CPE 365	Introduction to Databases	Fall 2024

Midterm 2 Study Guide

Note: This is a study guide provided to support your preparation for the second midterm. There is no submission required. I will not be releasing solutions, however, we reserve the Tuesday, December 3 lab period for discussions related to the problems in this study guide, and during that time, I will go over some problems and discuss solutions to them.

Recently, I've been organizing my late grandfather's stamp collection, which resulted in some additional acquisitions of postage stamps. In keeping track of the stamps, I have put together several spreadsheets that represent the stamps in the collection, their origins in the collection (i.e., when and how I acquired them) and their location in the collection (I maintain several stamp albums, organized roughly according to geography). Below is a small "slice" of the data found in those spreadsheets.

There are a total of five (5) tables in this database: `Albums`, `Sources`, `Countries`, `Stamps` and `Collection`. Below we describe each, and provide a small subset of the records stored in each table.

Albums. The Albums table lists stamp albums and stockbooks I maintain. Each stores stamps from one or more countries (and related stamp issuers). Type represents the type of an album (e.g., a ring binder, an album made by a specific company, etc....), Note is a short description of what is stored there, and Started is month and year when I started putting stamps in this album.

Albums:

Name	Type	Note	Started
Europe	Vintage ring binder	Most Western Europe stamps	Nov-2023
Austria	Lighthouse stockbook	Austria	May-2017
Africa I	Ring binder	Africa: A - M	Nov-2023
Africa II	Ring binder	Africa: N - Z	May-2024
Asia	Ring binder	Most Asia stamps	Nov-2023
Central America	Ring binder	Central America/Carribean	Jan-2024
Commonwealth	Ring binder	UK and Commonwealth	Jan-2024
Eastern Europe	Vintage ring binder	Eastern Europe countries	Feb-2024

Countries. The Countries table is a list of entities that issue stamps. Some such entities are defunct (or changed their name). From and To are the years the stamp issuer started issuing stamps, and the year they issued last known stamp (if it is not 2024, it means that the stamp issuer is now defunct). Album is a foreign key to Albums and indicates the location in the collection where stamps from this issuer are stored.

Countries:

Name	Continent	From	To	Album
Austria	Europe	1850	2024	Austria
France	Europe	1849	2024	Europe
Great Britain	Europe	1840	2024	Commonwealth
India	Asia	1852	2024	Asia
Dahomey	Africa	1899	1975	Africa I
Benin	Africa	1976	2024	Africa I
Mexico	North America	1856	2024	Central America
Nyassa	Africa	1898	1921	Africa I
Mozambique	Africa	1876	2024	Africa I
Hungary	Europe	1871	2024	Eastern Europe
Poland	Europe	1860	2024	Eastern Europe
Pitcairn Islands	Oceania	1940	2024	Commonwealth

Sources. The Sources table outlines the different stamp acquisitions I made. AcquiredOn indicates when the acquisition took place (Month, year), Name is a short text identifier for the source, and Desc provides a slightly more verbose description.

Sources:

Sid	Name	Desc	AcquiredOn
1	Grandfather's Collection	Part. Brought from Russia	Jan-2016
2	AUS	Purchased on trip to Australia	Sep-2017
3	SLO Flea Market 1	World stamps	Oct-2023
4	Nov23 Ebay 1	Old definitives	Nov-2023
5	Nov23 Ebay 2	Old definitives	Nov-2023
6	Jan24 Ebay 1	Europe	Jan-2024
7	April24 Ebay 2	100 full sets	Apr-2024

Stamps. The Stamps table has a short description of the stamps that are in my collection. Stamps are identified by their country of issue and their catalog number for that country. I am using a simple enumeration here, so the catalog numbers are integers. This table contains information about the stamp as it was issued. The Collection table described below documents specific stamps in my collection (tying them to the specific source, and identifying their conditions, and current value).

Stamps:

Country	Catalog	Year	Desc	Color
Austria	154	1908	60th Anniversary of Reign of Emperor Franz Josef	yellow
Austria	155	1908	60th Anniversary of Reign of Emperor Franz Josef	purple
France	113	1906	Sower	green
France	114	1906	Sower	red
France	365	1938	Mercury	brown
Great Britain	100	1900	Queen Victoria	green
Great Britain	102	1902	King Edward VII	green
Great Britain	122	1911	King George V	red
Pitcairn Islands	1	1940	King George VI	green
Pitcairn Islands	2	1940	King George VI	violet
Dahomey	140	1941	Man in a canoe	multicolored
Mexico	291	1899	Coat of Arms and Landmarks	violet
Mexico	771	1934	Folklore and History	brown
Nyassa	30	1901	Giraffe	brown
Mozambique	288	1933	Lusiads	multicolored
Hungary	8	1871	King Franz Josef	yellow
Hungary	9	1871	King Franz Josef	green
Hungary	13	1871	King Franz Josef	violet
Hungary	226	1916	Reaper	ultramarine
Poland	144	1923	Eagle	purple
Poland	667	1950	Rebuilding Warsaw	brown

Collection. The Collection table describes the specific stamps in my collection. Each stamp is uniquely identified by the Country,Catalog pair of values (foreign key to Stamps), the source of acquisition (Source - foreign key to Sources) and the stamp condition (Cond - either `Mint`, or `Used`). In addition, we specify the number of stamps (Num) of this kind and condition that came from this particular source, and the current value of the stamp (Value) in US dollars and cents.

Collection:

Country	Catalog	Source	Cond	Num	Value
Austria	154	1	used	6	0.82
Austria	155	1	used	2	0.27
Austria	155	1	mint	2	0.27
Austria	155	1	used	4	0.27
France	113	3	used	2	0.27
France	113	4	used	1	0.27
France	113	7	used	1	0.27
France	114	3	used	5	0.27
France	114	3	used	1	0.27
France	114	6	used	1	0.27
France	365	7	mint	1	0.27
Great Britain	100	2	used	2	0.54
Great Britain	100	3	used	1	0.54
Great Britain	102	3	used	1	0.54
Great Britain	122	3	used	1	1.06
Pitcairn Islands	1	2	mint	1	0.27
Pitcairn Islands	2	2	mint	1	0.27
Pitcairn Islands	2	7	mint	1	0.27
Dahomey	140	6	mint	1	0.27
Mexico	291	5	used	1	0.27
Mexico	771	5	used	1	0.27
Nyassa	30	6	mint	1	1.63
Hungary	8	1	used	2	13.17
Hungary	9	1	used	2	54.89
Hungary	226	1	used	1	0.27
Hungary	226	1	mint	1	0.27
Hungary	226	5	used	1	0.27
Hungary	226	6	used	1	0.27
Poland	144	6	used	1	0.27
Poland	667	7	used	1	0.27

If you need to refer to relation names in queries you can use Cn for Countries, Sr for Sources, A for Albums, S for Stamps, and C for Collection.

There are four different things you can do for a given prompt:

(A) Write the query as a relational algebra expression

(B) Write the query as a relational algebra tree

(C) Write the query in SQL

(D) Compute the answer given the contents of the tables shown above.

You *can*, in preparation for the midterm, perform all four tasks (A)–(D) above for each of the prompts below. However, some prompts yield some level of busywork when answering some of the questions. As a result, the *suggested activities* for each prompt are provided below (as a list of letter codes).

1. **((A),(B),(C),(D))** List all stamps issued in the 19th century that can be found in the Europe album. For each stamp, list its country of issue, catalog number, year of issue, and description. Sort stamps in alphabetical order by country and ascending order by catalog number within each country.

2. **((A),(B),(C),(D))** List all stamps from Europe purchased in October 2023 at the SLO Flea Market (SLO Flea Market 1 purchase). For each type of stamp, speicfy country, catalog number, year of issue, condition, number of stamps and the current value of a stamp.

3. **((A),(B),(C))** Find all albums in the collection which, if based solely on the current state of the database, would be empty. (note, there are two possible ways to interpret this query, both have similar solution. Either solution would be considered correct).

4. **((A),(C))** Find all stamps from now-defunct countries. Report the name of the country, the catalog number of the stamp, and the year of issue. Sort output in chronological order by year, breaking ties in lexicographic order by country name, and in catalog order within a single country.

5. **((A),(B),(C),(D))** Find all stamps that are older than the Great Britain's green Queen Victoria stamp. (you can assume that the table has only one stamp that matches the above description). Report, for each stamp, its country of origin, and the year of issue. Sort in chronological order of stamp issue, breaking ties lexicographically by the country name, and by catalog number.

6. **((A),(B),(C),(D))** Find the total number of European mint stamps in the collection. Report just the number.

7. **((A),(C))** Find the total number of stamps in each album (report only the albums with non-zero number of stamps for simplicity).

8. **((A),(B),(C))** Find the total value of all French stamps. Report just the number.

9. **((A),(B),(C),(D))** Find the number of stamps from my Grandfather's collection that are **NOT** located in the Europe album.

10. **((A),(C))** Report all stamps where the Mint condition of a stamp is NOT more expensive than the Used condition of the stamp. For each stamp report the name of the country, catalog number, year of issue, and current values for Mint and Used conditions of the stamp. Sort output in descending order by the difference between the two values, break ties in chronological order, then, if needed - in lexicographical order by the country name.

11. **((A),(B),(C))** Find the album (or albums, in case of a tie) in which the most expensive stamp in the collection is located. Report the name of the album and the date is was started.

12. **((A),(B),(C))** Find the stamp (or stamps) with the largest number of used copies that I have in my collection. Report name of the country, that issued the stamp, its catalog number, year it was issued, and its description.

13. **((A),(C),(D))** For how many stamps do I have both at least one used and at least one mint condition stamps? Report just the number.

14. **((A),(B),(C),(D))** Find the stamp source the yielded the largest number of stamps I recorded into the database thus far. Report the source, and the number of stamps that came from it. (if tied, report sources in alphabetical order).

15. **((A),(B),(C),(D))** Find the most popular stamp color (based on stamp issues).

16. **((A),(C))** Find the most popular stamp color among the stamps I own (including any duplicate stamps).

17. **((A),(C))** For each continent, report the country with the largest number of stamps in the collection.

18. **((A),(B),(C),(D))** Find all countries for which the collection **only** has Mint stamps.

19. **((A),(B),(C),(D))** For each album report the total number of stamps issued in the 20th century. Your report must have one record per album.

20. **((A),(B),(C),(D))** For each stamp album report the distribution of stamps in it by the purchase source.