Lab 5: Normalization

CS355/CE373 Database Systems
Fall 2024

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Contents

1 Instructions

- This lab will contribute 1% towards the final grade.
- **The deadline for this lab is the end of your lab.**
- The lab must be submitted online via CANVAS. You are required to submit a PDF file that contains the final ERD.
- The PDF file should be named as *Lab_05_aa01234.pdf* where *aa01234* will be replaced with your student id.
- **Files that don't follow the appropriate naming convention will not be graded.**

1.1 Marking scheme

This lab will be marked out of 100.

- 50 Marks are for the completion of the lab.
- 10 Marks are for filling the feedback form within the lab timings.
- 40 Marks are for progress and attendance during the lab.

1.2 Late submission policy

You can submit late till 11:59 PM on the same day as your lab with a 20% penalty. No submissions will be accepted afterward.

1.3 Use of AI

Taking help from any AI-based tools such as ChatGPT is strictly prohibited and will be considered plagiarism. Course staff may call students for Viva in case they feel that **AI** has been used for doing the lab.

2 Objective

The objective of this lab is to enable students to build data models for moderately complex business specifications, as per the rules of data normalization. The students should be able to assess and make sure that their data model does not leave room for anomalies in the dataset.

3 Exercise

Scenario 1 - Publications

Consider the table below that contains the information of some publishers that have published some journals written by a Faculty and assisted by a Supervisor. Carry out the Normalization exercise and convert the given table into 3NF.

1. Convert the relation to a valid 1NF form by identifying all primary keys.
2. Identify full and partial functional dependencies
3. Convert the relation to a valid 2NF form.
4. Identify transitive dependencies
5. Convert the relation to a valid 3NF form.

Pub ID (PK)	Research Paper Title	Pub Date	Journal	Category	Subject Area	No. of Pages	Faculty ID	Faculty Name	Supervisor ID	Supervisor Name
1001	Paper 1	1/1/2008	Journal 1	A	Databases Database Security	9	1	Faculty 1	5	Faculty 5
1005	Paper 2	1/5/2007	Journal 1	A	Decision Support System Knowledge Engineering Expert System	6	3	Faculty 3	23	Faculty 23
1008	Paper 3	1/7/2007	Journal 3	B	Computer Networking	10	5	Faculty 5	8	Faculty 8
1009	Paper 4	1/8/2007	Journal 1	A	Computer Graphics	4	4	Faculty 4	11	Faculty 11
1004	Paper 5	1/9/2007	Journal 2	C	Computer Graphics Computer Animation	5	6 3	Faculty 6 Faculty 3	21 7	Faculty 21 Faculty 7
1002	Paper 6	1/10/2007	Journal 5	C	OALP Data Mining	6	1	Faculty 1	8	Faculty 8
1007	Paper 7	1/11/2007	Journal 3	B	System Programming	7	2	Faculty 2	9	Faculty 9
1010	Paper 8	1/12/2007	Journal 6	B	E-Commerce	8	12	Faculty 12	10	Faculty 10
1015	Paper 9	1/13/2007	Journal 5	C	Databases	6	14	Faculty 14	11	Faculty 11
1018	Paper 10	1/14/2007	Journal 2	C	Database Security	7	17	Faculty 17	15	Faculty 15

Table 1: Publications

1NF is correct	15%
2NF is correct	30%
3NF is correct	35%
Functional and transitive dependencies are identified correctly.	20%

Table 2: Rubric for Scenario 1

You can also view the above table in Landscape mode at the end of this lab manual.

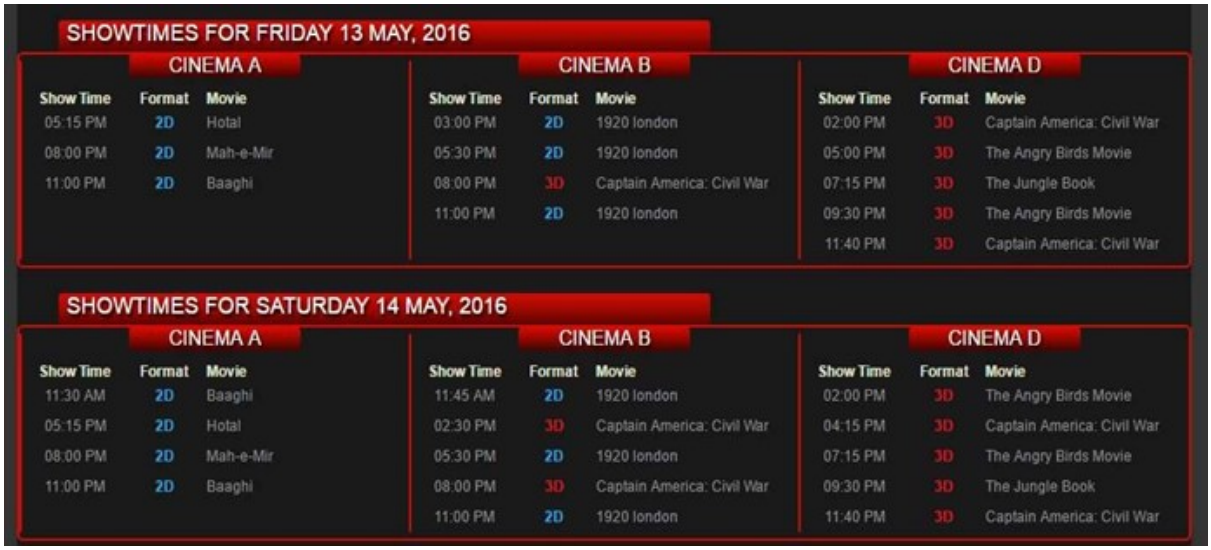
Scenario 2 - Atrium Cinema

You have to build an ERD for the given scenarios in DB Designer. The ERDs must be normalized up to 3NF and must contain the following details:

- Entities
- Attributes and their data types, null/not null constraints
- Primary Keys, Foreign Keys
- Relationships (1-1, 1-M)

You are building a database application for 'Atrium Cinema'. You could extract the following details from their website and have to design a data model that accommodates this information.

- There are multiple cinemas (A, B, and D) at Atrium with different screen sizes and capacity. A snapshot of the schedule of movies at each cinema is shown below:



SHOWTIMES FOR FRIDAY 13 MAY, 2016

CINEMA A

Show Time	Format	Movie
05:15 PM	2D	Hotal
08:00 PM	2D	Mah-e-Mir
11:00 PM	2D	Baaghi

CINEMA B

Show Time	Format	Movie
03:00 PM	2D	1920 london
05:30 PM	2D	1920 london
08:00 PM	3D	Captain America: Civil War
11:00 PM	2D	1920 london

CINEMA D

Show Time	Format	Movie
02:00 PM	3D	Captain America: Civil War
05:00 PM	3D	The Angry Birds Movie
07:15 PM	3D	The Jungle Book
09:30 PM	3D	The Angry Birds Movie
11:40 PM	3D	Captain America: Civil War

SHOWTIMES FOR SATURDAY 14 MAY, 2016

CINEMA A

Show Time	Format	Movie
11:30 AM	2D	Baaghi
05:15 PM	2D	Hotal
08:00 PM	2D	Mah-e-Mir
11:00 PM	2D	Baaghi

CINEMA B

Show Time	Format	Movie
11:45 AM	2D	1920 london
02:30 PM	3D	Captain America: Civil War
05:30 PM	2D	1920 london
08:00 PM	3D	Captain America: Civil War
11:00 PM	2D	1920 london

CINEMA D

Show Time	Format	Movie
02:00 PM	3D	The Angry Birds Movie
04:15 PM	3D	Captain America: Civil War
07:15 PM	3D	The Angry Birds Movie
09:30 PM	3D	The Jungle Book
11:40 PM	3D	Captain America: Civil War

Figure 1: Cinema Shows

- Clicking on the name of a movie takes you to a Details page that gives the following information:

Figure 2: Movie Details

- You can book your ticket(s) online by providing the following information, and after booking, a seat number will be allocated to each ticket

Figure 3: Ticket Booking

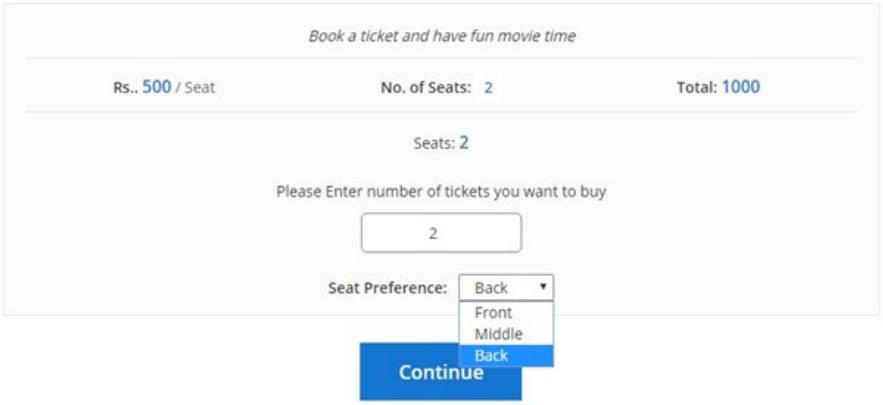


Figure 4: Seat Selection

- The ticket prices may vary for different halls and the type of movie as shown below:

Figure 5: Ticket Price

- Besides the current schedule of movies, the website also shows the list of movies to be shown in near future

Figure 6: Future Shows

Entities correctly identified	20%
All Attributes mentioned	15%
Relationships drawn and resolved correctly	20%
Correct Cardinalities correctly	10%
PK, FK identified and FK is placed in appropriate Entity table	10%
ERD is 3NF	25%

Table 3: Rubric for Scenario 2

Pub ID (PK)	Research Paper Title	Pub Date	Journal	Category	Subject Area	No. of Pages	Faculty ID	Faculty Name	Supervisor ID	Supervisor Name
1001	Paper 1	1/1/2008	Journal 1	A	Databases Database Security	9	1	Faculty 1	5	Faculty 5
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Table 4: Publications