Subject Code: KCS072

PAPER ID-310048

Roll No: | | | | | | | | | | | | | |

BTECH
(SEM VII) THEORY EXAMINATION 2024-25
NATURAL LANGUAGE PROCESSING

TIME: 3 HRS **M.MARKS: 100**

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

SECTION A

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

Q no.	Question	CO	Level
a.	How does context influence error detection?	1	K_1, K_2
b.	A Hidden Markov Model (HMM) is used for PoS tagging. Explain the backward algorithms used to compute tag probabilities.	1	K_1, K_2
c.	Provide an example of unification of feature structures for agreement in number and gender.	2	K_1, K_2
d.	Discuss the limitations of CFGs in modeling natural language syntax.	2	K_1, K_2
e.	Compare and contrast dictionary-based and distributional methods for word similarity measurement.	3	K_2
f.	Define selectional restrictions.	3	K_2
g.	How are speech sounds classified?	4	K_1, K_2
h.	How do vocal tract shape and size affect the spectrum of speech sounds?	4	K_1, K_2
i.	Demonstrate the Viterbi algorithm.	5	K_3, K_4
j.	Compare and contrast LPC and PLP coefficients for speech feature extraction.	5	K_3, K_4

SECTION B

2. Attempt any *three* of the following: **10 x 3 = 20**

Q no.	Question	CO	Level
a.	Consider the regular expression (ab)*c. Draw the corresponding finite-state automaton and explain how it recognizes the language.	1	K_1, K_2
b.	Given the sentence "The dog saw the man with the telescope," illustrate the ambiguity in parsing using dependency grammar. Propose a resolution.	2	K_1, K_2
c.	Discuss how syntax-driven semantic analysis works. Create a semantic attachment for the sentence: "John gave Mary a book."	3	K_2
d.	Compare filter-bank and LPC methods in speech feature extraction. Provide numerical examples where possible.	4	K_1, K_2
e.	What are likelihood distortions in speech recognition? Provide examples and their perceptual impact.	5	K_3, K_4

SECTION C

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

Q no.	Question	CO	Level
a.	A word processor uses a minimum edit distance algorithm to suggest corrections for misspelled words. If the word "intention" is misspelled	1	K_1, K_2

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	as "execution," calculate the minimum edit distance and outline the alignment steps.		
b.	Compare and contrast interpolation and backoff smoothing techniques. How are these applied to n-gram models?	1	K_1, K_2

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

Q no.	Question	CO	Level
a.	Discuss the concept of treebanks in NLP. How do they facilitate training syntactic parsers? Illustrate with an example.	2	K_1, K_2
b.	Explain the CYK parsing algorithm with a worked example of parsing the sentence "He saw a cat." using a given CFG.	2	K_1, K_2

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

Q no.	Question	CO	Level
a.	Given a sentence with multiple possible word senses (e.g., "bank"), outline how Word Sense Disambiguation (WSD) is performed using supervised learning.	3	K_2
b.	Implement a bootstrapping method for WSD using a small set of seed words. Illustrate with examples.	3	K_2

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

Q no.	Question	CO	Level
a.	Explain the mathematical basis of the log-spectral distance measure. Compute it for two spectral frames with given power spectra.	4	K_1, K_2
b.	Derive and explain the LPC coefficients for a given speech frame.	4	K_1, K_2

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

Q no.	Question	CO	Level
a.	Discuss spectral distortion measures in speech analysis. Calculate the cepstral distance for given cepstral coefficients.	5	K_3, K_4
b.	Discuss the role of HMMs in speech recognition. Explain the forward and backward procedures with an example.	5	K_3, K_4