

Lab 4: Normalization

CS 355 Database Systems
Habib University
Fall 2023

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_04-aa1234.pdf* where *aa1234* 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

You have to build ERDs 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)

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. Show all intermediate steps and write any assumptions that you may take.

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	9	1	Faculty 1	5	Faculty 5
1005	Paper 2	1/5/2007	Journal 1	A	Database Security 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 26 Faculty 3	21 7	Faculty 21 Faculty 7
1002	Paper 6	1/10/2007	Journal 5	C	OALP Data Mining System	6	1	Faculty 1	8	Faculty 8
1007	Paper 7	1/11/2007	Journal 3	B	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 and ERD 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 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			CINEMA B			CINEMA D		
Show Time	Format	Movie	Show Time	Format	Movie	Show Time	Format	Movie
05:15 PM	2D	Hotel	03:00 PM	2D	1920 London	02:00 PM	3D	Captain America: Civil War
08:00 PM	2D	Mah-e-Mir	05:30 PM	2D	1920 London	05:00 PM	3D	The Angry Birds Movie
11:00 PM	2D	Baaghi	08:00 PM	3D	Captain America: Civil War	07:15 PM	3D	The Jungle Book
			11:00 PM	2D	1920 London	09:30 PM	3D	The Angry Birds Movie
						11:40 PM	3D	Captain America: Civil War

SHOWTIMES FOR SATURDAY 14 MAY, 2016								
CINEMA A			CINEMA B			CINEMA D		
Show Time	Format	Movie	Show Time	Format	Movie	Show Time	Format	Movie
11:30 AM	2D	Baaghi	11:45 AM	2D	1920 London	02:00 PM	3D	The Angry Birds Movie
05:15 PM	2D	Hotel	02:30 PM	3D	Captain America: Civil War	04:15 PM	3D	Captain America: Civil War
08:00 PM	2D	Mah-e-Mir	05:30 PM	2D	1920 London	07:15 PM	3D	The Angry Birds Movie
11:00 PM	2D	Baaghi	08:00 PM	3D	Captain America: Civil War	09:30 PM	3D	The Jungle Book
			11:00 PM	2D	1920 London	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:

Country	Finland, USA
Year	2016-05-20
Category	Comedy, Action, Family, Animation
Release Date	May 20, 2016
Director	Clay Kaytis, Fergal Reilly
Cast	Jason Sudeikis, Josh Gad, Danny McBride, Maya Rudolph, Kate McKinnon, Sean Penn, Tony Hale, Keegan Michael Key, Bill Hader, Peter Dinklage
Producer	John Cohen, Catherine Winder

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

Which Movie Do You Want To See?

City Movie Cinema Date Time

Figure 3: Ticket Booking

Book a ticket and have fun movie time

Rs.. 500 / Seat No. of Seats: 2 Total: 1000

Seats: 2

Please Enter number of tickets you want to buy

Seat Preference:

Figure 4: Seat Selection

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

Ticket Price	
Cinema A and B	
2D Movies	- Rs. 400 per person
3D Movies	- Rs. 500 per person
Cinema D	
2D Movies	- Rs. 500 per person
3D Movies	- Rs. 600 per person

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
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Table 4: Publications