

Competitive Exam Preparation & Progress Management System

A Database Management System Project Report

Prepared By:-

Preet Dave

B.Tech Information & Communication Engineering

2025 Batch

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1 Problem Statement

The purpose of this project is to develop a database system for managing competitive exam preparation and student progress tracking. The system will allow students to register for various exams, attempt topic-wise practice sessions, attempt full-length mock tests, and receive personalized notifications. It will also track their performance topic-wise and overall.

The project aims to cover:

- Student profile management
- Exam details and classification (Government/Private)
- Topic-wise practice session logging
- Mock test attempt logging and score tracking
- Notifications and reminders
- Tracking weak areas based on practice session accuracy
- Managing multivalued preferences for exam types

2 Entity-Relationship Diagram (EERD)

2.1 Purpose

The Entity-Relationship Diagram visually represents the data model for the Competitive Exam Preparation & Progress Management System. It illustrates how entities such as **Student**, **Exam**, **PracticeSession**, **MockTest**, and **Notification** are related and interact within the system.

2.2 Entities and Their Attributes

- **Student**: Represents exam aspirants. Attributes: *student_id* (PK), *name*, *email*, *phone*.
- **Exam**: Represents competitive exams. Attributes: *exam_id* (PK), *exam_name*, *exam_type*, *exam_date*, *application_deadline*, *syllabus*, *total_marks*, *duration_minutes*.
- **GovtExam/PrivateExam**: Specializations of Exam, modeled via ISA relationship.
- **PracticeSession**: Attributes: *session_id* (PK), *topic_name*, *attempt_date*, *num_questions*, *correct_answers*.
- **MockTest**: Full syllabus mock tests linked to exams. Attributes: *test_id* (PK), *exam_id* (FK), *total_marks*, *test_date*.
- **Registration**: Status of student exam registration. Attributes: *registration_id* (PK), *status*.
- **Notification**: Attributes: *notification_id* (PK), *message*, *notify_date*.

2.3 Relationships and Their Significance

- **Registers:** Links Student, Exam, and Registration with a composite key (*student_id, exam_id*).
- **Attempts (PracticeSession):** Records student topic-wise practice attempts.
- **Attempts (MockTest):** Records student mock test attempts with score and percentage.
- **Includes:** An Exam includes multiple MockTests.
- **Receives:** Student receives Notifications.

2.4 Cardinality and Constraints

- One Student can register for multiple Exams.
- One Exam can have multiple MockTests.
- Every PracticeSession belongs to one Student.
- Every Registration must involve one Student and one Exam.
- Every Notification can be sent to multiple Students.

2.5 Special EER Concepts Used

- **Weak Entity:** Registration (depends on Registers relationship)
- **Multivalued Attribute:** *preferred_exam_type* (handled via separate relation **StudentPreferred** created during normalization)
- **Derived Attribute:** percentage in Attempts_MockTest (computed at runtime)
- **ISA Relationship:** GovtExam and PrivateExam (specializations of Exam)

2.6 Normalization-Driven Tables

Derived through normalization process:

- **StudentPreferred:** Converted from the multivalued attribute *preferred_exam_type* in UNF (1NF action).
- **Registers:** From Student-Exam many-to-many relationship.
- **Attempts_PracticeSession:** From multivalued attempts per student per session.
- **Attempts_MockTest:** From multivalued attempts per student per mock test.
- **Receives:** From multiple Notifications sent to multiple Students.