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UE14CS333

NATURAL LANGUAGE PROCESSING

PES UNIVERSITY

PES University, Bengaluru
(Established under Karnataka Act 16 of 2013)

END SEMESTER ASSESSMENT (ESA) - B. TECH (PESU – CSE)
6th SEMESTER - (Jan - May 2017)

UE14CS333/14CS333 - NATURAL LANGUAGE PROCESSING – Elective

Time: 3 Hrs | **Answer ALL Questions** | **Max Marks: 100**

1.	a)	Consider an application for translation of real time English Speech to Kannada text sub titles. **Draw** an NL processing pipeline(s) based high level solution architecture for such an App.	06
	b)	Define the terms: *Derivational Morphology , Morphotactics , FST as a Recognizer*	06
	c)	**Draw** an FST for e-insertion to implement the following class of Orthographic singular/plural rules. { Fox <=> Foxes; Buzz <=> Buzzes; Class <=> Classes; Watch <=>Watches }	08
2.	a)	**Derive** the basic equation to compute the probability of a sentence (string of tokens), based on an N-gram approximation.	06
	b)	A corpus has 800,000 tokens with 20,000 unigram types from a vocabulary of 40,000. Justify and Compute the Witten-Bell probability mass of ALL the unseen Unigrams What will be the smoothed Probability and Count of the unseen Unigrams ?	08
	c)	What are the real use cases for Part-of-Speech(PoS) tagging ? Briefly state how a Stochastic trigram HMM tagger works .	06
3.	a)	For the following grammar fragment (Add a couple of lexicon rules, if needed) **S => VP ; NP => Det Nominal ; VP => V NP ;** **Draw** a Directed Acyclic Graph to show the three types of state entries created by Earley's parser using the sentence , **" Ping the Host "**	06
	b)	How does FOPC support *Verifiability* and *Unambiguous Representation ?*	05
	c)	State whether the following are TRUE / FALSE i) Well formed formula of FOPC has at least one Predicate ii) FOPC sentences can be parsed by Earley's parser iii) FOPC Functions can not have other Functions and Terms as arguments iv) FOPC Predicates can not have Predicates as arguments v) Lambda(λ) is a connective in standard FOPC grammar	05
	d)	**Draw** Reichenbach's diagrams(if feasible) representing flow of time, for the tenses of the verbs in the following sentences. i) When the train started, I *had not reached* the station ii) By 12 Noon tomorrow , I *will have spoken* to the architect iii) I usually *go* for a walk around 7.00AM iv) I *will eat* dessert after every dinner	04

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4.	a)	Consider a verb phrase modifier rule **VP => VP PP.** Construct the semantics for the constituent ***"ate lunch in a hurry"*** using appropriate λ attachments. Why does the resulting FOPC expression have a λ term ?	06
	b)	A travel website has data on 400 resorts of which, 100 are beach resorts and 20 of the beach resorts are close to Bangalore. For a query **"beach resorts near Bangalore"**, two search engines **G** and **B** return 30 and 50 results with 20 and 45 incorrect results respectively. Based on F-Measure with Beta = 2.0, decide on the better search engine.	06
	c)	With an example each, define Hyper/Hyponym, Polysemy .	04
	d)	**List** the four pre-processing steps and four prominent approaches to Robust Word Sense Disambiguation.	04
5.	a)	For the terms (Computing , Multicore, Algorithms, Processor) in Docs A, B and C, the absolute term frequencies are (4, 5, 6, 3), (4, 20, 2, 18) and (2, 21, 27, 8) respectively. For the following query vectors, using cosine similarity, find the retrieved document; q1: (Computing , Multicore, Algorithms, Processor) q2: (Multicore, Algorithms,)	07
	b)	**State** the sequence of steps that drive the Lappin-Leass reference resolution algorithm.	05
	c)	**State** the coherence relation, ***within*** each of the sentence-pair (S1 - S5), in the following passage . (***Note: Each macro sentence is made up of a pair of mini sentences***) S1: It was the last day ,of his favorite movie. Ravi went to iNOX in the mall . S2: He then took an Ola cab to John's Electronics appliances Store. Autos were on strike and were off the road. S3: He wanted to buy a Laptop from John's store. John is a good friend of Ravi. S4: Ravi got a huge pay hike. He was declared the employee of the month. S5: He wanted to invite John to his house party. He also wanted to discuss about his new job. **Draw** the Discourse Structure Tree(DST) of the passage formed by the above sentence-pairs (S1 - S5) , using coherence relations ***across*** S1 – S5, at the macro sentence level.	08