Data and Applications (Project Phase-1)

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Database of a University

1.Introduction to Mini world

The UoD in this document provides information about the database of university named VYS university. The database provides information about students, professors, student life on campus and many more which will be discussed later in this document.

2. Purpose of Database

The purpose of this database is to keep records of students, professors, university clubs, hostel facilities in university, events, sports facilities and courses taught.

3. Users of Database

- Dean / Professors' View (Cannot view other professors' data and sensitive information of students)
- Students' View (Cannot view professors' and other students' data)
- Management's View (Can view the entire database)

4. Applications of Database

1. To view students' information.
2. To know about clubs and club events that take place.
3. To know about the courses offered by college to different branches.
4. To know about the faculties.
5. To know about sports facilities
6. To generate stats from this data

5. Database Requirements

5.1 Assumptions

1. Every Department has a unique name

2. No. of students taking a course can be zero

3. (*) -> Primary Key, (M) -> Multivalued, (C) -> Composite, (D) -> Derived. (p*) -> Partial key.

4. Name of club, Hostels are unique.

5.Students with the same house are in the same hostel. (Basically house == hostel)

5.2 Entity Types

Type of Entity	Entity Type	Entities	Attributes	Constraints and Datatype
Strong Entities	Departments	Computer Sc. Electronics Mechanical Agriculture, etc.	Name (*)	NOT NULL, VARCHAR (50)
			Building No.	NOT NULL, SMALLINT
			Head	NOT NULL, VARCHAR (50)
	Subjects	Linear Algebra, C Programming, Internet of Things, Probability, etc.	Course ID (*)	NOT NULL, VARCHAR (10)
			Lab (y/n)	BOOL
			No. Of Students	INT
			Prof_ID (M)	NOT NULL, INT
	Professors	Dean (Academics) Dean (Sports), Aftab Hussain, Suryajith Chillara	Name (C) *First Name, Middle Name, Last Name*	NOT NULL, VARCHAR (50)
			Prof_ID (*)	NOT NULL, INT
			Gender	VARCHAR (7)
			Department	NOT NULL, VARCHAR (50)
			Salary	NOT NULL, BIGINT
			Course ID (M)	NOT NULL, INT
			Date of Birth(C)	DATE/TIME
			Age (D) *Derived from DoB*	SMALLINT
	Students	Shambhavi, Yatharth Gupta, Vansh Marda, etc.	Name (C) *First Name, Middle Name, Last Name*	NOT NULL, VARCHAR (50)
			Roll Number (*)	NOT NULL, INT
			Date of Birth	DATE/TIME
			Department	NOT NULL, VARCHAR (50)
			Email	NOT NULL, VARCHAR (70)
			Password	NOT NULL, VARCHAR (50)
			CGPA	NOT NULL, FLOAT, <=10
			Batch	NOT NULL, VARCHAR (10)
			Age (D) *Derived from DoB*	NOT NULL, INT
			Gender *Male/Female/others*	NOT NULL, VARCHAR (10)

			Hostel	
	Clubs	Dance Club, Music Club, Arts Society, Robotics Club, etc.	Coordinators (M)	NOT NULL, VARCHAR (50)
			Name (*)	NOT NULL, VARCHAR (50)
			Club Room	VARCHAR (50)
			No. Of Members	NOT NULL, INT
	Hostels	Emerald, Ruby, Pearl, Sapphire Quartz Diamond	Name (*)	NOT NULL, VARCHAR (50)
			Capacity of Hostel	NOT NULL, INT
			Warden	NOT NULL, VARCHAR (20)
			Hostel type *Boys/girls*	NOT NULL, VARCHAR (20)
			Per room capacity	NOT NULL, SMALLINT
	Sports	Tennis, Cricket, Badminton, Swimming, etc.	In-charge	NOT NULL, VARCHAR (50)
			Name (*)	NOT NULL, VARCHAR (50)
			Equipment (M)	VARCHAR (50)
			Ground / Court	NOT NULL, VARCHAR (50)
	Locations	SRK Auditorium, Tata Seminar Hall, Einstein lecture hall, etc.	Address (*) (C)	NOT NULL, VARCHAR (50)
			Capacity	NOT NULL, INT
Weak Entities	Mess (Relates to hostel)	Veg, Non-Veg, etc.	Name (p*)	NOT NULL, VARCHAR (50)
			No. Of Students Registered	INT
	Equipment (Relates to sports)	Badminton racquet (Medium size), Cricket Bat(large), etc.	Quantity	INT
			Equipment name(p*)	NOT NULL, VARCHAR (50)
			Size	VARCHAR (50)

5.3 Relationships

S. No	Relationship	Degree	Constraints (min, max)
1	**Mess** belongs to **Hostel**	2	Mess (1,1) Hostel (1,2)
2	**Sports** has **Equipment**	2	Sports (0, N) Equipment (1,1)
3	**Student** belongs to **Department**	2	Student (1,1) Department (1, N)
4	**Professor** belongs to **Department**	2	Professor (1, N) Department (1, N)
5	**Student** is a member of **Club**	2	Student (0, N) Club (1, N)

6	**Professor** teaches **Student** a **Subject** at a **location**	4	Professor (1, N) Student (1, N) Subjects (1, N) Location (1, 1)
7	**Student** belongs to **Hostel**	2	Student (1,1) Hostel (1, N)
8	**Sport** won by **hostel**	2	Sport (1,1) Hostel (0, N)
9	**Hostel** competes with a **Hostel**	1	Hostel (1, N) Hostel (1, N)
10 (bonus)	**Professor supervises Professor**	1	Prof_visor (0, N) Prof_visee (0, 1)

Notations:

    Mess (1,1): min 1 and max 1 mess can belong to a hostel

    Hostel (1,2): min 1 and max 2 mess can be present in a hostel

Functional Requirements

Retrieval

I. Selection:

- Retrieve complete data of a subject
- Get equipment data of each sport
- Get equipment data of all sports together
- Retrieve student / professor details
- Get information about all the departments in building no. 4
- Number of professors teaching a subject

II. Projection:

- Name of all sports having non-zero equipment
- Number of subjects having more than 30 students enrolled

III. Aggregate:

- Number of subjects having labs
- Average number of students per subject
- Total amount spent by university on professors' salary
- Least populated hostel
- Sport with maximum equipment

IV. Search:

- Search for students /professors using first letter of their name
- Search for departments by their name

Analysis

1. Number of students enrolled for the subjects having more than average number of students.
2. Number of girls and boys having above average CGPA in mechanical department
3. Student female is to male ratio

Modifications

(a) Insertion:

+ Insert data tuples of newly enrolled students and professors
+ Insert data of newly formed clubs

(b) Update:

+ Update values of attributes like coordinator of clubs, wardens of hostels
+ Update number of students registered/enrolled in each mess, hostel, club, department and subject when new batch joins the university.

(c) Delete:

– Delete data of graduated students / retired professors
– Delete data of damaged sports equipment

Disclaimer: In any of the above modifications, care must be taken that no integrity constraint is violated.