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VIT[®]

Vellore Institute of Technology
(Deemed to be University under section 3 of UGC Act, 1956)

REG.NO.:

SLOT: E1 + TE1

SCHOOL OF COMPUTER SCIENCE AND ENGINEERING
CONTINUOUS ASSESSMENT TEST - II
FALL SEMESTER 2024-2025

Programme Name & Branch : B.Tech., CSE
 Course Code and Course Name : BCSE409L, Natural Language Processing
 Faculty Name(s) : Prof. Varalakshmi M, Prof. Sudhakar P, Prof. Durgesh Kumar, Prof. Sarvanakumar K, Prof. Arivoli A, Prof. Sathyaraj R
 Class Number(s) : VL2024250101855, VL2024250101890, VL2024250101884, VL2024250101858, VL2024250101879, VL2024250101864
 Date of Examination :
 Exam Duration : 90 minutes Maximum Marks: 50

General instruction(s):

- Answer All Questions
- M - Max mark; CO - Course Outcome; BL - Blooms Taxonomy Level (1 - Remember, 2 - Understand, 3 - Apply, 4 - Analyse, 5 - Evaluate, 6 - Create)
- Course Outcomes (Type the CO statements covered in this question paper. Use the CO number as per the syllabus copy)

Q. No	Question	M	CO	BL				
1.	Generate a syntax tree for the following sentences using given Context Free Grammar using CYK algorithm. <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 50%;">Grammar</th> <th style="width: 50%;">Sentence</th> </tr> </thead> <tbody> <tr> <td> $S \rightarrow NP VP$ $NP \rightarrow she$ $NP \rightarrow NP PP$ $NP \rightarrow fish$ $VP \rightarrow V NP$ $NP \rightarrow fork$ $VP \rightarrow VP PP$ $NP \rightarrow chopsticks$ $PP \rightarrow P NP$ $V \rightarrow eats$ $V \rightarrow fish$ $P \rightarrow with$ </td> <td style="text-align: center; vertical-align: middle;"> she eats fish with chopsticks </td> </tr> </tbody> </table>	Grammar	Sentence	$S \rightarrow NP VP$ $NP \rightarrow she$ $NP \rightarrow NP PP$ $NP \rightarrow fish$ $VP \rightarrow V NP$ $NP \rightarrow fork$ $VP \rightarrow VP PP$ $NP \rightarrow chopsticks$ $PP \rightarrow P NP$ $V \rightarrow eats$ $V \rightarrow fish$ $P \rightarrow with$	she eats fish with chopsticks	10	C03	BL5
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2.	Explain the process of Semantic Role Labeling (SRL) and its significance in Natural Language Processing using the following sentence: <p style="text-align: center;"><i>John gave Mary a book on her birthday</i></p> a) Identify the semantic roles of the relevant constituents in the sentence. [5 Marks] b) Describe the steps involved in performing SRL for this sentence, including the role of syntactic parsing. [5 Marks]	10	CO3	BL2				
3.	a) Summarize the architecture diagram of CBOW in word2vec model. The architecture diagram should include the name of each layer, parameter at each layer with appropriate dimensions, and explanation of each layer. [6 Marks]	6	C05	BL3				
	b) Illustrate the process of training datasets for the CBOW model from the examples given below using the sliding window concept (consider the window size length is two). [4 Marks] <p style="margin-left: 20px;"><i>I am happy because I am learning.</i></p>	4						



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4.	<p>Evaluate the bigram Language model (with and without Add-1 Laplace smoothing) for the calculation of probability of the given sentence. The solution should include the detailed expression for the probability and perplexity calculation. Discuss the association of the Model performance with perplexity value</p> <p>Sentence <s> humpty dumpty sat on kings wall </s></p> <p>Corpus:</p> <table border="1" data-bbox="115 525 1201 934"> <tr> <td data-bbox="115 525 608 934"> <s> humpty dumpty sat on the wall </s> <s> humpty was angry on kings </s> <s> humpty dumpty has a great fall </s> <s> all the the kings horses and the kings men </s> <s> could not put the humpty together again </s> <s> dumpty sat for a while and read the kings wall </s> </td> <td data-bbox="608 525 1201 934"> <s> humpty dumpty now wise and strong </s> <s> learned from his fall, and right or wrong </s> <s> humpty dumpty vowed to never sit on kings wall again </s> <s> but to find safer places to sustain </s> <s> humpty saw amazing painting on kings wall </s> </td> </tr> </table>	<s> humpty dumpty sat on the wall </s> <s> humpty was angry on kings </s> <s> humpty dumpty has a great fall </s> <s> all the the kings horses and the kings men </s> <s> could not put the humpty together again </s> <s> dumpty sat for a while and read the kings wall </s>	<s> humpty dumpty now wise and strong </s> <s> learned from his fall, and right or wrong </s> <s> humpty dumpty vowed to never sit on kings wall again </s> <s> but to find safer places to sustain </s> <s> humpty saw amazing painting on kings wall </s>	10	CO4	BL4													
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5.	<p>a) Consider the following given sentences. Match the lexical relations between the first word (w1) to the second word (w2) i.e. w1 is a <lexical relation> of w2. [4 Marks]</p> <p>A. Invention of the wheel is one of the landmarks in the history of mankind. B. Companies are trying to make driverless car. C. Golden daffodils are fluttering and dancing in the breeze. D. Keukenhof has a unique flower park.</p> <p>Match the following pairs:</p> <table border="1" data-bbox="207 1302 900 1585"> <thead> <tr> <th>S.No</th> <th>Type of relation</th> <th>w1-w2 pair</th> </tr> </thead> <tbody> <tr> <td>i)</td> <td>Holonym</td> <td>wheel-car</td> </tr> <tr> <td>ii)</td> <td>Hyponym</td> <td>car-wheel</td> </tr> <tr> <td>iii)</td> <td>Meryonym</td> <td>daffodils-flower</td> </tr> <tr> <td>iv)</td> <td>Hypernym</td> <td>flower- daffodils</td> </tr> </tbody> </table> <p>b) Briefly describe the difference between WordNet and a dictionary for representing the different word senses and their meaning. Enumerate at least three wordnet name. [4+2 Marks]</p>	S.No	Type of relation	w1-w2 pair	i)	Holonym	wheel-car	ii)	Hyponym	car-wheel	iii)	Meryonym	daffodils-flower	iv)	Hypernym	flower- daffodils	10	CO3	BL5
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