



# GÖTEBORGS UNIVERSITET

Masters Programme in Language Technology

## INTRODUCTION TO FORMAL LINGUISTICS LT2112

AUTUMN SEMESTER 2015

Thursday, 10th December 2015, 9:00am–12:00am

Viktoriagatan 30, Göteborg

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Candidate number: \_\_\_\_\_

Name: \_\_\_\_\_

Personnummer: \_\_\_\_\_

Write your answers on separate sheets of paper. On each page write your candidate number in the top right corner. Start each part on a new sheet of paper indicating clearly the name of that part. Mark clearly the number of the question that you are answering. To ensure that the examination is anonymous do not include any other personal information on the answer sheets.

If you are re-taking this exam, **answer only questions from those parts that you are re-taking**. You have 3 hours to complete the exam. You should spend 45 minutes on each part.

Do not turn over until told that you may do so.

## PART 1: PHONETICS AND PHONOLOGY

1. In a periodic sound, you measured Hz to be 1000, what is T? Show your calculation.  
(2p)
2. A. Write down 2 alveolar fricatives with phonological notation.  
B. Write down a close rounded front vowel with phonetic notation. (4p)
3. Give an example of a minimal pair in English, which phoneme distinguishes them?  
Write the phonemes using IPA. (2p)
4. What is the articulatory terminology for (2p)
  - A. Space between the vocal folds
  - B. Hard palate
  - C. Teeth
  - D. Tip of the tongue

## PART 2: MORPHOLOGY

1. What are the following morphological concepts: *lemma*, *bound morpheme*, *lexeme*? Explain and provide examples. [3 marks]
2. What does the term *allomorphy* mean? Explain and provide examples. [2 marks]
3. What is the difference between *derivation* and *inflection*? Explain and provide examples. [3 marks]
4. In language typology languages are often divided into groups based on morphological properties. Name two such categories and their signifying features. Also, for each type, give one example of a language which is of that type. [4 marks]
5. Below are some words and phrases in Turkish and English translations.

deniz = ‘an ocean’

denize ‘to an ocean’

denizin = ‘of an ocean’

eve = ‘to a house’

evden = ‘from a house’

evjikden = ‘from a little house’

denizjikde = ‘in a little ocean’

elde = ‘in a hand’

elim = ‘my hand’

eller = ‘hands’

dishler = ‘teeth’

dishiminiz = ‘of our tooth’

dishleriminiz = ‘of our teeth’

eljike = ‘to a little hand’

denizlerimizde = ‘in our oceans’

evjiklerimizde = ‘in our little houses’

- (a) : Give the Turkish morpheme which corresponds to each of the following English translations:

i. Ocean: in: my:

ii. house: to: of:

iii. hand: from: our:

iv. tooth: [plural]: little:

[4 marks]

(b) What is the order of morphemes in a Turkish word (in terms of noun, plural marker, etc.)? [1 marks]

(c) How would you say "of our little hands" in Turkish? [1 marks]

(d) Give the English translation for the Turkish form "dishjiklerden". [2 marks]

### PART 3: SYNTAX

1. Assign each word in the following sentences the appropriate lexical category using the / notation and the tag-set from Penn Treebank, for example *likes*/VBZ (for a list of tags see Table 1). [4 marks]

*Labs in the US states of Washington and Louisiana began "listening" on Friday for the gravitational waves that are predicted to flow through the Earth when violent events occur in space. The Advanced Ligo facilities have just completed a major upgrade. Scientists believe this will now give them the sensitivity needed to pick up what should be a very subtle signal.*

Discuss any problems you may have encountered. [1 mark]

2. Illustrate with an example what is meant by the notion of *recursion* and how it affects syntactic structure of natural language? [2.5 marks]
3. Provide a syntactic parse of the following sentence. You may use either bracketing or trees. [4 marks]

- (a) If the delicate gravitational waves pass through the set-up, the laser light should show evidence of having been ever so slightly disturbed - either lengthened or shortened.

Discuss any problems you may have encountered. [1 mark]

4. Define and provide an example of *unification of feature structures*. [2.5 marks]
5. What is the difference between the notion of *verbal arguments* and *grammatical roles*? Illustrate at least one phenomenon where there is a different mapping between the two. [5 marks]

**Table 1:** Penn Treebank Tags

| Number | Tag   | Description                              |
|--------|-------|--|
| 1.     | CC    | Coordinating conjunction                 |
| 2.     | CD    | Cardinal number                          |
| 3.     | DT    | Determiner                               |
| 4.     | EX    | Existential there                        |
| 5.     | FW    | Foreign word                             |
| 6.     | IN    | Preposition or subordinating conjunction |
| 7.     | JJ    | Adjective                                |
| 8.     | JJR   | Adjective, comparative                   |
| 9.     | JJS   | Adjective, superlative                   |
| 10.    | LS    | List item marker                         |
| 11.    | MD    | Modal                                    |
| 12.    | NN    | Noun, singular or mass                   |
| 13.    | NNS   | Noun, plural                             |
| 14.    | NNP   | Proper noun, singular                    |
| 15.    | NNPS  | Proper noun, plural                      |
| 16.    | PDT   | Predeterminer                            |
| 17.    | POS   | Possessive ending                        |
| 18.    | PRP   | Personal pronoun                         |
| 19.    | PRP\$ | Possessive pronoun                       |
| 20.    | RB    | Adverb                                   |
| 21.    | RBR   | Adverb, comparative                      |
| 22.    | RBS   | Adverb, superlative                      |
| 23.    | RP    | Particle                                 |
| 24.    | SYM   | Symbol                                   |
| 25.    | TO    | to                                       |
| 26.    | UH    | Interjection                             |
| 27.    | VB    | Verb, base form                          |
| 28.    | VBD   | Verb, past tense                         |
| 29.    | VBG   | Verb, gerund or present participle       |
| 30.    | VCN   | Verb, past participle                    |
| 31.    | VBP   | Verb, non-3rd person singular present    |
| 32.    | VBZ   | Verb, 3rd person singular present        |
| 33.    | WDT   | Wh-determiner                            |
| 34.    | WP    | Wh-pronoun                               |
| 35.    | WP\$  | Possessive wh-pronoun                    |
| 36.    | WRB   | Wh-adverb                                |

## PART 4: SEMANTICS

1. For each of the following arguments, determine whether it is valid or invalid. If it's invalid, explain why. [4 marks]
  - (1) a. Either Colonel Mustard or Miss Scarlet is the culprit.  
b. Miss Scarlet is not the culprit.  
c. Hence, Colonel Mustard is the culprit.
  - (2) a. All engineers enjoy ballet.  
b. Therefore, some males enjoy ballet.
2. Fill in the missing premises in the following arguments that will make them valid. [4 marks]
  - (3) a. If you keep driving your car with a faulty oil pump, it will eventually explode.  
b. \_\_\_\_\_  
c. Therefore, if you keep driving your car with a faulty oil pump, you will eventually get hurt.
  - (4) a. Gossiping is morally wrong.  
b. Gossiping is not a constitutional right.  
c. \_\_\_\_\_  
d. Therefore, gossiping ought to be against the law.
3. What problem we may encounter if we consider meaning only as *extension*? Illustrate with an example. [4 marks]
4. Evaluate the following expressions with respect to  $\mathcal{M}_3$  using a method where you represent the results of the evaluation in a truth table. [4 marks]
  - (5) a.  $\forall x \exists y [\text{likes}(x,y) \wedge \text{run}(\text{sibling\_of}(x))]$   
b.  $\neg \exists x [\text{likes}(l,x) \wedge x = \text{sibling\_of}(l)]$

$$\mathcal{M}_3 \langle U_3, V_3 \rangle$$

$$U_3 = \{l, a, g, b\}$$

$$V_3(\text{Lydia}) = l; V_3(\text{Alex}) = a; V_3(\text{George}) = g; V_3(\text{Bertie}) = b$$

$$V_3(\text{likes}) = \{\langle l, l \rangle, \langle l, b \rangle, \langle l, g \rangle, \langle a, g \rangle\}$$

$$V_3(\text{runs}) = \{l, b\}$$

$$V_3(\text{human}) = \{l, a\}$$

$$V_3(\text{cat}) = \{g, b\}$$

$$V_3(\text{owns}) = \{\langle l, b \rangle, \langle a, g \rangle\}$$

$$V_3(\text{sibling\_of}) = \{\langle l, a \rangle, \langle a, l \rangle, \langle g, b \rangle, \langle b, g \rangle\}$$
 This is a function!

5. In addition to entailment, name and exemplify at least two other meaning relations can we distinguish in a set of propositions? [4 marks]