CZ2007 LAB 3
INTRODUCTION TO DATABASE

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Contents

1 CREDIT_CARD

CREDIT_CARD (card_num, bank, date_valid_to, date_valid_from, customer_id)

Keys: card_num

Primary Key: card_num

FDs: card_num → bank, date_valid_to, date_valid_from,customer_id

All the attributes are functionally dependent on solely the Primary Key (card_num)

LHS is a key

∴ The relation is in 3NF

2 CUSTOMER

CUSTOMER (customer_id, username, email,password,full_name,address,phone_num)

Keys: customer_id,username, email

Primary Key: customer_id

FDs:

customer_id → username, email,password, full_name,address,phone_num

username → customer_id , email,password, full_name,address,phone_num

email → username, customer_id,password, full_name,address,phone_num

phone_num →full_name, address

∴The relation is **not** in 3NF

3NF Procedures:

Mninimal Basis for R:

CUSTOMER (customer_id(A), username(B), email(C),password(D),full_name(E), address(F),phone_num(G))

= CUSTOMER(A,B,C,D,E,F,G)

KEYS: A,B,C

FDS: A→BCDEFG, B→ACDEFG, C→BADEFG
, G→EF

STEP 1.1: (Keep RHS only 1 attribute):

A→B, A→C, A→D, A→E, A→F, A→G

B→A, B→C, B→D, B→E, B→F, B→G

C→A, C→B, C→D, C→E, C→F, C→G

G→E, G→F

STEP 1.2: (Remove redundant FD):

Original closures:

$\{A\}^+$={ABCDEFG}, $\{B\}^+$={ACDEFG}, $\{C\}^+$={BADEFG}, $\{G\}^+$={EF}

we remove A→E, A→F $\{A\}^+$={ABCDEFG}

we remove B→C, B→D, B→E, B→F, B→G $\{B\}^+$={ACDEFG}

we remove C→B, C→D, C→E, C→F, C→G $\{C\}^+$={BADEFG}

CUSTOMER ={ A→B, A→C, A→D, A→G G→E, G→F , B→A, C→A}

STEP 1.3: (Remove dedundanr attributes on LHS):

CUSTOMER ={ A→B, A→C, A→D, A→G G→E, G→F , B→A, C→A}

Step 2: (Combine FDs whose LHS are same:)

CUSTOMER={A→BCDG, G→EF , B→A, C→A}

Step 3: (Create a table for each FD:)

R_1 (ABCDG) = R_1 (customer_id, username, email,password,phone_num)

R_2 (BA) = R_2 (customer_id, username)

R_3 (CA) = R_3 (customer_id, email)

R_4 (GEF) = R_4(phone_num,full_name,address)

Step 4: (If non of the tables contain a key of the original table R, create a table that contains a key of R:)

R_1 contains all keys. Do not need to create new table

Step 5: (Remove redundant tables:)

R_2 & R_3 is a sub set of R_1 so we remove them

Final Answer

R_1 (customer_id, username, email,password,phone_num) R_4(phone_num,full_name,address)

$\therefore$ The relation is in 3NF

3 ORDER

ORDER (order_id, date, status, customer_id)

Keys: order_id

Primary Key: order_id

FDs: order_id → date, status, customer_id

All the attributes are functionally dependent on solely the Primary Key (order_id)

LHS is a key

∴The relation is in 3NF

4 ORDER_ITEM

ORDER_ITEM (sequence_num, order_id, product_unit_price, quantity, status, product_id, shipment_id)

Keys: {sequence_num, order_id}

Primary Key: {sequence_num, order_id}

FDs: sequence_num, order_id→ product_unit_price, quantity, status, product_id, shipment_id

All the attributes are functionally dependent on solely the Primary Key {sequence_num, order_id}

LHS is a key

∴The relation is in 3NF

5 PRODUCT_TYPE

PRODUCT_TYPE (product_type_id, description, parent_product_type_id)

Keys: product_type_id

Primary Key: product_type_id

FDs: product_type_id → description, parent_product_type_id

All the attributes are functionally dependent on solely its Primary Key(product_type_id)

LHS is a key

∴The relation is in 3NF

6 RESTRICTED_TO

RESTRICTED_TO (shop_id, product_type_id)

Keys: {shop_id,product_type_id}
Primary Key: {shop_id,product_type_id}
FDs: shop_id,product_type_id → shop_id,product_type_id

Only trival FD exists in the relation
∴ The relation is in 3NF

7 SHIPMENT

SHIPMENT (shipment_id, tracking_num, date)

Keys: shipment_id, tracking_num
Primary Key: shipment_id
FDs: shipment_id → tracking_num, date
tracking_num → shipment_id, date

Both FD's LHS are superkey
∴The relation is in 3NF

8 INVOICE

INVOICE(invoice_number,date,status,order_id)

Keys: invoice_number
Primary Key: invoice_number
FDs: invoice_number → date,status,order_id

All the attributes are functionally dependent on solely its Primary Key(invoice_number)
LHS is a key
∴The relation is in 3NF

9 PAYMENT

PAYMENT (payment_id, amount, card_num,invoice_number)

Keys: payment_id

Primary Key: payment_id

FDs: payment_id → amount,card_num,invoice_number

All the attributes are functionally dependent on solely its Primary Key(payment_id)

LHS is a key

∴The relation is in 3NF

10 PRODUCT

PRODUCT(product_id,name,colour,price,size,description,shop_id,product_type_id)

Keys: product_id

Primary Key: product_id

FDs: product_id → name,colour,price,size,description,shop_id,product_type_id

All the attributes are functionally dependent on solely its Primary Key(payment_id)

LHS is a key

∴The relation is in 3NF

11 PHOTOS

PHOTOS(photo_sequence, product_id, url)

Keys: {photo_sequence, product_id}

Primary Key: {photo_sequence,product_id}

FDs: photo_sequence,product_id → url

All the attributes are functionally dependent on solely its
Primary Key (photo_sequence,product_id)

LHS is a key

∴The relation is in 3NF

12 SHOP

SHOP (shop_id, shop_name)

Keys: shop_id

Primary Key: shop_id

FDs: shop_id→ shop_name

All the attributes are functionally dependent on solely its Primary Key (shop_id)

LHS is a key

∴The relation is in 3NF

13 ERD REFERENCE