DASC 5333 Database Systems for Data Science
CSCI 4333 Design of Database Systems
Spring 2023
Homework #7

Suggested Solution to Question (1)

SCSP's relation schema with entries for normalization analysis:

1	Country(CountryCode, Name)
Candidate Keys	[1] CountryCode, [2] Name
Foreign Keys	
Nullable Attributes	
Non-nullable Attributes	CountryCode, Name
Notes	
Normalization Analysis	[FD]: [1] CountryCode -> Name, [2] Name -> CountryCode [Highest NF]: BCNF
2	Address(AddressId, Street, City, State, ZipCode, CountryCode)
Candidate Keys	[1] AddressId
Foreign Keys	[1] CountryCode references Country(CountryCode)
Nullable Attributes	State, ZipCode
Non-nullable Attributes	AddressId, Street, City, CountryCode
Notes	
Normalization Analysis	[FD]: [1] AddressId -> Street, City, State, ZipCode, CountryCode [Highest NF]: BCNF
3	Organization(OrganizationId, Name, Phone, AddressId, OriginCountryCode)
Candidate Keys	[1] OrganizationId
Foreign Keys	[1] AddressId references Address(AddressId), [2] OriginCountryCode references Country(CountryCode).
Nullable Attributes	Phone, AddressId, OriginCountryCode
Non-nullable Attributes	OrganizationId, Name
Notes	
Normalization Analysis	[FD]: [1] OrganizationId -> Name, Phone, AddressId, OriginCountryCode; [2] possible: Name -> OrganizationId [Highest NF]: BNCF
4	Account(AccountId, Username, Password)
Candidate Keys	[1]AccountId, [2] Username
Foreign Keys	
Nullable Attributes	
Non-nullable Attributes	AccountId, Username, Password
Notes	[1] AccountId is created as the surrogate primary key.
Normalization Analysis	[FD]: [1] AccountId -> Username, Password, [2] Username -> AccountId [Highest NF]: BCNF
5	Person(PersonId, LName, FName, Email, Phone, AccountId, OrganizationId)
Candidate Keys	[1] PersonId
Foreign Keys	[1] AccountId references Account(AccountId), [2] OrganizationId references

	Organization(OrganizationId)
Nullable Attributes	Phone, OrganizationId, AccountId
Non-nullable Attributes	PersonId, LName, FName, Email
Notes	[1] PersonId is created as the surrogate primary key.
Normalization Analysis	[FD]: [1] PersonId -> LName, FName, Email, Phone, AccountId, OrganizationId [Highest NF]: BCNF
6	Conference(ConferenceId, Name, StartDate, EndDate, VenueName, VenueAddressId, ChairId, LeadOrganizationId)
Candidate Keys	[1] ConferenceId
Foreign Keys	[1] VenueAddressId references Addrwess(AddressId), [2] ChairId references Member(MemberId), [3] LeadOrganizationId references Organization(OrganizationId)
Nullable Attributes	ChairId, VenueAddressId
Non-nullable Attributes	ConferenceId, Name, StartDate, EndDate, VenueName, LeadOrganizationId
Notes	
Normalization Analysis	[FD]: [1] ConferenceId -> Name, StartDate, EndDate, VenueName, VenueAddressId, ChairId, LeadOrganizationId [Highest NF]: BCNF
7	SupportOrganization(SO_Id, ConferenceId, OrganizationId)
Candidate Keys	[1] SO_Id, [2] ConferenceId, OrganizationId
Foreign Keys	[1] ConferenceId references Conference(ConferenceId), [2] OrganizationId references Organization(OrganizationId)
Nullable Attributes	
Non-nullable Attributes	SO_Id, ConferenceId, OrganizationId
Notes	[1] SO_Id is created as the surrogate primary key.
Normalization Analysis	[FD]: [1] SO_Id -> ConferenceId, OrganizationId, [2] ConferenceId, OrganizationId -> SO_Id [Highest NF]: BCNF
8	Staff(StaffId, ConferenceId, PersonId, Role, Description)
Candidate Keys	[1] StaffId, [2] ConferenceId, PersonId
Foreign Keys	[1] ConferenceId references Conference(ConferenceId), [2] PersonId references Person(PersonId)
Nullable Attributes	Description
Non-nullable Attributes	StaffId, ConferenceId, PersonId, Role
Notes	[1] StaffId is created as the surrogate primary key.
Normalization Analysis	[FD]: [1] StaffId -> ConferenceId, PersonId, Role, Description, [2] ConferenceId, PersonId -> StaffId [Highest NF]: BCNF
9	Track(TrackId, TrackName, ConferenceId)
Candidate Keys	[1] TrackId
Foreign Keys	[1] ConferenceId references Conference(ConferenceId)
Nullable Attributes	
Non-nullable Attributes	TrackId, TrackName, ConferenceId
Notes	
Normalization Analysis	[FD]: [1] TrackId -> TrackName, ConferenceId, [2] possible: TrackName,

	ConferenceId -> TrackId
	[Highest NF]: BCNF
10	Paper(PaperId, Title, SubmissionDate, TrackId)
Candidate Keys	PaperId
Foreign Keys	[1] TrackId references Track(TrackId)
Nullable Attributes	
Non-nullable Attributes	PaperId, Title, SubmissionDate, TrackId
Notes	
Normalization Analysis	[FD]: [1] PaperId -> Title, SubmissionDate, TrackId, [2] Possible: trackId, Title -> PaperId
	[Highest NF]: BCNF
11	Authorship(AuthorshipId, AuthorId, PaperId, position)
Candidate Keys	[1] AuthorshipId, [2] PaperId, position, [3] PaperId, AuthorId
Foreign Keys	[1] PaperId references Paper(PaperId)
Nullable Attributes	
Non-nullable Attributes	AuthorshipId, PersonId, PaperId, position
Notes	[1] AuthorshipId is created as the surrogate primary key. [2] Candidate keys [2] and [3] are optional.
Normalization Analysis	[FD]: [1] AuthorshipId -> AuthorId, PaperId, position, [2] AuthorId, PaperId -> Authorship, [3] PaperId, Position -> Authorship.
	[Highest NF]: BCNF
12	Outcome(OutcomeId, OutcomeCode, Outcome, Description)
Candidate Keys	[1] OutcomeId
Foreign Keys	
Nullable Attributes	Description
Non-nullable Attributes	OutcomeId, Outcome, OutcomeCode
Notes	
Normalization Analysis	[FD]: [1] OutcomeId -> OutcomeCode, Outcome, Description
	[Highest NF]: BCNF
13	Review(ReviewId, ReviewerId, PaperId, OutcomeId, Comment)
Candidate Keys	[1] ReviewId, [2] ReviewerId, PaperId
Foreign Keys	[1] ReviewerId references Person(PersonId), [2] PaperId references Paper(PaperId), [3] OutcomeId references Outcome(OutcomeId).
Nullable Attributes	
Non-nullable Attributes	ReviewId, ReviewerId, PaperId, OutcomeId, Comment
Notes	[1] ReviewId is created as a surrogate primary key. [2] ReviewerId, PaperId. Candidate key [2] is optional.
Normalization Analysis	[FD]: [1] ReviewId -> ReviewerId, PaperId, OutcomeId, Comment, [2] ReviewerId, PaperId -> ReviewId
	[Highest NF]: BCNF
14	Keyword(KeywordId, Keyword)
Candidate Keys	[1] KeywordId, [2] Keyword
Foreign Keys	
Nullable Attributes	
Non-nullable Attributes	KeywordId, Keyword
Notes	[1] KeywordId is created as the surrogate primary key.

Normalization Analysis	[FD]: [1] KeywordId -> Keyword, [2] Keyword -> KeywordId [Highest NF]: BCNF
15	AssociatedKeyword(AK_Id, PaperId, KeywordId)
Candidate Keys	[1] AK_Id, [2] PaperId, KeywordId
Foreign Keys	[1] PaperId references Paper(PaperId), [2] KeywordId references Keyword(KeywordId)
Nullable Attributes	
Non-nullable Attributes	AK_Id, PaperId, KeywordId
Notes	[1] AK_Id is created as the surrogate primary key.
Normalization Analysis	[FD]: [1] AK_Id ->PaperId, KeywordId, [2] PaperId, KeywordId -> AK_Id [Highest NF]: BCNF