

# Natural Language Processing

## Assignment- 6

### TYPE OF QUESTION: MCQ

Number of questions: 10

Total mark: 10 X 1 = 10

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**Question 1 : Which of the following is/are true about the Chu-Liu-Edmonds Algorithm?**

1. Each vertex in the graph greedily selects the incoming edge with the highest weight
2. During the iteration of algorithm it always produce minimum spanning tree
3. During the iteration of algorithm it never produces cycle
4. The running time of the Algorithm is  $O(EV)$  where V be the set of nodes and E be the set of directed edges

**Answer: 1, 4**

**Solution:**

During the iteration of the algorithm it always produces a minimum spanning tree and it might produce cycle also. Refer lecture 30

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**Question 2. With respect to a Dependency Structure, which of the following is not a valid criterion for a syntactic relation between a head H and a dependent D in a construction C?**

1. The form of D depends on H.
2. The form of H depends on D.
3. H selects D and determines whether D is obligatory.
4. H specifies D.

**Answer: 2, 4**

**Solution:** Explained in Lecture 27.

**Solution:** The size of the feature vector for any configuration always depends on no. of features defined and no. of possible oracle transitions. Refer transition based parsing lecture

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**Question 3: Consider the sentence: "Ramesh scored a brilliant century". What is the type of the following relation?**

century -> brilliant

1. Endocentric
2. Exocentric
3. Both endocentric and exocentric
4. None of the above

**Answer: 1**

**Solution :**

Refer lecture 27 of week 6

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**Question 4: Which of the following is /are false about data driven deterministic parsing?**

1. Deterministic parsing requires an oracle
2. An oracle can be approximated by a classifier
3. A classifier can be trained using treebank data
4. None of the above

**Answer: 4**

**Solution:**

For data driven deterministic parsing 1,2,3 all are true.

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**Question 5: Suppose you write down the sequence of actions that generate the parse tree of the sentence "I prefer ChatGPT course" using Arc-Eager Parsing. The number of times you have to use Right Arc, Left Arc, Reduce, Shift is:**

Format of the answer is [a, b, c, d] corresponding to the 4 values in the order specified in the query.

1. [3, 0, 2, 1]
2. [1, 2, 1, 3]
3. [1, 2, 0, 3]
4. [1, 2, 0, 2]

**Answer: 3**

**Solution:** Please refer lecture

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**Question 6: Correct sequence of actions that generates the parse tree of the sentence “I prefer ChatGPT course” using Arc-Eager Parsing is:**

**Note: Right Arc (RA), Left Arc(LA), Reduce(RE), Shift(SH)**

1. SH->LA->SH->SH->LA->RA
2. SH->LA->SH->RE->LA->RA
3. SH->LA->SH->SH->RA->LA
4. SH->LA->RE->SH->SH->LA

**Answer: 1**

**Solution:** Solve by arc-eager parsing, Refer lecture 29

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**Question 7: Suppose you are training MST Parser for dependency and the sentence, “I like online exam” occurs in the training set. The POS tags for these words are Pronoun, Verb, PropNoun and Noun, respectively. Also, for simplicity, assume that there is only one dependency relation, “rel”. Thus, for every arc from word  $w_i$  to  $w_j$ , your features may be simplified to depend only on words  $w_i$  and  $w_j$  and not on the relation label.**

**Below is the set of features**

**f1:  $\text{pos}(w_i) = \text{Verb}$  and  $\text{pos}(w_j) = \text{Noun|Pronoun}$**

**f2:  $w_i = \text{Root}$  |  $w_i$  occurs before  $w_j$  in the sentence**

**f3:  $w_i = \text{Root}$  and  $\text{pos}(w_j) = \text{Verb}$**

**f4:  $w_j$  occurs before  $w_i$  in the sentence**

**The feature weights before the start of the iteration are: [5,20,15,12]**

**Suppose you are also given that after applying the Chu-Liu Edmonds, you get the following parse tree {Root → like, like → I, I → online, online → exam}**

**What would be the weights after this iteration?**

1. [6, 19, 14, 13]
2. [6, 19, 15, 13]
3. [6, 19, 13, 13]
4. [6, 19, 15, 12]

**Answer: 2**

**Solution:** Please refer lecture 30

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**Question 8: Which of the following is true about the formal conditions on dependency graph ?**

1. Graph G is connected and projective
2. G is connected but not acyclic
3. G acyclic and obeys the single head constraint
4. Both 1 and 3

**Answer: 4**

**Solution:**

The formal conditions on dependency graphs are that G is connected, acyclic, projective and should obey single head constraint. Refer lecture 27

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**Question 9: Assume that you are learning a classifier for the data-driven deterministic parsing and the sentence 'I prefer ChatGPT course' is a gold-standard parse in your training data. You are also given that 'ChatGPT' and 'course' are 'Nouns', 'I' is a 'Pronoun' while the POS tag of 'prefer' is 'Verb'. Obtain the dependency graph for this sentence on your own. Assume that your features correspond to the following conditions:**

1. The stack is empty.
2. Top of stack is Noun and Top of buffer is Verb.
3. Top of stack is Pronoun and Top of buffer is Verb.
4. The word at the top of stack occurs before word at the top of the buffer in the sentence

**The initial weights of your features are**

**[2,2,2,2 | 3,3,3,2] 2,2,2,2 | 2,2,2,2]** where the first four features correspond to LA, and then to RA, SH and RE, respectively

**Use this gold standard parse during online learning. What will be the weights after completing two iteration of Arc-Eager parsing over this sentence:**

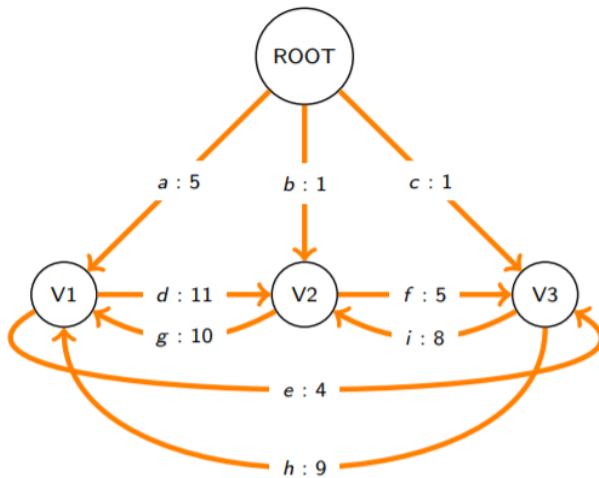
1. [2,2,2,2 | 3,3,3,2] 2,2,2,2 | 2,2,2,2]
2. [2,2,3,2 | 2,3,2,1] 3,2,2,2 | 2,2,2,2]
3. [2,2,3,3 | 2,3,2,1] 3,2,2,2 | 2,2,2,2]
4. [2,2,3,3 | 3,3,2,1] 3,2,2,2 | 2,2,2,2]

**Answer: 3**

**Solution:** Refer lecture 29 of week 6

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**Question 10:** Consider the following graph with a root node and 3 other vertices. The edge weights between all the pair of nodes have been provided. Suppose you use Chu-Liu-Edmonds algorithm to find the MST for this graph. Which pair of nodes will have to be contracted to form a single vertex during the algorithm in the 1st iteration?



1. (V2, V3)
2. (V1, V3)
3. All these pairs will get contracted at different times in the algorithm
4. (V1, V2)

**Answer: 4**

**Solution:** Solve by applying Chu-Liu-Edmonds Algorithm