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**BTECH**  
**(SEM V) THEORY EXAMINATION 2023-24**  
**NATURAL LANGUAGE PROCESSING**

TIME: 3 HRS

M.MARKS: 100

**Note:** 1. Attempt all Sections. If require any missing data; then choose suitably.

**SECTION A**

**1. Attempt all questions in brief. 2 x 10 = 20**

| Q no. | Question  | Marks | CO |
|-------|---|-------|----|
| a.    | How has NLP evolved over time?  | 2     |    |
| b.    | Can you explain the challenges associated with language modeling in NLP?                | 2     |    |
| c.    | Discuss strategies for handling ambiguity in parsing.                                   | 2     |    |
| d.    | How Dynamic Programming is employed in parsing algorithms?                              | 2     |    |
| e.    | Discuss the limitations of supervised approaches in handling WSD challenges.            | 2     |    |
| f.    | How do semantic attachments contribute to disambiguating word senses?                   | 2     |    |
| g.    | Discuss the applications of filter bank methods in speech signal processing.            | 2     |    |
| h.    | How do filter banks contribute to speech analysis?                                      | 2     |    |
| i.    | Describe the role of Perceptual Linear Prediction.                                      | 2     |    |
| j.    | How does the process of feature extraction contribute to understanding speech patterns? | 2     |    |

**SECTION B**

**2. Attempt any three of the following: 10 x 3 = 30**

|    |  |    |  |
|----|--|----|--|
| a. | Provide an overview of Hidden Markov Models and Maximum Entropy models in word-level analysis. How do these models contribute to language processing tasks, and what are their strengths and weaknesses?                         | 10 |  |
| b. | Discuss Probabilistic CYK parsing and Probabilistic Lexicalized CFGs. How do these probabilistic parsing techniques improve upon traditional parsing algorithms, and what are their applications in natural language processing? | 10 |  |
| c. | Compare and contrast first-order logic with propositional logic. Discuss the expressive power of first-order logic and its significance in representing complex relationships.   | 10 |  |
| d. | Analyze the challenges associated with accurately representing and classifying speech sounds. How do these challenges impact the development of speech recognition systems?  | 10 |  |
| e. | Explain the significance of Likelihood Distortions in speech analysis and how they contribute to the assessment of speech models.  | 10 |  |

**SECTION C**

**3. Attempt any one part of the following: 10 x 1 = 10**

|    |  |    |  |
|----|--|----|--|
| a. | Explain the concept of Minimum Edit Distance and its significance in the context of word-level analysis. | 10 |  |
| b. | Discuss the challenges associated with evaluating N-grams and the role of smoothing techniques.          | 10 |  |



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**4. Attempt any one part of the following: 10 x 1 = 10**

|    |   |    |  |
|----|---|----|--|
| a. | Compare and contrast Dependency Grammar with Phrase Structure Grammar. Highlight the key differences in representing syntactic relationships between words in these two grammatical frameworks. | 10 |  |
| b. | How does Shallow Parsing differ from deep parsing, and what are the advantages and limitations of each approach?  | 10 |  |

**5. Attempt any one part of the following: 10 x 1 = 10**

|    |   |    |  |
|----|---|----|--|
| a. | Examine how thesaurus-based and distributional methods contribute to measuring word similarity. Discuss the strengths and weaknesses of each approach and their applicability in different contexts.      | 10 |  |
| b. | Compare and contrast WSD techniques using dictionaries and thesauri. How do these lexical resources contribute to disambiguating word senses, and what are the considerations when choosing between them? | 10 |  |

**6. Attempt any one part of the following: 10 x 1 = 10**

|    |   |    |  |
|----|---|----|--|
| a. | Explore the acoustic phonetics aspect of speech production. How do the acoustics of speech production contribute to the perceptual differences between various speech sounds? | 10 |  |
| b. | Explore the Linear Predictive Coding method in speech processing. How does LPC model speech signals, and what are its advantages in speech analysis and synthesis?            | 10 |  |

**7. Attempt any one part of the following: 10 x 1 = 10**

|    |   |    |  |
|----|---|----|--|
| a. | Elaborate on the concept of time alignment in speech analysis, focusing on the techniques of Dynamic Time Warping and the representation of multiple time-alignment paths.                    | 10 |  |
| b. | Explain the process of evaluating Hidden Markov Models, including the concept of the Optimal State Sequence and the role of Viterbi Search in determining the most likely sequence of states. | 10 |  |