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COMP3278 Project report

Topic: Library Management System

Brief Description:

A system for the library management to keep track of information of libraries, book status and library card holder status, in addition to standard enterprise information such as human resources and accounting.

Business Rules:

- The top layer of library management called Library Management Centre here, can be divided into separate libraries.
- Libraries are identified by their unique ID. Each library has a location as its name, and item amount.
- The Library Management Centre has a list of staff. Each staff is associated with him a unique staff ID, name, identity card number, address, email, phone number, library ID, position, join date, and salary.
- The Library Management Centre also has a list of their storage. Each item is identified by their unique item ID, and has ISBN, bought date, cost, library ID, and status. Its other data is stored in Collection, with ISBN, name, type (book, CD, etc.), author, publisher, language, search ID, and category.
- Books or CD can have the same name and search ID if they are the same book/CD, but must have different item ID.
- Library card holders (members) are identified by their unique ID. Each of them has name, identity card number, address, and penalty.
- Library card holders has a list of items borrowed, maximum 6 slots. Each slot has a slot ID, an item ID of the borrowed item, borrowed date and return date.

Assumptions:

- Other information of libraries, such as opening time etc. are assumed consistent throughout libraries and unimportant to the system and thus are not included. There are no mobile libraries.
- Books/CDs and human resources are distributed through The Library Management Centre.

- Return date of book can be extended.
- Books/CDs must be returned to their original library before they can be borrowed again. Users can return an item to any library, but it will be in a status called “delivering” before returning to its original library.
- Assume that CD uses ISBN also.

System functionalities/user activities:

- List all items. It can be sorted/filtered by ID/type/library/category etc.
- List all staff. It can be sorted/filtered by ID/library/position/salary etc.
- Find specific item through searching name/ID/ISBN.
- etc.

Data requirement analysis:

Library

(M/O = Mandatory/Optional)

Attribute Name	Description		
ID_library	Unique ID of library	M/O	Mandatory
		Type	char
		Length	3
		Format	
		Validation	
		Default	
		Example	001
Location	Location of library. Also name of library.	M/O	Mandatory
		Type	varchar
		Length	20
		Format	
		Validation	
		Default	
		Example	Tsuen Wan
item_amount	Total amount of items of library	M/O	Mandatory
		Type	int
		Length	
		Format	
		Validation	>=0
		Default	
		Example	5894

Staff

Attribute Name	Description		
ID_staff	Unique ID of staff	M/O	Mandatory
		Type	char
		Length	5
		Format	
		Validation	
		Default	
		Example	00001
name	name of staff	M/O	Mandatory
		Type	varchar
		Length	30
		Format	
		Validation	
		Default	
		Example	Chris Wong
card_ID	ID card no. of staff	M/O	Mandatory
		Type	char
		Length	8
		Format	
		Validation	
		Default	
		Example	A1234567
address	address of staff	M/O	Mandatory
		Type	varchar
		Length	200
		Format	
		Validation	
		Default	
		Example	Flat A, 3/F, Block A, XX Gardens, XX Nathan Road, Mong Kok

email	email of staff	M/O	Mandatory
		Type	varchar
		Length	30
		Format	
		Validation	
		Default	
		Example	a@gmail.com
phone	phone no of staff	M/O	Mandatory
		Type	char
		Length	8
		Format	
		Validation	
		Default	
		Example	98765432
ID_library	library ID of staff	M/O	Mandatory
		Type	char
		Length	3
		Format	
		Validation	
		Default	
		Example	001
position	position of staff	M/O	Mandatory
		Type	varchar
		Length	20
		Format	
		Validation	
		Default	
		Example	Book manager
join_date	join date of staff	M/O	Mandatory
		Type	date
		Length	10
		Format	dd/mm/yyyy
		Validation	
		Default	
		Example	01/08/2014

salary	salary of staff	M/O	Mandatory
		Type	numeric
		Length	(7,1)
		Format	
		Validation	>0
		Default	
		Example	123456.7

Collection

Attribute Name	Description		
ISBN	ISBN of items	M/O	Mandatory
		Type	char
		Length	13
		Format	
		Validation	
		Default	
		Example	9788175257665
name	name of items	M/O	Mandatory
		Type	varchar
		Length	100
		Format	
		Validation	
		Default	
		Example	Life of Pi
type	type of items	M/O	Mandatory
		Type	char
		Length	2
		Format	
		Validation	
		Default	
		Example	01
author	author of items	M/O	Optional
		Type	varchar
		Length	50
		Format	
		Validation	
		Default	
		Example	Ray Chan

publisher	publisher of items	M/O	Optional
		Type	varchar
		Length	50
		Format	
		Validation	
		Default	
		Example	Ape Publisher Ltd
language	language of items	M/O	Mandatory
		Type	varchar
		Length	20
		Format	
		Validation	
		Default	
		Example	English
ID_search	search ID of items	M/O	Mandatory
		Type	char
		Length	7
		Format	
		Validation	
		Default	
		Example	857 4038
category	category of items	M/O	Mandatory
		Type	varchar
		Length	20
		Format	
		Validation	
		Default	
		Example	Novel

Item

Attribute Name	Description		
ID_item	Unique ID of items	M/O	Mandatory
		Type	char
		Length	10
		Format	
		Validation	
		Default	
		Example	010 234 5678

ISBN	ISBN of items	M/O	Mandatory
		Type	char
		Length	13
		Format	
		Validation	
		Default	
		Example	9788175257665
ID_library	ID of belonging library of items	M/O	Mandatory
		Type	char
		Length	3
		Format	
		Validation	
		Default	
		Example	001
bought_date	bought date of items	M/O	Mandatory
		Type	date
		Length	10
		Format	dd/mm/yyyy
		Validation	
		Default	
		Example	23/05/2008
cost	cost of items	M/O	Optional
		Type	numerical
		Length	(4,1)
		Format	
		Validation	
		Default	
		Example	128.5
status	status of items	M/O	Mandatory
		Type	char
		Length	2
		Format	
		Validation	
		Default	
		Example	01

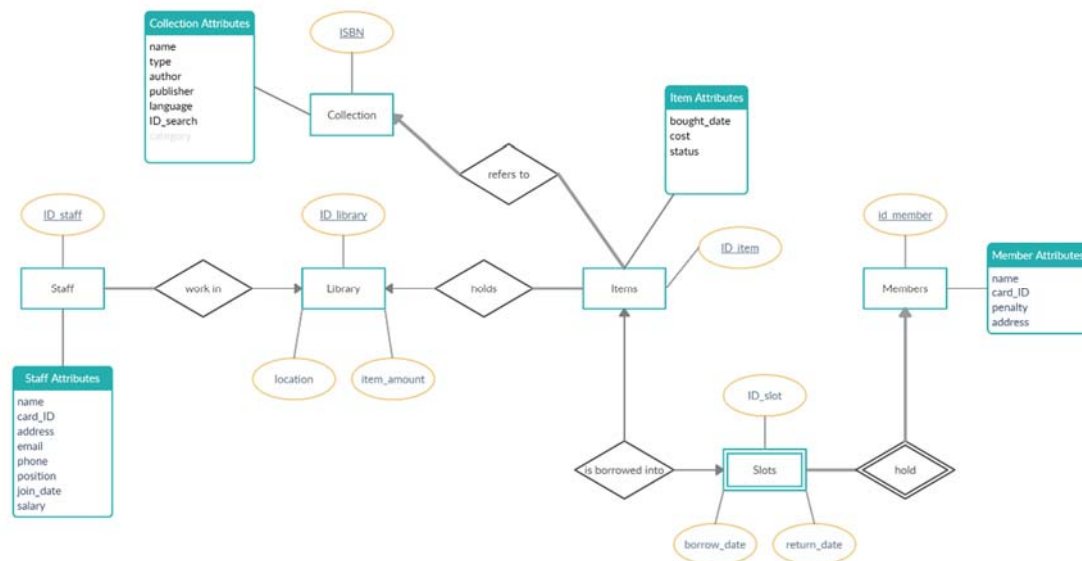
Library card holder(member)

ID_member	Unique ID of members	M/O	Mandatory
		Type	char
		Length	10
		Format	
		Validation	
		Default	
		Example	925 364 4578
name	name of mambers	M/O	Mandatory
		Type	varchar
		Length	30
		Format	
		Validation	
		Default	
		Example	Chan Tai Man
card_ID	ID card no. of members	M/O	Mandatory
		Type	char
		Length	8
		Format	
		Validation	
		Default	
		Example	B9876543
penalty	penalty of members, i.e. how much they need to pay when they did not return item on time/broke a book etc.	M/O	Mandatory
		Type	numerical
		Length	(4,1)
		Format	
		Validation	>=0
		Default	0
		Example	15.4
address	address of members	M/O	Mandatory
		Type	varchar
		Length	200
		Format	
		Validation	
		Default	
		Example	Flat B, 4/F, Block E, XX Gardens

Slot

ID_slot	ID of slots	M/O	Mandatory
		Type	char
		Length	11
		Format	
		Validation	
		Default	
		Example	6
ID_item	ID of borrowed items	M/O	Optional
		Type	char
		Length	10
		Format	
		Validation	
		Default	
		Example	010 234 5678
borrow_date	borrowed date of items	M/O	Optional
		Type	date
		Length	10
		Format	
		Validation	
		Default	
		Example	09/10/2020
return_date	return date of items	M/O	Optional
		Type	date
		Length	10
		Format	
		Validation	
		Default	
		Example	23/10/2020

ER Model Diagram:



ER diagram description:

Total Participation is denoted with thick lines while partial is denoted with thin lines.

Derived attributes are derived with pale grey font colour.

- Each staff belongs to one and only one library. (Total participation)
- Each item belongs to one and only one library. (Total participation)
- A library has zero to many staff, and zero to many books.
(Partial participation)
- Each item can be borrowed by zero to one member.
(Partial participation)
- Each item can be of one and only one collection. (Total participation)
- Each collection can be of one or more items. (Total participation)
- Each member can borrow zero to six items.
(Partial participation)
- Each slot can fit in zero to one item.
(Partial participation)
- Each item can be in zero or one slot.
(Partial participation)
- Each slot is owned by one and only one member.
(Total participation)
- Each member has six slots.
(Total participation)

Relational Database Schema:

Library(ID_library, location, item_amount)

Staff(ID_staff, ID_library, name, card_ID, address, email, phone, position, join_date, salary)

- Foreign key: {ID_library} references Library(ID_library)

Collection(ISBN, name, type, author, publisher, language, ID_search, category)Item(ID_item, ID_library, ISBN, bought_date, cost, status)

- Foreign key: {ID_library} references Library(ID_library)
- Foreign key: {ISBN} references Collection(ISBN)

Member(ID_member, name, card_ID, penalty, address)

Slot(ID_member, ID_slot, ID_item, borrow_date, Return_date)

- Foreign key: {ID_member} references Member(ID_member)
{ID_item} references Item(ID_item)

Queries:

Q1: List all libraries.

Q2: List all staff with criteria. Example criteria are:

- a) from library with ID=4;
- b) with salary>50000;
- c) with join date later than 2011-01-01, ordered by join date;
- d) with position "Accounting Assistant".

Q3: List all members. Example criteria is with penalty larger than 0.

Q4: List all collection with specified language (e.g. Chinese).

Q5: List the library location, all Item ID, ISBN, names, and status with location "Jinnan", ordered by status then ISBN

Q6: List all library location, Item ID, ISBN, names, and status with collection name "Unthinkable", ordered by status.

Q7: List all library location, Item ID, ISBN, names, and status with type = 1(books), ordered by ISBN then status.

Q8: List all library location, Item ID, ISBN, names, and status with category "Drama", ordered by ISBN then status.

Q9: List all slots of a member, displaying member ID, name, Slot ID, and collection name (name of item borrowed). Ordered by slot ID. Shows *NULL* for unoccupied slots. Example is with ID=35.

Q10: List all member ID, name, member ID card, Slot ID, collection name, borrow date and return date with return date before 2020-11-20, ordered by member ID then slot ID. This is for the library to check for expiry.

Q11: List all library ID, location, item amount and count the total of books of that library. For checking purposes.

Q12: List all member ID, names and count the number of empty slots. If all slots are full, *NULL* will be displayed.

Q13: List all member ID and names for members who is not borrowing a book at the moment.

Q14: List all member ID and names for member who borrowed the item "Houseboat". Shows ISBN and collection name for checking purposes.

Q15: Simulating a recommendation of a random book/CD. Display library locations, item ID, ISBN, collection name and status of an item randomly selected.