b)	Discuss acoustic phonetics. Explain the acoustics of speech production and its relevance in speech recognition systems.	7	U5

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