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**Question Paper Code: UEG78S**

B.E. DEGREE EXAMINATION, NOV 2025

Professional Elective

21ADVG78 – AI IN SPEECH PROCESSING

(Regulations 2021)

(Common to BME & Mechanical Engineering)

Duration: Three hours

Maximum: 100 Marks

Answer ALL Questions

PART - A (5 x 20 = 100 Marks)

1. (a) Describe how regular expressions are used in text processing. Give CO1-U (20)  
examples for matching patterns such as  
(i) email address,  
(ii) dates and  
(iii) phone numbers.

Or

- (b) Explain with examples the different types of ambiguity in natural CO1-U (20)  
language processing. Why is resolving ambiguity crucial for language  
understanding?

2. (a) Apply the Forward Algorithm to compute the likelihood of the CO2-App (20)  
sequence “rainy → walk” in a simple weather-HMM model. Show all  
steps.

Or

- (b) Given the misspelled word “recieve”, apply the Noisy Channel Model CO2-App (20)  
to generate the most likely correction. Show the probability  
calculations if provided with prior word frequencies.

3. (a) Demonstrate how articulatory phonetics explains the difference CO2-App (20)  
between voiced and voiceless consonants. Provide 5 examples from  
English.

Or

- (b) Apply the concept of phonological categories to explain how the same phoneme can have different pronunciations (allophones) in different contexts. Give examples. CO2-App (20)
4. (a) Explain the conversion of abbreviations and acronyms contribute to effective text normalization. CO1-U (20)
- Or
- (b) What is diphone waveform synthesis, and how does it differ from other speech synthesis methods? Explain its advantages and limitations in the context of generating natural-sounding speech. CO1-U (20)
5. (a) Demonstrate how acoustic likelihoods are computed in HMM-based ASR using Gaussian Mixture Models (GMMs). Provide an example with a simple observation sequence. CO2-AP (20)
- Or
- (b) Apply the concept of embedded training by explaining how multiple utterances of the word “yes” are used to improve the accuracy of an acoustic model. CO2-App (20)