

# HEALTHCARE MANAGEMENT SYSTEM

*Project Database Report*

*Database Management Systems (CSN-351)*

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## PURPOSE

The purpose of this software is to provide the patients a user friendly online platform to search nearby doctors (particular or based on his/her specialisation and rating) easily and make an appointment with them to get prescribed and/or treated.

This document contains the description about the construction of database which will be used in the software.

## FEATURES

Healthcare Management System contains following database features:

1. **Users** (not doctors): On signup user details asked includes name, email Id, password, dob, gender, city, state, contact no., image URL. Name, email Id and password are compulsory.
2. **Doctors**: On signup doctor details include his basic information including his specialization, hospital associated with, fee, etc. Doctors have particular time slots for appointments i.e he/she will take appointments only between their given slots.
3. **Hospitals**: Includes doctors details associated with it along with facilities like ICU, etc available. This will help user to approach doctor who not just have specialization but also appropriate labs, etc.
4. **Feedback**: User could review his doctor after successful meetup by rating(out of 5) and commenting it. This feedback (average of rating) is used for future doctor suggestion to other users.

## ASSUMPTION

1. One doctor will be associated with at most one hospital at a time and is specialized only in one field.
2. One patient can visit a particular doctor only once per day.
3. Contact No. in a single valued attribute.
4. The fee charged is the appointment fee of that doctor. It does not consist any other chargeable fee. We are not considering the charges of Hospital as this app only meant for doctors and patients.

## PROCEDURE

### Entites and Attributes:

1. User/Patient : p\_id, p\_name, p\_email\_id, p\_password, dob, gender, contact\_no, image\_url, city, state, pincode, latitude, longitude, a\_id.
2. Doctor : d\_id, name, d\_name, specialisation, fee, d\_email\_id, d\_password, image\_url, certificate\_url, contact\_no., work\_timeslot, rating, a\_id, h\_id.
3. Hospital : h\_id, h\_name, city, state, pincode, latitude, longitude, doctor\_id, contact\_no, website, facility.
4. Appointment: a\_id, p\_id, d\_id, date, issue, prescription.
5. Article : art\_id, art\_title, art\_time, art\_content, art\_like\_count.

Attributes	-	Mapped into
p_id	-	A
p_name	-	B
p_email_id	-	C <sub>1</sub>
d_email_id	-	C <sub>2</sub>
p_password	-	D <sub>1</sub>
d_password	-	D <sub>2</sub>
dob	-	E
gender	-	F
contact_no	-	G
image_url	-	H
city	-	I
state	-	J
pincode	-	K
latitude	-	f
longitude	-	g
d_id	-	L
d_name	-	M
specialisation	-	N
fee	-	O
rating	-	P
certificate_url	-	Q
work_timeslot	-	R
h_id	-	S

h_name	-	T
website	-	U
facilities	-	V
a_id	-	W
date	-	X
issue	-	Y
prescription	-	Z
art_id	-	a
art_title	-	b
art_time	-	c
art_content	-	d
art_like_count	-	e

### Functional Dependencies

$A \rightarrow BC_1D_1EFGHIJKfg$   
 $C_1 \rightarrow AD_1$   
 $C_2 \rightarrow D_2L$   
 $fg \rightarrow KIJ$   
 $L \rightarrow MNOPC_2D_2HQGRS$   
 $S \rightarrow TIJfgGUV$   
 $W \rightarrow ALXYZ$   
 $A \rightarrow bcdeL$   
 $AL \twoheadrightarrow W$

### Minimal Cover

Step 1: Replace each functional dependency  $X \rightarrow \{A_1, A_2, \dots, A_n\}$  in F by the n functional dependencies  $X \rightarrow A_1, X \rightarrow A_2, \dots, X \rightarrow A_n$ .

$A \rightarrow B$   
 $A \rightarrow C_1$   
 $A \rightarrow D_1$   
 $A \rightarrow E$   
 $A \rightarrow F$   
 $A \rightarrow G$   
 $A \rightarrow H$

$A \rightarrow I$   
 $A \rightarrow J$   
 $A \rightarrow K$   
 $A \rightarrow f$   
 $A \rightarrow g$   
 $C_1 \rightarrow A$   
 $C_1 \rightarrow D_1$   
 $C_2 \rightarrow D_2$   
 $C_2 \rightarrow L$   
 $fg \rightarrow K$   
 $fg \rightarrow I$   
 $fg \rightarrow J$   
 $L \rightarrow M$   
 $L \rightarrow N$   
 $L \rightarrow O$   
 $L \rightarrow P$   
 $L \rightarrow C_2$   
 $L \rightarrow D_2$   
 $L \rightarrow H$   
 $L \rightarrow Q$   
 $L \rightarrow G$   
 $L \rightarrow R$   
 $L \rightarrow S$   
 $S \rightarrow T$   
 $S \rightarrow I$   
 $S \rightarrow J$   
 $S \rightarrow K$   
 $S \rightarrow G$   
 $S \rightarrow U$   
 $S \rightarrow V$   
 $W \rightarrow A$   
 $W \rightarrow L$   
 $W \rightarrow X$   
 $W \rightarrow Y$   
 $W \rightarrow Z$   
 $a \rightarrow b$   
 $a \rightarrow c$

$a \rightarrow d$

$a \rightarrow e$

$a \rightarrow L$

Closures:

$A^+ = \{A, B, C_1, D_1, E, F, G, H, I, J, K, f, g\}$

$C_1^+ = \{A, B, C_1, D_1, E, F, G, H, I, J, K, f, g\}$

$C_2^+ = \{D_2, L, M, N, O, P, C_2, H, Q, G, R, S, T, U, V\}$

$fg^+ = \{f, g, K, I, J\}$

$L^+ = \{L, M, N, O, P, C_2, D_2, H, Q, G, R, S, T, U, V\}$

$S^+ = \{T, I, J, K, f, g, G, U, V\}$

$W^+ = \{W, A, B, C_1, D_1, C_2, D_2, E, F, G, H, I, J, K, f, g, L, M, N, O, P, Q, R, S, T, U, V, X, Y, Z\}$

$a^+ = \{a, b, c, d, e, L, M, N, O, P, C_2, D_2, H, Q, G, R, S, T, U, V\}$

Step 2 : For each functional dependency  $X \rightarrow A$  in  $F$

for each attribute  $B$  that is an element of  $X$

if  $\{F - \{X \rightarrow A\}\} \cup \{(X - \{B\}) \rightarrow A\}$  is equivalent to  $F$

then replace  $X \rightarrow A$  with  $(X - \{B\}) \rightarrow A$  in  $F$ .

$A \rightarrow B$

$A \rightarrow C_1$

$A \rightarrow D_1$

$A \rightarrow E$

$A \rightarrow F$

$A \rightarrow G$

$A \rightarrow H$

$A \rightarrow I$

$A \rightarrow J$

$A \rightarrow K$

$A \rightarrow f$

$A \rightarrow g$

$C_1 \rightarrow A$

$C_1 \rightarrow D_1$

$C_2 \rightarrow D_2$

$C_2 \rightarrow L$

$fg \rightarrow K$

$fg \rightarrow I$

$fg \rightarrow J$

$L \rightarrow M$

$L \rightarrow N$   
 $L \rightarrow O$   
 $L \rightarrow P$   
 $L \rightarrow C_2$   
 $L \rightarrow D_2$   
 $L \rightarrow H$   
 $L \rightarrow Q$   
 $L \rightarrow G$   
 $L \rightarrow R$   
 $L \rightarrow S$   
 $S \rightarrow T$   
 $S \rightarrow I$   
 $S \rightarrow J$   
 $S \rightarrow K$   
 $S \rightarrow G$   
 $S \rightarrow U$   
 $S \rightarrow V$   
 $W \rightarrow A$   
 $W \rightarrow L$   
 $W \rightarrow X$   
 $W \rightarrow Y$   
 $W \rightarrow Z$   
 $a \rightarrow b$   
 $a \rightarrow c$   
 $a \rightarrow d$   
 $a \rightarrow e$   
 $a \rightarrow L$

No functional dependencies removed.

Step 3 : For each remaining functional dependency  $X \rightarrow A$  in  $F$   
           if  $\{F - \{X \rightarrow A\}\}$  is equivalent to  $F$ ,  
           then remove  $X \rightarrow A$  from  $F$ .

$A \rightarrow B$   
 $A \rightarrow C_1$   
 $A \rightarrow E$   
 $A \rightarrow F$   
 $A \rightarrow G$

$$A \rightarrow H$$

$$A \rightarrow f$$

$$A \rightarrow g$$

$$C_1 \rightarrow A$$

$$C_1 \rightarrow D_1$$

$$C_2 \rightarrow L$$

$$C_2 \rightarrow D_2$$

$$fg \rightarrow K$$

$$fg \rightarrow I$$

$$fg \rightarrow J$$

$$L \rightarrow M$$

$$L \rightarrow N$$

$$L \rightarrow O$$

$$L \rightarrow P$$

$$L \rightarrow C_2$$

$$L \rightarrow H$$

$$L \rightarrow Q$$

$$L \rightarrow G$$

$$L \rightarrow R$$

$$L \rightarrow S$$

$$S \rightarrow T$$

$$S \rightarrow f$$

$$S \rightarrow g$$

$$S \rightarrow G$$

$$S \rightarrow U$$

$$S \rightarrow V$$

$$W \rightarrow A$$

$$W \rightarrow L$$

$$W \rightarrow X$$

$$W \rightarrow Y$$

$$W \rightarrow Z$$

$$a \rightarrow b$$

$$a \rightarrow c$$

$$a \rightarrow d$$

$$a \rightarrow e$$

$$a \rightarrow L$$



Removed dependencies:

$$A \rightarrow D_1$$

$$A \rightarrow I$$

$$A \rightarrow J$$

$$A \rightarrow K$$

$$L \rightarrow D_2$$

$$S \rightarrow I$$

$$S \rightarrow J$$

$$S \rightarrow K$$

Final minimal cover:

$$A \rightarrow BC_1EFGHfg$$

$$C_1 \rightarrow AD_1$$

$$fg \rightarrow KIJ$$

$$L \rightarrow MNOPC_2HQGRS$$

$$C_2 \rightarrow D_2L$$

$$S \rightarrow TIJfgGUV$$

$$W \rightarrow ALXYZ$$

$$a \rightarrow bcdeL$$

$$AL \twoheadrightarrow W$$

DECOMPOSITION:

For User/Patient :

1NF:

$$R_1(\underline{A}, B, C_1, D_1, E, F, G, H, I, J, K, f, g)$$

Candidate keys: A, C<sub>1</sub>

2NF:

Removing partial dependencies of non-prime attributes, if any:

$$R_1(\underline{A}, B, C_1, D_1, E, F, G, H, I, J, K, f, g)$$

Candidate keys: A, C<sub>1</sub>

3NF:

Removing transitive dependencies of non-prime attributes, if any:

$$R_1(\underline{A}, B, C_1, D_1, E, F, G, H, f, g)$$

Candidate keys: A, C<sub>1</sub>

$$R_2(\underline{f, g}, K, I, J)$$

Candidate keys: fg

4NF:

Removing multivalued dependencies, if any:

$R_1(\underline{A}, B, C_1, D_1, E, F, G, H, f, g)$

Candidate keys: A,  $C_1$

$R_2(\underline{f}, \underline{g}, K_1, I, J)$

Candidate keys: fg

5NF:

Removing join dependencies, if any:

$R_1(\underline{A}, B, C_1, E, F, G, H, f, g)$

Candidate keys: A,  $C_1$

$R_2(\underline{f}, \underline{g}, K_1, I, J)$

Candidate keys: fg

$R_3(A, \underline{C_1}, D_1)$

Candidate keys: A,  $C_1$

For Doctor :

1NF:

$R_4(\underline{L}, M, N, O, P, C_2, D_2, H, Q, G, R, S)$

Candidate keys: L,  $C_2$

2NF:

Removing partial dependencies of non-prime attributes, if any:

$R_4(\underline{L}, M, N, O, P, C_2, D_2, H, Q, G, R, S)$

Candidate keys: L,  $C_2$

3NF:

Removing transitive dependencies of non-prime attributes, if any:

$R_4(\underline{L}, M, N, O, P, C_2, D_2, H, Q, G, R, S)$

Candidate keys: L,  $C_2$

4NF:

Removing multi-valued dependencies, if any:

$R_4(\underline{L}, M, N, O, P, C_2, D_2, H, Q, G, R, S)$

Candidate keys: L,  $C_2$

5NF:

Removing join dependencies, if any:

$R_4(\underline{L}, M, N, O, P, C_2, H, Q, G, R, S)$

Candidate keys: L,  $C_2$

$R_5(\underline{C_2}, D_2, L)$

Candidate keys: L, C<sub>2</sub>

For Hospital :

1NF:

R<sub>6</sub>(S, T, I, J, K, f, g, G, U, V)

Candidate keys: S

2NF:

Removing partial dependencies of non-prime attributes, if any:

R<sub>6</sub>(S, T, I, J, K, f, g, G, U, V)

Candidate keys: S

3NF:

Removing transitive dependencies of non-prime attributes, if any:

R<sub>6</sub>(S, T, f, g, G, U, V)

Candidate keys: S

R<sub>2</sub>(f, g, K, I, J)

Candidate keys: fg

4NF:

Removing multi-valued dependencies, if any:

R<sub>6</sub>(S, T, f, g, G, U, V)

Candidate keys: S

R<sub>2</sub>(f, g, K, I, J)

Candidate keys: fg

5NF:

Removing join dependencies, if any:

R<sub>6</sub>(S, T, f, g, G, U, V)

Candidate keys: S

R<sub>2</sub>(f, g, K, I, J)

Candidate keys: fg

For Appointment :

1NF:

R<sub>7</sub>(W, A, L, X, Y, Z)

Candidate keys: W

2NF:

Removing partial dependencies of non-prime attributes, if any:

R<sub>7</sub>(W, A, L, X, Y, Z)

Candidate keys: W

3NF:

Removing transitive dependencies of non-prime attributes, if any:

$R_7(\underline{W}, A, L, X, Y, Z)$

Candidate keys: W

4NF:

Removing multi-valued dependencies, if any:

$R_7(\underline{W}, X, Y, Z)$

Candidate keys: W, ALW

$R_8(\underline{A}, \underline{L}, W)$

Candidate keys: ALW

5NF:

Removing join dependencies, if any:

$R_7(\underline{W}, X, Y, Z)$

Candidate keys: W, ALW

$R_8(\underline{A}, \underline{L}, W)$

Candidate keys: ALW

For Article :

1NF:

$R_7(\underline{a}, b, c, d, e, L)$

Candidate keys: a

2NF:

Removing partial dependencies of non-prime attributes, if any:

$R_9(\underline{a}, b, c, d, e, L)$

Candidate keys: a

3NF:

Removing transitive dependencies of non-prime attributes, if any:

$R_9(\underline{a}, b, c, d, e, L)$

Candidate keys: a

4NF:

Removing multi-valued dependencies, if any:

$R_9(\underline{a}, b, c, d, e, L)$

Candidate keys: a

5NF:

Removing join dependencies, if any:

$R_9(\underline{a}, b, c, d, e, L)$

Candidate keys: a

ER diagram for MockHMS database :

