DNA PROJECT PHASE - 1

Introduction

The **JEE-Main examination** formerly known as the All India Engineering Entrance Examination is an all India standardized computer-based test for admission to various technical undergraduate programs in engineering, architecture, and planning across India. The exam is conducted by the National Testing Agency. Since 2021, this examination is being conducted **4 times** every year, spanning from January to May. The examination consists of only **three papers**: **Paper 1 for B.E./B. Tech. courses** and **Paper 2 for B. Architecture** and **Paper 3 for B. Planning** courses. A candidate can opt for any or both papers and can try for admission to all three - B.tech, B.planning, B.architecture.

Purpose

This database maintains *all necessary information related to the JEE-Main examination which is used as a means to admit students into the top colleges all over the country.* This exam is used for admissions into B. Tech, B. Planning, and B. Architecture. **Its main purpose is to maintain the data of all the registered students who are attempting the exam**. It keeps track of the performance and results of each student at each phase and students can hence easily access their results after every paper. It also helps the organizing committee and employees of the NTA keep track of the status of the exam at various centers all over the nation. It can also be used by various college/university officials to observe the result trends of various students which helps in the admission process as well.

Users

The ***primary users** of the database are students* of various institutions who wish to apply for the competitive examinations being conducted by the National Testing Agency (NTA). Students can register for their respective examinations through the database. They can also update their personal details (OR) de-register themselves from certain examinations.*The **secondary users** are the employees of the organization* which is conducting the examinations. They use it to know the statistics of the examinations. **Other users** m*ay include parents/guardians of students, teachers, institutions of higher studies, press officials, and in general anyone* who wants to know more about the examinations.

Database Requirements

Entities

1. **Student**

   - Application Number (Unique 10 digit number) (1st Primary key)
   - Aadhar Number (Unique 12 digit number) (2nd Primary key)
   - Name (1-100 characters)
   - DOB (Date, Month, Year)(2-digits, 2-digits, 4-digits) (dd/mm/yyyy) (Multivalued Attribute)
   - Age (Derived Attribute)
   - Gender (Male(M)/Female(F))

- E-mail Address (3rd Primary Key) (Valid Email ID)
- Address (Composite Attribute)
    - Address Line-1 (20 characters)
    - Address Line-2 (20 characters)
    - City/Town/Village (10 characters)
    - District (15 characters)
    - State (20 characters)
    - Pincode (6 digits)
- Nationality (15 characters)
- Category (General/PwD/Gen-EWS/OBC/SC/ST/NCL/Transge nder)

2. Center

- Address (Center Number, City, State, PIN Code) (Multi-valued attribute)(1-100 characters)
- Center Number: A unique 5-digit number (Primary key)
- City: From a pre-designated list
- State: From a pre-designated list
- PIN Code: A unique 6-digit number (Alternate key)

3. Staff

- ID (A unique 10-digit number) (Primary Key)
- Center number (A unique 5-digit number)
- Name (1-100 characters)

3.a Invigilators

- Aadhar number (Unique 12 digit number) (Alternate key)
- Qualifications (10 characters)
- Mobile number (10 characters)

3.b Technicians

- Aadhar number (Unique 12 digit number) (Alternate key)
- Grade (I/II/III)
- Mobile number (10 characters)

3.c Security

- Agency (10 characters)

4. Examination Details

- Phase (1 (OR) 2 (OR) 3 (OR) 4)
- Shift (Morning (M) / Evening (E))
- Course name (B.E./B.Tech(A) (OR) B.Arch(B) (OR) B.Plan(C))
- Examination ID (3 alphanumeric characters) (Derived attribute) (Primary key)

5. Fees

- Examination ID (3 alphanumeric characters)
- Nationality (1-50 characters)
- Category/Caste (General/PwD/Gen-EWS/OBC/SC/ST/NCL/Transgender)
- Fee (0-4000 Rupees) (Derived Attribute)

6. **Exam Type**

- Paper name (B.E./B.Tech(A) (OR) B.Arch(B) (OR) B.Plan(C))
- Mathematics (Marks 0-200)
- Physics (Marks 0-200)
- Chemistry (Marks 0-200)
- General Aptitude (Marks 0-200)
- Planning (Marks 0-200)
- Drawing (Marks 0-200)
- Marks (100 to 500 numbers)

Weak Entities

1. Parents/Guardians

- Guardian (Father(F)/Mother(M)/Others(O))
- Guardian's Name (1-100 characters) (Partial Key Attribute)
- DOB (Date, Month, Year)(2-digits, 2-digits, 4-digits)(dd/mm/yyyy) (Multivalued Attribute) (Partial Key Attribute)
- Guardian's Mobile Number (10 digits)
- Guardian's Qualification (20 characters)
- Guardian's Occupation (20 characters)
- Annual Income (1000-(to any) Rupees)

2. Education Details

- 10th or Equivalent (Composite Attribute)
  - PASS Status (Yes(Y)/No(N))
  - Overall Percentage (1-100)
  - Place of Schooling (50 characters)
  - School Board (CBSE/ICSE/STATE)
  - Board Roll Number (Unique 10 digit number) (Partial Key Attribute)
- 12th or Equivalent (Composite Attribute)
  - PASS Status (Yes(Y)/No(N))
  - Overall Percentage (1-100)
  - Place of Schooling (50 characters)
  - School Board (CBSE/ICSE/STATE)
  - Board Roll Number (Unique 10 digit number) (Partial Key Attribute)

3. Results

- Phase Number (1 (OR) 2 (OR) 3 (OR) 4) (Partial Key Attribute)
- Physics (Composite Attribute)
  - (Marks) (0 to 200 numbers)
  - (Percentage) (Derived Attribute) (1-100)
- Chemistry (Composite Attribute)
  - (Marks) (0 to 200 numbers)
  - (Percentage) (Derived Attribute) (1-100)
- Mathematics (Composite Attribute)
  - (Marks) (0 to 200 numbers)
  - (Percentage) (Derived Attribute) (1-100)
- General Aptitude (Composite Attribute)
  - (Marks) (0 to 200 numbers)

- - - (Percentage) (Derived Attribute) (1-100)
  - Planning (Composite Attribute)

    - (Marks) (0 to 200 numbers)
    - (Percentage) (Derived Attribute) (1-100)
  - Drawing (Composite Attribute)

    - (Marks) (0 to 200 numbers)
    - (Percentage) (Derived Attribute) (1-100)
  - Total Marks (100 to 500 numbers)

  - Qualified for JEE Advanced (B.E./B.Tech) (Yes(Y)/No(N)) (Derived Attribute)

  - AIR Rank (Based on final percentage) (1-1000000) (Derived Attribute)

Relationships

- **N=2 Relationships**

  - **Between Staff and Center**

    - **Name:** WORKS_AT
    - **Degree:** 2
    - **Entities:** Staff, Center
    - **Cardinality:** 1 : N
    - **Description:** Each staff member is assigned a center to invigilate, but each center can be allocated to many staff members.
  - **Between Examination details and Center**

    - **Name:** CONDUCTED_AT
    - **Degree:** 2
    - **Entities:** Examination Details, Center
    - **Cardinality:** N: 1
    - **Description:** Each center is assigned a particular examination to conduct, but each examination shift is conducted at various centers.
  - **Between Staff and Examination details**a)**

    - **Name:** INVIGILATES_IN
    - **Degree:** 2
    - **Entities:** Staff, Examination Details
    - **Cardinality:** M: N
    - **Description:** Each staff member is assigned various examination shifts to work at and each examination shift has many staff members working at the same time.
  - **Between Parents/Guardians and Student**

    - **Name:** GUARDIAN_OF
    - **Degree:** 2
    - **Entities:** Parents/Guardians, Student
    - **Cardinality:** N: 1
    - **Description:** Each parent/ guardian is the guardian of one student and each student can have multiple guardians (upto 3 and at least 1).
  - **Between Education Details and Student**

    - **Name:** STUDIED_AT
    - **Degree:** 2
    - **Entities:** Education Details, Students
    - **Cardinality:** 1:1

- **Description:** Each student has his/her Educational Qualifications (10th & 12th Grade) which are unique to them.
        - **Between Students and Results****

            - **Name:** SCORED
            - **Degree:** 2
            - **Entities:** Students, Results
            - **Cardinality:** 1 : N
            - **Description:** Each student scores marks in each of the subjects in each phase. The aggregate of marks in each phase gives total marks in that phase.
    - **N=3 Relationship**

        - **Students visit centers to appear for examinations**

            - **Name:** VIST_TO_APPEAR_FOR
            - **Degree:** 3
            - **Entities:** Students, Centers, and Examination details
            - **Description:** Students visit centers and centers conduct examinations and students appear for examinations.
    - **N=4 Relationship**

        - **Exams and its related information**

            - **Name:** EXAMS
            - **Degree:** 4
            - **Entities:** Students, Examination Details, Exam Type, Fees
            - **Description:** Students give different types of exams and each exam has its own examination details and fee structure, hence all 4 (n>3) entities are related by 1 relationship named "EXAMS".

Functional Requirements

Modifications

- **Insert:**

    - Students are added to the database after they register for any examination.
    - Staff members are added to the database in order to assign them to their respective centers.
- **Delete:**

    - Students who want to opt-out after registering can be removed from the database.
- **Update:**

    - Updating the results entity for each student after he/she gives an examination shift.
    - Updating the status of fee payments by students.
    - Updating the address details of students who have relocated after registration.

Retrievals

- **Selection:**

    - Retrieve the complete data tuples of students from the database.
- **Projection:**

    - Names of all students who scored greater than 89 percentile in any of the shifts.
- **Aggregate:**

- Maximum score secured by a student in a particular phase.
- **Search:**
  - Search for all the students from Telangana State.
- **Analysis:**
  - Generate a status report of the number of students who have paid the fees.
    This will be useful for moving on to assigning them centers, exam details, etc.
  - Number of students that scored above 90 percentile overall among all phases.
    This will be useful to notify the students if they qualified for the next stage i.e, JEE-A.

Bonus

Super key: In the "Staff" entity, "ID" and "Center Number" attributes together constitute a Super key.
Candidate key: In the "Educational Details" entity, the "School Board" and "Board Roll Number" attributes together constitute a Candidate key.
Alternate key: In the "Student" entity, the "E-mail Address" attribute is an Alternate key.

Extra Information

Super Class and Sub-Class:

Super Class: Staff
Sub-Class: Invigilators, Technicians, Security

Entity with two primary key attributes:

"Student" entity has **"Application Number"** and **"Aadhar Number"** as the *two primary key attributes*.