

Week 4 Workshop Assignment Project Exam Help

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Housekeeping information

Assistance of the submission via Wattle is due 20:50 Sep 5 (Friday, Week 6)

- Individual, no group work!
- •

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Partial marks may be awarded.



Housekeeping information

Assistant of the Submission via Wattle is due 20:50 Sep 9 (Friday, Week 6)

- Individual, no group work!
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- Partial marks may be awarded.
- Droppin sessions to Assignment 1 (Waek 5 and W Assignment 1 (Waek 5 and W
 - Aug 24 (Tue) 2-3 pm
 - Aug 25 (Wed) 8-9 pm (NEW)
 - Aug 30 (Mon) 2-3 pm (NEW)
 - Aug 31 (Tue) 2-3 pm
 - Sep 1 (Wed) 8-9 pm (NEW)



Database Design – Four Phases

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- https://eduassistpro.github.
- Conceptual Design Entity-Relationship Model
- Active We Chat edu_assist_present the later of the Relationship Model to Relationship Mo
- Physical Design



Phase 2: Conceptual Design

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- used to communicate the requirements of a
- A conceptual data model is built using the informati __assist_prequirements specification.

Note: The conceptual design is based on the **Entity-Relationship Model** in this course.



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What does modeling do?



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What does modeling do?

Modeling de Wechatedu_assist_pr

- helps in conceptualising and visualising th we may want to build.
- · facilitates specifications of the behaviour of a system
- gives rise to a template that guides us in constructing a system

• ...



Entity-Relationship (ER) Model

Assignment Project Exam Help • ER diagrams (Peter Chen in 1976):

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• Key attribute with underlined;

Add rectangles; Chat edu_assist_pr

Relationship as diamonds.



(Exercise 1) Consider the following data requirements for a university student database that is used to keep track of students' transcripts.

SSTHOUT VERY REPUBLIE OF CALLS THE PROPERTY OF SECURITY Number, address, phone, and birthdate. Both social security number and student number have unique values for each student.

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- https://eduassistpro.github.
- Each course has a course name, description, cour semaster louis, level, and offering department uses is unfold bleach course. In all edu_assist_properties.
- Each section of a course has an instructor, semest number and the section number distinguishes different sections of the same course that are taught during the same semester/year; its values are 1, 2, 3, ..., up to the number of sections taught during each semester.
- A grade record refers to each student and a particular section, consisting of a final mark and a letter grade from (F, D, C, B, A).



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phone and birthdate. Both social security number

unique values for each student Add WeChat edu_assist_pr



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phone and birthdate. Both social security number unique values for each student.

Question Wat are in Critics reality and U_assist_pi



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phone and birthdate. Both social security number unique values for each student.

Question Wat are in Critics hearth and U_assist_pr

- Entities: STUDENT
- Relationships:
- Attributes: name, student number, social security number, address, phone and birthdate for STUDENT



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 - Question What Truthe entitles relationships and assist_prediction of the partition of the p
 - Relationships: has_major_with betw

 DEPARTMENT, has_minor_with between STUDENT and DEPARTMENT
 - Attributes: name for has_major_with, name for has_minor_with



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Assignment Project Example the pentity can participate in.

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Each student has exactly one major, and may hav



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Each student has exactly one major, and may hav departments.

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Cardinality ratios: Every student has at most may offer many majors (to different students)

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Assignment Project Example the pentity can participate in.

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Each student has exactly one major, and may hav departments.

Question Wat all the Constraint at reach U_assist_pr

Cardinality ratios: Every student has at most may offer many majors (to different students)

Participation constraints: Every student must have one major (total) and each department must (typically) offer one major (total).

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Each student has exactly one major, and may hav Question var as whee strain at the Good U_assist_pr



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Each student has exactly one major, and may hav departments.

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Cardinality ratios: Every student has at most may offer many minor (to different students)

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Question Wat all the Constraint at reach U_assist_pr

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Participation constraints: Every student may or may not have one minor (partial) and each department must (typically) offer one minor (total).

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Assignment Project Exam Help Things" in the real world with independent existence).

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Each course has a course name, description, course number, number of semester hours, level, and offering department.



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Each course has a course name, description, course number, number of semester hours, level, and offering department.

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- Entities: course, department
- Relationships: offer (between department and course)
- Attributes: course name, description, course number, number of semester hours and level (of the entity course)



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Each course has a course name, description, course number, number of semester hours, level, and offering department.



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Question What are the constraints of relation to a serious course is offered by at Cardinality ratios: Every course is offered by at

a department may offer many courses



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Each course has a course name, description, course number, number of semester hours, level, and offering department.

Question What are the constraints are relations U_assist process

Cardinality ratios: Every course is offered by at a department may offer many courses

Participation constraints: Every course must be offered by some department (total) and each department may (or may not) offer any courses (partial).



Assertionships: Associations between entitles. Help

• Attributes: Properties that describe entities and relationships.

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A grade record refers to each student and a particul a final mark and whitter grade from (F,D, C, B,A).

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Assertionships: Associations between entitles. Help

• Attributes: Properties that describe entities and relationships.

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Attributes: Properties that describe entities and relationships.

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A grade record refers to each student and a particul a final mark and a butter grade from (F,D,C,B,A).

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Entities: section, course, student



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Attributes: Properties that describe entities and relationships.

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A grade record refers to each student and a particul a final mark and a letter grade from (F,D,C,B,A).

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- Entities: section, course, student
- Relationships: section_taught (between section and course), grade_record (between student and section)



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Attributes: Properties that describe entities and relationships.

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A grade record refers to each student and a particul

a final mank and a butter grade from (F,D,C,B,A).

Question Wat are the artitles lead in sup GhU_assist_DI

- Entities: section, course, student
- Relationships: section_taught (between section and course), grade_record (between **student** and **section**)
- Attributes: instructor, semester, year, and section number (of the weak entity section), final mark and letter grade (of the relationship grade_record)



(Exercise 1) Consider the following data requirements for a university student database that is used to keep track of students' transcripts.

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- Each section of a course has an instructor, semest number and the section number distinguishes different sections of the same course that are taught during the same semester/year; its values are 1, 2, 3, ..., up to the number of sections taught during each semester.
- A grade record refers to each student and a particular section, consisting of a final mark and a letter grade from (F, D, C, B, A).



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student, course, department, section (weak entity)

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Assignment Project Exam Help student, course, department, section (weak entity)

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Assignment Project Exam Help student, course, department, section (weak entity)

- ° https://eduassistpro.github.
 - has_major (between student and department)
 - offer (between department and confidence of tauxive the weel region edu_assist_pr
 - grade_record (between student a



Assignment Project Exam Help student, course, department, section (weak entity)

- https://eduassistpro.github.
 - has_major (between student and department)
 - offer (between department and conscion tauth) to ween earlier edu_assist_pr
 - grade_record (between student a
- Identify the attributes of entities and relationships and identify a primary key for each entity type
- Identify cardinality ratios and participation constraints on relationships



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Software tool to draw ER diagram

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- We require students to use an academic tool, TerraER, to draw the ER di
- ° i https://eduassistpro.github.
- You can download the jar file from the following website: https://github.com/rterrabh/TerraER You can double-click that file to execute on Windo
- that the Java Runtime Environment JRE has been i
- More information on how to use TerraER will be provided next week.



(Exercise 2) A retailer company wants to build a database application for managing information about its sale process. The company sells products in both local shops and webstores on the internet. Each local shop has a name, contact details (e.g., when number and an ail,), and a unique location. The database application also needs to store the URL(u

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details such as their name, address and email. Ever assigned a unique ID. A customer may place an orde least one project an exact derig from effect slop assist of Customers have three payment options (i.e., cas

card) but for each order only one payment option can be chosen. A delivery may be requested for each order. After full-payment is received, a delivery would be sent out subject to products' availability. Every delivery has a unique tracking number.



(Exercise 2) A retailer company wants to build a database application for managing information about its sale process. The company sells

products in both local shopping webstores of the Internet. Each local shop has a rank, contact details (e.g., phone number the trinain, and a punique location. The database application also needs to store the URL(u ery

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Assignment Project Exam Help Identify the entities (including weak entity types)

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Assignment Project Exam Help

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 - The company sells products in both local
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- Identify the entities (including weak entity types)
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 - The company sells products in both local the Internet.

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• subclass shop, webstore



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- Identify the entities (including weak entity types)
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 - The company sells products in both local the Internet.

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- subclass shop, webstore
- superclass store



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- Identify the entities (including weak entity types) sh
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- subclass shop, webstore
- superclass store
- disjoint and complete



Assignment Project Exam Help

- Identify the entities (including weak entity types) sh
- https://eduassistpro.github.
 - The company sells products in both local

Aach other lands and the land of the land

- subclass shop, webstore
- superclass store
- disjoint and complete
- Identify the relationships



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products in both local shopp and webstores of the Internet. Each local part and shall contact details (e.g., phene number that emails, and a punique location. The database application also needs to store the URL(u ery

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shop or a **webstore**. **Customers** have thr

paypal, and credit card) but for each **order** only one payment option can be chosen. A **delivery** may be requested **for** each **order**. After full-payment is received, a **delivery** would be sent out subject to **products**' availability. Every **delivery** has a unique tracking number.



- ໍ¤ໍ່nttps://eduassistpro.github.
 - superclass store
- Identify the relationships Author place cross hat edu_assist_pr
 - order consists of product
 - each order is from store(superclass) (either subclass shop or subclass webstore)
 - delivery is for order



- https://eduassistpro.github.
 - superclass store
- Identify the relationships
- Identity the at ribus of the ties and eating the U_assist_pi



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 - superclass store
- Identify the relationships
- Ider the fit ribus of the ties a detail of the U_assist_properties a detail of the U_assist_properties and the ties a detail of the U_assist_properties and the ties and the
 - Every product has a unique productID, a description, an item price, and a quantity in stock.



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- Identify the relationships
- Identify the entity type

 Identify the entity the entity type

 Identify the entity the
 - Every product has a unique productID, a description, an item price, and a quantity in stock.
 - Attributes for product: productID, description, item price, quantity



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- Identify the relationships
- Idertity the attributes of the ties an actation is U_assist_piece for each entity type
 - Every product has a unique productID, a description, an item price, and a quantity in stock.
 - Attributes for product: productID, description, item price, quantity
 - Primary key for product: productID



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- Identify the relationships
- o Identity the attribute of entities and relationships u_assist_properties and relationships u_assist_properties.



Assignment ud of real montes Exam Help shop, webstore, product, customer, order, delivery

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- Identify the relationships
- o Identity the attribute of entities and relationships u_assist_properties and relationships u_assist_properties.
 - The database application should also record customers' details such as their name, address and email. Every customer is assigned a unique ID.



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- Identify the relationships
- o Identity the attribute of entities and relationships u_assist_properties and relationships u_assist_properties.
 - The database application should also record customers' details such as their name, address and email. Every customer is assigned a unique ID.
 - Attributes for customer: name, address, email, CustomerID



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- Identify the relationships
- Identity the attribute of entities and relationships u_assist_pr
 - The database application should also record customers' details such as their name, address and email. Every customer is assigned a unique ID.
 - Attributes for customer: name, address, email, CustomerID
 - Primary key for customer: CustomerID



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 Identify subclass/superclass and the corresponding disjointness and co

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- Identify the attributes of entities and relationships for each entity type WeChat edu_assist_pr



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 Identify subclass/superclass and the corresponding disjointness and co

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- Identify the attributes of entities and relationships for each entity type Change to Change the Change to Change the Change that the Change



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 Identify subclass/superclass and the corresponding disjointness and co

- Ia •
- - Attributes for superclass store: name, location/URL



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 Identify subclass/superclass and the corresponding disjointness and co

- Ia •
- Identify the attributes of entities and relationships
 for each entity type Chan, atta CU_assist_pi
 email), and a unique location. The databas
 store the URL(unique), name and last updated date of each webstore.
 - Attributes for superclass store: name, location/URL
 - Primary key for superclass store: location/URL



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 Identify subclass/superclass and the corresponding disjointness and co

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- Identify the attributes of entities and relationships
 for each entity type of change that the control of the control of
 - Attributes for superclass store: name, location/URL
 - Primary key for superclass store: location/URL
 - Attributes for subclass shop: phone number, email
 - Attributes for subclass webstore: last updated date



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- Identify cardinality ratios and participation const Add WeChat edu_assist_pr



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Cardinality ratios: A customer may

is placed by one customer.



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Id

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- Identify the attributes of entities and relationships
- Identify cardinality ratios and participation const

- Cardinality ratios: A customer may
 is placed by one customer.
- Participation constraints: A customer may or may not place any orders (Partial). An order must be placed by one customer (Total).



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- Identify subclass/superclass
- Id

- Identify the attributes of entities and relationships
- Identify cardinality retires and participation construction assist_pr



Assignment Project Exam Help

- Identify subclass/superclass
- Id

- Identify the attributes of entities and relationships
- Identify cardinality retires and participation construction and participation construction



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- Identify subclass/superclass
- Id

- Identify the attributes of entities and relationships
- Identify cardinality nations and participation construction and participation construction
 - Cardinality ratios: A delivery is for at most one order and an order has at most one delivery.



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- Identify subclass/superclass
- Id

- Identify the attributes of entities and relationships
- Identify cardinality nations and participation construction and participation constructions are participated and participation constructions and participation constructions are participated and participat
 - Cardinality ratios: A delivery is for at most one order and an order has at most one delivery.
 - Participation constraints: A delivery must be for an order (Total).
 An order may or may not have a delivery (Partial).



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- Identify the attributes of entities and relationships
- Identify cardinality ratios and participation const

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 Cardinality ratios: An order may co product may be contained in many orders.



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- Identify the attributes of entities and relationships
- Identify cardinality ratios and participation const
 - Add We hat edu_assist_pr
 - Cardinality ratios: An order may co product may be contained in many orders.
 - Participation constraints: A order must contain some product (Total). A product may or may not be contained in an order (Partial).



Assignment Project Exam Help Constructing an ER or EER Model

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- Identify the attributes of entities and relationships
- Identify cardinality in the sand participation const u_assist_pr



Assignment Project Exam Help Constructing an ER or EER Model

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- Identify the attributes of entities and relationships
- Identity cardinality with a arc participation construction assist_pr
- Not all the constraints can be expressed in the ER model



(Exercise 2) A retailer company wants to build a database application for managing information about its sale process. The company sells products in both local shops and webstores on the internet. Each local shop has a name, contact details (e.g., when number and email, and a unique location. The database application also needs to store the URL(u

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details such as their name, address and email. Ever assigned a unique ID. A customer may place an orde least one project and except der is their islam assigned a unique ID. A customer may place an orde least one project and except der is their islam assigned a unique ID. A customer may place an orde Customers have three payment options (i.e., c credit card) but for each order only one payment option can be chosen. A delivery may be requested for each order. After full-payment

is received, a delivery would be sent out subject to products' availability. Every delivery has a tracking number.



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Phase 3: Logical Design

Assignment Project Exam Help Logical design is the process of constructing a logical data model (e.g.

 Logical design is the process of constructing a logical data model (e.g. relational or object-oriented).

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 To: Relations with their primary and foreig to deal with retrieving, updating and deletion.

Note: The logical design is based on the **relational data model** in this course.



ER-to-Relations Algorithm

Assisphint of the resident of the steps for the EER model.

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- Foreign key approach
- Merged relation appro

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- Step 5: Mapping of Binary M:N Relationship Types
- Step 6: Mapping of Multi-valued Attributes
- Step 7: Mapping of N-ary Relationship Types
- Step 8: Mapping of Superclass/Subclass



Step 1: Regular Entity types

Assignment regular certify type received relation scheme with the attributes p

• PK: the key attributes of E

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Step 1: Regular Entity types

Assignment in the lattilibrates policy separation and the lattilibrates policy in the lattilibrates policy separation and the

PK: the key attributes of E

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- COURSE(course_num, course_name, description, num_sem_hours, level)with PK: {course_num}
- Note: This is not necessarily the final relation schema of Course.



Step 2: Weak Entity Types

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Step 2: Weak Entity Types

Assume the first of its identifying entity type, where PK: the partial key attributes of E_W plus the PK of its identifying entity

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SECTION(section_num, instructor, semester, year, course_num)
 with PK: {section_num, course_number}
 with FK: [course_num] COURSE[course_num]



Assemble to relation the Point one cotal particle attributes of R and the PK of the partial-side entity type by the attributes of R and the PK of the partial-side entity type, where

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PK: {Name}

FK: [Mgr_SSN]⊆EMPLOYEE[SSN].



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• DEFARTMENT (Name, Activess, Myrash, edu_assist_pr

PK: {Name}

FK: [Mgr_SSN]⊆EMPLOYEE[SSN].

• How can we model the total participation?



SSFprenting the Leading of the total-side entity type by the altributes of R and the PK of the partial-side entity type, where

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• DEPARTMENT (Name, Address, Myrash, edu_assist_pr

PK: {Name}

FK: [Mgr_SSN]⊆EMPLOYEE[SSN].

How can we model the total participation?
 Add NOT NULL constraint to Mgr_SSN for total participation.



SSFprenting the Leading of the total-side entity type by the altributes of R and the PK of the partial-side entity type, where

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• DEFARTMENT (Name, Activess, Myrash, edu_assist_pr

PK: {Name}

FK: [Mgr_SSN] SEMPLOYEE[SSN].

Why don't we extend the relation schema of the partial-side entity type?



SSFprenting the Leading of the total-side entity type by the altributes of R and the PK of the partial-side entity type, where

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. DEFARTMENT (Name, Activess, Myrash, edu_assist_pr

PK: {Name}

FK: [Mgr_SSN] SEMPLOYEE[SSN].

Why don't we extend the relation schema of the partial-side entity type?
 This may cause many NULL values.



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Assignmentality the Power line of the realisation Help

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- If participation on both sides is total, we may merge the relation schemas of both entity types and the attributes of the relat single relition. We Chat edu_assist_properties. We Chat edu_assist_properties.

PK: {SSN} or {Dname}



Assignmentality the Power line of the realisation Help

- If participation on both sides is total, we may merge the relation schemas of both entity types and the attributes of the relat • EMPLOYEE-DEP(SSN, Name, Salary, Start_
- PK: {SSN} or {Dname}
- How can we model the total participations?



Assignment the Problect reliant Help

- If participation on both sides is total, we may merge the relation schemas of both entity types and the attributes of the relat • EMPLOYEE-DEP(SSN, Name, Salary, Start_
- PK: {SSN} or {Dname}
- How can we model the total participations? Add NOT NULL constraint to both SSN and Dname for total participations.



Assignmentality the Power line of the realisation Help

- If participation on both sides is total, we may merge the relation schemas of both entity types and the attributes of the relat • EMPLOYEE-DEP(SSN, Name, Salary, Start_
- PK: {SSN} or {Dname}
- How can we model the total participations? Add NOT NULL constraint to both SSN and Dname for total participations.
- Is merging them always a good solution?



Step 3: Binary 1:1 Relationship Types - (Merged relation)

Assignment the Problect reasoning Help

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- If p of both entity types and the attributes of the relat
- single relation.

 Howeled Houging there should have a good u_assist_pr



Step 3: Binary 1:1 Relationship Types - (Merged relation)

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- of both entity types and the attributes of the relat
- However Holging there is not have a edu_assist_pr
 - (1) The two entity types represent different entitie
 - (2) The two entity types participate in different relationship types.
 - (3) Having separate relation schemas for two entity types often leads to more efficient updates than a single relation schema.
 - (4) ...



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• If both sides are partial, we may create a (n cross-references the PKs of the relation schema Add WeChat edu_assist_pressure and the cross-references the PKs of the relation schema cross-references the reference cross-references the reference cross-reference cross-ref



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If both sides are partial, we may create a (n

- cross-references the PKs of the relation schema

 MANAGES SN, Dyanes art cale With ECU_ASSIST_DI PK: {SSN} or {Dname}

FKs: [SSN]⊆EMPLOYEE[SSN] and [Dname]⊆DEPARTMENT[Name]



Assingment to Propincial religionship Help

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If both sides are partial, we may create a (n

- cross-references the PKs of the relation schema

 MAXINGS ISN, DVances art cale With EQU_ASSIST_DI PK: {SSN} or {Dname}
 - FKs: [SSN]⊆EMPLOYEE[SSN] and [Dname]⊆DEPARTMENT[Name]
- Can we still merge them into a single relation using previous approaches?



Assingment to Propincial religionship Help

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If both sides are partial, we may create a (n

- cross-references the PKs of the relation schema

 MANAGES SN, Dyanes art cale With ECU_ASSIST_DI PK: {SSN} or {Dname}
 - FKs: [SSN]⊆EMPLOYEE[SSN] and [Dname]⊆DEPARTMENT[Name]
- Can we still merge them into a single relation using previous approaches? We cannot; otherwise what would be the primary key for the merged relation schema?



Step 4: Binary 1:N Relationship Types

Assignment the lationship the attributes of anothe PK of the 1 side entity type by the attributes of anothe PK of the 1 side entity type, where

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Step 4: Binary 1:N Relationship Types

Assignment in the lationship the reation scheme of the lation scheme of the lation side entiry type by the attributes plan and the PK of the Lation side entiry type, where

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Add WeChat edu_assist_pr

 STUDENT(SSN, Name, Number, DoB, address, phone, major_dept, major_name) with

PK: {SSN}

FK: [major_dept] CDEPARTMENT[dept_code]



Step 5: Binary M:N (N:N) Relationship Types

A SS Foreart M:NY (M) petationship type to greate Frenchis some without participating emity types, where

- PK: the combination of the PKs of the participating entity types
- •

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GRADE_RECORD(ssn, section_num, course_num, letter_grade, final_grade)

PK: {ssn, section_num, course_num}

 $FK: [ssn] \subseteq STUDENT[ssn]$

FK: [section_num, course_num] \subseteq Section[section_num, course_num].



Step 6: Multi-valued Attributes

Assertione corresponding to A plus the PK of the entity/relationship type that has A as an attribute, where

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Step 6: Multi-valued Attributes

Assemble that the separation of the entity/relationship type that has A as an attribute, where

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EMPLOYEE_ADDRESS(SSN, Address) with

PK: {SSN, Address}

FK: [SSN]⊆EMPLOYEE[SSN]



ER-to-Relations Algorithm (Recall)

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- Foreign key approach
- Merged relation appro

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- Step 5: Mapping of Binary M:N Relationship Types
- Step 6: Mapping of Multi-valued Attributes Step 7: Mapping of N-ary Relationship Types
- Step 8: Mapping of Superclass/Subclass



(Credit Cookie) Graph Model and ER Diagram

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(Credit Cookie) Graph Model and ER Diagram

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