COMP349:
Spoken Language Dialog Systems
Mock Exam Paper: Second Half

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Section B Questions

• Typical topics:
  – Any of the key concepts introduced in the lectures
  – Designing grammars and prompts
  – Working out a call-flow for a specified application
Key Concepts

Question 1

• Q1: Explain what the following terms mean in the context of spoken language dialog systems:
  – Tapered prompting [1 mark]
  – TTS [1 mark]
  – Acoustic model [1 mark]
Key Concepts

Solution 1

• Tapered prompting is a technique used in dialog systems to respond to the user when the system does not understand what the user has said. Each time the user is reprompted, the system uses a shorter prompt to ask for information, but an increasingly longer prompt explaining what they have to do. For example:

— ...
TTS stands for Text To Speech, which is also known as speech synthesis. This is the technology that takes a textual form of an utterance to be made by the system and converts it into sound.

A TTS system uses a lexicon that defines mappings from orthographic strings to sequences of phonemes.
Key Concepts
Solution 1

• An acoustic model is a statistical model of a unit of speech, typically a phoneme. Acoustic models are connected together into networks to form a search space that the speech recogniser can use to try to match the user’s utterance.

• Different acoustic models are needed for each different dialect of a language in order to cater for variations in the phoneme inventories of the dialects.
Key Concepts
More Questions

• Q2: What is the difference between an n-gram language model and a grammar-based language model? [3 marks]

• Q3: What is the difference between a speaker dependent and a speaker independent system? When would either be appropriate? [3 marks]

• Q4: What is n-best processing? Give an example of where you could make use of an external knowledge source to select amongst n-best results. [2 marks]
• N-best processing involves analysing the multiple ranked hypotheses provided by a speech recognition engine to determine whether the top-ranked hypothesis provided by the system is necessarily the best solution. This analysis might use some external knowledge source.

• For example, a grammar that recognises credit card numbers might hypothesise the following three hypotheses:

  - …

• By calculating and checking each credit card number’s check digit, the system might decide that the first hypothesis does not correspond to a real credit card number, but that the second does, so the second hypothesis is more likely to be what the caller said.
Key Concepts
Question 5

- **Q5:** Given the following grammar ... classify each of the following cases as either CA-in, FA-in, FA-out or FR-in. [2 marks]

<table>
<thead>
<tr>
<th>#</th>
<th>Recognised Utterance</th>
<th>Actual Utterance</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Fourth of July</td>
<td>Fourth of July</td>
</tr>
<tr>
<td>2</td>
<td>Fourth of November</td>
<td>Fourth of September</td>
</tr>
<tr>
<td>3</td>
<td>Ninth of August</td>
<td>Knife of August</td>
</tr>
<tr>
<td>4</td>
<td>I don’t care</td>
<td>First of May</td>
</tr>
</tbody>
</table>
Dialog System Design

Question 1

• Q1: Explain the differences between form-filling and mixed initiative dialog handling. Provide two sample dialogs from an airline flight reservation system to illustrate. [5 marks]
Dialog System Design
Question 2

• Q2: You have been asked to design a dialog system that allows a caller to manage their schedule. The system should allow the user to interrogate the schedule to determine where she needs to be at specific times, schedule new appointments, and delete existing appointments.
Dialog System Design
Question 2 Continued

• Provide a plausible sample dialog that demonstrates the functionality of the system. [2 marks]
• Draw a dialog flow for the application. [3 marks]
• For each dialog state that requests data from the user, provide a prompt and a grammar. [4 marks]
• What would be the most difficult problem in building such a system, and how would you solve this? [1 mark]
Dialog Systems
Question 3

• Q3: List four common applications of dialog system technology and describe briefly what the functionalities of these systems might be. Rank the four applications in terms of the complexity of their design and development, commenting on what is involved in each. [8 marks]

• 4 marks for the four application descriptions; 4 marks for comments on complexity
Q4: Provide grammars that would be appropriate for handling responses to the following prompts. You do not have to provide semantic slot fills as part of your grammars.

- [Taxi booking] Are you ready to go now? [2 marks]
- [Auto attendant] Whom would you like to speak to? [2 marks]
- [Bill payment in banking]: What bill would you like to pay? [4 marks]
Dialog Systems
Question 5

Q5: Provide a phrase structure grammar that covers the following data.
- a large green t-shirt
- a very green t-shirt
- a very very green t-shirt
- a very very very green t-shirt
- a very very very very green t-shirt
- a very very very very very green t-shirt
Question 5 Sample Answer

- NP → Det Adv* Adj* N
- Det → the
- Adv → very
- Adj → large | green
- N → t-shirt
Good luck in the exam!