# School of Information Technology
# IIT Kharagpur

**Course Id: IT60113 Advanced Database Systems**                **Class Test 1**

**Date: August 2, 2007**                                **Total Time: 1 Hour**
**Max. Marks: 40**

1. Consider the following relational schema in a database of World Cup Cricket Championship. The meaning of each column should be understood from common knowledge wherever not specified. The primary keys are highlighted in bold.

    team(**countryName**, continent, jersey_color)
    player(**playerName**, date_of_birth, player_type, countryName)
    match(**countryName1,        countryName2,        match_date**,        no_of_century, win_countryName)
    player_perf(**countryName, playerName**, **match_date**, runs, wickets)

    (a) Based on the above schema, express the following queries using SQL
    **4×3=12**
       (i)    Names of the players who scored at least one century in the tournament
       (ii)   Name of each player and the number of centuries he scored
       (iii)  Names of the teams who have scored more than 5000 runs in the tournament

    (b) Represent the following queries as relational algebra expressions          **3×2=6**
       (i)      Names of players who were born before 10/10/1990
       (ii)     Number of wickets taken by Anil Kumble

2. Given a relation **r** over a relation schema R with W, X, Y and Z subsets of R. Prove or disprove the following inference rules based on functional dependencies.     **[3+3=6]**

    i)      $X \to Y$, $W \to Z$, and $Y \subseteq W$, imply $X \to Z$.
    ii)     $X Z \to Y$, $X \to W$, and $Z \subseteq W$, imply $X \to Y$.

3. Consider the following database application.

An institute has a large number of students and several departments, which offer a number of courses. A student can belong to any one department. Students of any department can register for courses offered by any department.

Following points may be noted

- A department has a department code and a department name.
- A student has a roll no., name and address. A student can also have one or more phone nos.
- A course has a course id, course name and the no. of credits (e.g., 3, 4, etc.). A course is never offered jointly by two departments.
- When a student registers for a course, the semester (e.g., Spring06, Autumn07, etc.) in which he takes the course should be maintained as well as the grade obtained.

Answer the following questions based on the above data requirement specifications:
 (a) Draw the E-R model of the system clearly identifying the entities, relations, cardinalities and all the attributes (including the type of attribute like candidate key, multi-valued attribute, derived attribute, etc.)
 (b) Derive the relational schema from the above E-R model. For each table, clearly identify all the columns, primary and foreign keys.

**[8+8=16]**