Course No.:*ITPC 206*   Course Title: *Database Systems*   Max. Marks: *20*

Note 1: The question paper contains 3 questions.
Note 2: All questions are compulsory.

Q1:A: Consider relation schema R(ABCDEFG) with set of FDs ($A \rightarrow BC, C \rightarrow DE, B \rightarrow F, A \rightarrow G, C \rightarrow F$) The decomposition of R into R1(ADFG), R2(CEF), R3(ABCG) is lossless or lossy: [1 Marks]

Q1:B: Consider relation schema R(ABCDEFG) with set of FDs ($A \rightarrow BC, C \rightarrow DE, B \rightarrow F, A \rightarrow G, C \rightarrow F$) The decomposition of R into R1(ADFG), R2(CEF), R3(ABCG) is Dependency preserving or not: [1 Marks]

Q1:C: Consider the following ER-Model. Find the minimum number of tables needed to represent E1, E2, R1 and R is [3 Marks]
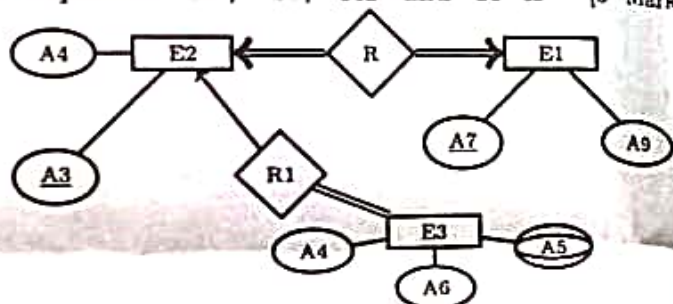
Q1:D: Let E1, E2, and E3 be three entities in an E-R diagram with simple single value attributes. R1 and R2 are two relationship between these entities, where as R1 is one-to-one with Partial participation constraints both side of entities E1 and E2 and R2 is many to one with Total participation constraints both side of E1 and E3. What is the minimum number of relations required to convert this requirement into relational models if we will allow null value: [2 Marks]

Q1:E: What is the highest normal form for Relation R(A,B,C,D,E) with FDs ($AB \rightarrow C, BC \rightarrow D, CD \rightarrow A, AD \rightarrow B$) [2 Marks]

Q1:F: How many super-key in the relation R(A,B,C,D) with FDs ($ABC \rightarrow D, D \rightarrow A$) [1 Marks]

Q2: Given a schema R(A, B, C, D, E), and the following set of FDs ($A \rightarrow BC, B \rightarrow D, E \rightarrow A, CD \rightarrow EA, A \rightarrow D$)

  i. Compute the canonical cover for FDs. [1 Marks]

  ii. What is the highest normal form? [1 Marks]

  iii. Decompose R into BCNF using BCNF decomposition rule. [2 Marks]

  iv. Prove that your decomposition is a lossless join AND dependency preserving. [1 Marks]

Q3: create ER diagram for the following requirement: [5 Marks]

  i. Institute has some sponsored Projects. Projects will have one Faculty as Principal Investigator (PI), and can have one or more faculty member as Co-PIs. Some projects will not have any Co-PI.

  ii. A Project has ProjectID (unique), Project name, Budget, and Duration as attributes. Faculty are identified by FacultyID (unique) and have Name, Dept, Designation as other attributes.

  iii. A Project is funded by only one Funding agency (like UGC, DIT, DST etc.) which has- Agency name (unique), Head, Location (with street, city, and state as sub components).

  iv. A faculty, as a PI can have zero to any number of projects. Similarly a faculty as a Co-PI can have zero to any number of projects. A funding agency might have funded one or more projects.