DASC 5333 Database Systems for Data Science
CSCI 4333 Design of Database Systems
Spring 2025
Suggestion Solution for Q1 of Homework #7

1	TaxCategory(TC_Id, Name, TaxRate)
Candidate Keys	[1] TC_Id, [2] Name
Foreign Keys	
Nullable Attributes	
Non-nullable Attributes	TC_Id, Name, TaxRate
Notes	[1] A surrogate key, TC_Id, is created as the primary key.
Normalization Analysis	[FD]: [1] TC_Id -> Name, TaxRate, [2] Name -> TC_Id [Highest NF]: BCNF
2	Item(ItemId, Item, CurrentPrice, CurrentPriceSince, Description, Comment, IsActive, TC_Id)
Candidate Keys	[1] ItemId, [2] Item
Foreign Keys	[1] TC_Id references TaxCategory(TC_Id)
Nullable Attributes	Description, Comment
Non-nullable Attributes	ItemId, Item, CurrentPrice, CurrentPriceSince, IsActive, TC_Id
Notes	
Normalization Analysis	[FD]: [1] ItemId -> Item, CurrentPrice, CurrentPriceSince, Description, Comment, IsActive, TC_Id, [2] Item -> ItemId [Highest NF]: BCNF
3	MenuCategory(MC_Id, CategoryName, Description)
Candidate Keys	[1] MC_Id, [2] CategoryName
Foreign Keys	
Nullable Attributes	Description
Non-nullable Attributes	MC_Id, CategoryName
Notes	[1] A surrogate key, MC_Id, is created as the primary key.
Normalization Analysis	[FD]: [1] MC_Id -> CategoryName, Description, [2] CategoryName -> MC_Id [Highest NF]: BCNF
4	ItemCategory(IC_Id, ItemId, MC_Id)
Candidate Keys	[1] IC_Id, [2] ItemId, MC_Id
Foreign Keys	[1] ItemId references Item(ItemId), [2] MC_Id references MenuCategory(MC_Id)
Nullable Attributes	
Non-nullable Attributes	IC_Id, ItemId, MC_Id
Notes	[1] A surrogate key, IC_Id, is created as the primary key.
Normalization Analysis	[FD]: [1] IC_Id -> ItemId, MC_Id, [2] ItemId, MC_Id -> IC_Id [Highest NF]: BCNF
5	ItemHistory(IH_Id, ChangeTime, Price, Comment, IsActive, ItemId)
Candidate Keys	[1] IH_Id
Foreign Keys	[1] ItemId references Item(ItemId)
Nullable Attributes	Price, Comment, IsActive
Non-nullable Attributes	IH_Id, ChangeTime, ItemId

Notes	[1] A surrogate key, IH_Id, is created as the primary key.
Normalization Analysis	[FD]: [1] IH_Id -> ChangeTime, Price, Comment, IsActive, ItemId [Highest NF]: BCNF
6	Waiter(WaiterId, FName, LName)
Candidate Keys	[1] WaiterId
Foreign Keys	
Nullable Attributes	
Non-nullable Attributes	WaiterId, FName, LName
Notes	
Normalization Analysis	[FD]: [1] WaiterId -> FName, LName [Highest NF]: BCNF
7	Customer(CId, FName, LName, Phone, Address, City, State, ZipCode)
Candidate Keys	[1] CId
Foreign Keys	
Nullable Attributes	FName, LName,
Non-nullable Attributes	CId, Phone, Address, City, State, ZipCode
Notes	[1] A surrogate key, CId, is created as the primary key.
Normalization Analysis	[FD]: [1] CId -> FName, LName, Phone, Address, City, State, ZipCode [Highest NF]: BCNF
8	Table(TableId, TableNum, Description)
Candidate Keys	[1] TableId, [2] TableNum
Foreign Keys	
Nullable Attributes	Description
Non-nullable Attributes	TableId, TableNum
Notes	
Normalization Analysis	[FD]: [1] TableId -> TableNum, Description, [2] TableNum -> TableId [Highest NF]: BCNF
9	Order(OrderId, OrderTime, Comment)
Candidate Keys	[1] OrderId
Foreign Keys	
Nullable Attributes	Comment
Non-nullable Attributes	OrderId, OrderTime
Notes	[1] In this design, the superclass ‘Order’ and the three subclasses are modeled by a relation each. It is possible to use other designs, such as one relation for all four classes.
Normalization Analysis	[FD]: [1] OrderId -> OrderTime, Comment [Highest NF]: BCNF
10	TakeOutOrder(TO_Id, PickupTime, OrderId)
Candidate Keys	[1] TO_Id, [2] OrderId
Foreign Keys	[1] OrderId references Order(OrderId)
Nullable Attributes	PickupTime
Non-nullable Attributes	To_Id, OrderId
Notes	[1] A surrogate key, TO_Id, is created as the primary key. [2] Other reasonable designs acceptable.
Normalization Analysis	[FD]: [1] TO_Id -> PickupTime, OrderId, [2] OrderId -> TO_Id [Highest NF]: BCNF

11	DeliveryOrder(DeliveryId, PromisedTime, OrderId, CId)
Candidate Keys	[1] DeliveryId, [2] OrderId
Foreign Keys	[1] OrderId references Order(OrderId), [2] CId references Customer(CId)
Nullable Attributes	PromisedTime
Non-nullable Attributes	DeliveryId, OrderId, CId
Notes	[1] A surrogate key, DeliveryId, is created as the primary key.
Normalization Analysis	[FD]: [1] DeliveryId -> PromisedTime, OrderId, Cid, [2] OrderId -> DeliveryId [Highest NF]: BCNF
12	InhouseOrder(IO_Id, NumGuests, OrderId, WaiterId)
Candidate Keys	[1] IO_Id, [2] OrderId
Foreign Keys	[1] OrderId references Order(OrderId), [2] WaiterId references Waiter(WaiterId)
Nullable Attributes	
Non-nullable Attributes	IO_Id, NumGuests, OrderId, WaiterId
Notes	[1] A surrogate key, IO_Id, is created as the primary key.
Normalization Analysis	[FD]: [1] IO_Id -> NumGuests, OrderId, WaiterId, [2] OrderId -> IO_Id [Highest NF]: BCNF
13	OrderTable(OT_Id, IO_Id, TableId)
Candidate Keys	[1] OT_Id, [2] IO_Id, TableId
Foreign Keys	[1] IO_Id references InhouseOrder(IO_Id), [2] TableId references Table(TableId)
Nullable Attributes	
Non-nullable Attributes	OT_Id, IO_Id, TableId
Notes	[1] A surrogate key, OT_Id, is created as the primary key.
Normalization Analysis	[FD]: [1] OT_Id -> IO_Id, TableId, [2] IO_Id, TableId -> OT_Id [Highest NF]: BCNF
14	OrderItem(OItemId, ItemId, Quantity, OrderId, Comment)
Candidate Keys	[1] OItemId, [2] OrderId, ItemId (possibly)
Foreign Keys	[1] OrderId references Order(OrderId), [2] ItemId references Item(ItemId)
Nullable Attributes	Comment
Non-nullable Attributes	OItemId, ItemId, Quantity, OrderId
Notes	[1] A surrogate key, OItemId, is created as the primary key.
Normalization Analysis	[FD]: [1] OItemId -> ItemId, Quantity, OrderId, Comment, [2] (possibly) OrderId, ItemId -> OItemId [Highest NF]: BCNF
15	Bill(Bill_Id, Total, OrderId)
Candidate Keys	[1] Bill_Id
Foreign Keys	[1] OrderId references Order(OrderId),
Nullable Attributes	
Non-nullable Attributes	Bill_Id, Total, OrderId
Notes	[1] A surrogate key, Bill_Id, is created as the primary key.
Normalization Analysis	[FD]: [1] Bill_Id -> Total, OrderId [Highest NF]: BCNF
16	ItemsForBill(IFB_Id, Bill_Id, OT_Id)
Candidate Keys	[1] IFB_Id, [2] Bill_Id, OT_Id

Foreign Keys	[1] Bill_Id references Bill(Bill_Id), [2] OT_Id references OrderItem(OT_Id)
Nullable Attributes	
Non-nullable Attributes	IFB_Id, Bill_Id, OT_Id
Notes	[1] A surrogate key, IFB_Id, is created as the primary key.
Normalization Analysis	[FD]: [1] IFB_Id -> Bill_Id, OT_Id, [2] Bill_Id, OT_Id -> IFB_Id [Highest NF]: BCNF