

**Exam “Semistructured Data in XML”**  
**Sommersemester 2008 (translated in 2020)**  
**Prof. Dr. Wolfgang May**  
**16. Juli 2008, 10-12 Uhr**  
**Working time: 90 Minuten**

Given Name:

Family Name:

Matr. No.:

	Max. Punkte	Erreichte Punkte
Aufgabe 1 (XML design, DTD)	23	
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Note:

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The “project” in this exam deals with the database of an airline: flight connections, flight plan, flight bookings.

Some data/code fragments are given:

- An XML data frame (in a fully computer-based exam this would be given in the file exam.xml) including sample data for airports. Since such airport data is used and shared by all airlines, we assume that all airport data worldwide (with unique airport codes) is given by the IATA (International Air Transport Assoc.).

In addition to the above data, the database should be extended to contain airline-specific information:

- the connections provided by the airline, e.g. the flight code “LH123” from “FRA” to “LIS”, departure 12h30min, arrival 14h30min, and flight code “LH124” from “FRA” to “JFK”, departure 8h40min, arrival 11h20min (all wrt. local time; the timezones are stored within the airports). Summer- and winter time are not considered.
- Assumption: there is no flight connection over midnight, i.e., all flights arrive at the same day when they departed.
- Assumption: every connection is provided every day; thus there is no additional data for this necessary.
- For every day and every connection, the bookings are stored. The airline database receives bookings e.g. from Online-Web-Portals as XML fragments in HTTP messages. The content of such a message looks as follows (note: this exam did not yet use xsd:datetime etc):

```
<booking flight="LH123" firstname="John" name="Doe" nationality="uk">
  <date year="2008" month="07" day="16"/>
</booking>
```

- Assumption: the pair (family name, given name) uniquely identifies a person.

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### Aufgabe 1 (XML design, DTD [23 Punkte])

1. Extend the given XML fragment with sample data for flight connections and bookings (use some reasonable representation of departure and arrival time in hours/minutes than can be used for simple computations) (8 P)
2. Give a DTD for your XML design. (15 P)



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**Aufgabe 2 (XPath, XQuery [22 Punkte])**

Solve the following exercises (2a)–(2d) according to your XML database.

1. Give an XPath expression that yields all flight codes of Lufthansa flights that *John Doe* has booked in July 2008. (3 P)
2. Give an XPath query or an XQuery query that yields the names of all airports from which Albany (Code: ALB) can be reached with exactly one intermediate stop (5 P).
3. Give an XPath query or an XQuery query that yields the names of all airports from which *all* portuguese airports (country code: “P”) can be reached directly. (5 P)
4. Give an XPath query or an XQuery query that yields information about all passengers who travel on 16.7.2008 from another country to the USA, and continue on the next day with a domestic flight (i.e. a flight inside the USA). Output the full names of the passengers, and the flight codes of their (incoming+domestic) flights. (9 P).



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**Aufgabe 3 (XQuery or XSLT [15 Punkte])**

Goal: create an HTML table (flight code, departure airport, arrival airport) which contains exactly those flights that have at least eight hours traveling time.

1. This question is just a preliminary thought, and is not to be solved in XQuery, but just give the time: What time is it in Frankfurt, when flight LH123 arrives in Lisbon? (2 P)
2. Give an XQuery query or an XSLT stylesheet that creates the above-mentioned table. (13 P)



**Aufgabe 4 (XSLT [20 Punkte])**

For its flights to the USA, every airline has to submit to the US administration two days before a list that contains information about all passengers of such flights according to the following DTD:

```
<ELEMENT airlineReport (name, flight+)>
  <ATTLIST airlineReport month CDATA #REQUIRED
                        day CDATA #REQUIRED
                        year CDATA #REQUIRED>
<ELEMENT name (#PCDATA)> <!-- name of the airline that submits the report -->
<ELEMENT flight (person+)>
  <ATTLIST flight code ID #REQUIRED>
<ELEMENT person (givenname, familyname, nationality)>
  <ELEMENT givenname (#PCDATA)>
  <ELEMENT familyname (#PCDATA)>
  <ELEMENT nationality (#PCDATA)>
```

1. Give a short sample XML fragment, what this report for the Lufthansa looks like. (3 P)
2. Give an XSLT stylesheet, that can be invoked e.g. by

```
saxonXSL -s lufthansa.xml -xsl makeUSreport.xsl month=07 day=16 year=2008
```

and creates the report for the given day according to your database. (17 P)





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**Aufgabe 5 (Conceptual Questions [10 Punkte])**

In a declarative database language, one cannot only state queries, but also data can be changed, deleted, and inserted. In SQL; there is e.g. the construct z.B. in SQL durch das Konstrukt

```
UPDATE table_name
SET attribute = new_value
WHERE condition .
```

What parameters/information must commands in any XML database language (e.g., an extension to XQuery) be able to express?

How would you express a modification of the flight plan, e.g., setting the arrival time of LH123 to 14:40?



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Trennen Sie diese Seite ggf. ab, um damit die restlichen Aufgaben bearbeiten zu können (Kopien dieses Blattes sind verfügbar; versehen Sie diese bitte zuerst mit Ihrem Namen).

```
<lufthansa>
  <airport code="FRA" city="Frankfurt/Main" country="D" timezone="+1">
    <name>Rhein-Main-Flughafen Frankfurt</name>
  </airport>
  <airport code="LON" city="London" country="GB" timezone="0">
    <name>London Heathrow</name>
  </airport>
  <airport code="LIS" city="Lisbon" country="P" timezone="0">
    <name>Lisboa Portela</name>
  </airport>
  <airport code="JFK" city="New York" country="USA" timezone="-5">
    <name>John F. Kennedy Airport New York</name>
  </airport>
  <airport code="ALB" city="Albany" country="USA" timezone="-5">
    <name>Albany International Airport</name>
  </airport>
<!-- further airports -->
```

</lufthansa>