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Indian Institute of Information Technology, Lucknow

Mid-Semester Exam

DMS1301C - Database Management Systems

B.Tech. (CS/IT/CSAI/CSB) – I Semester

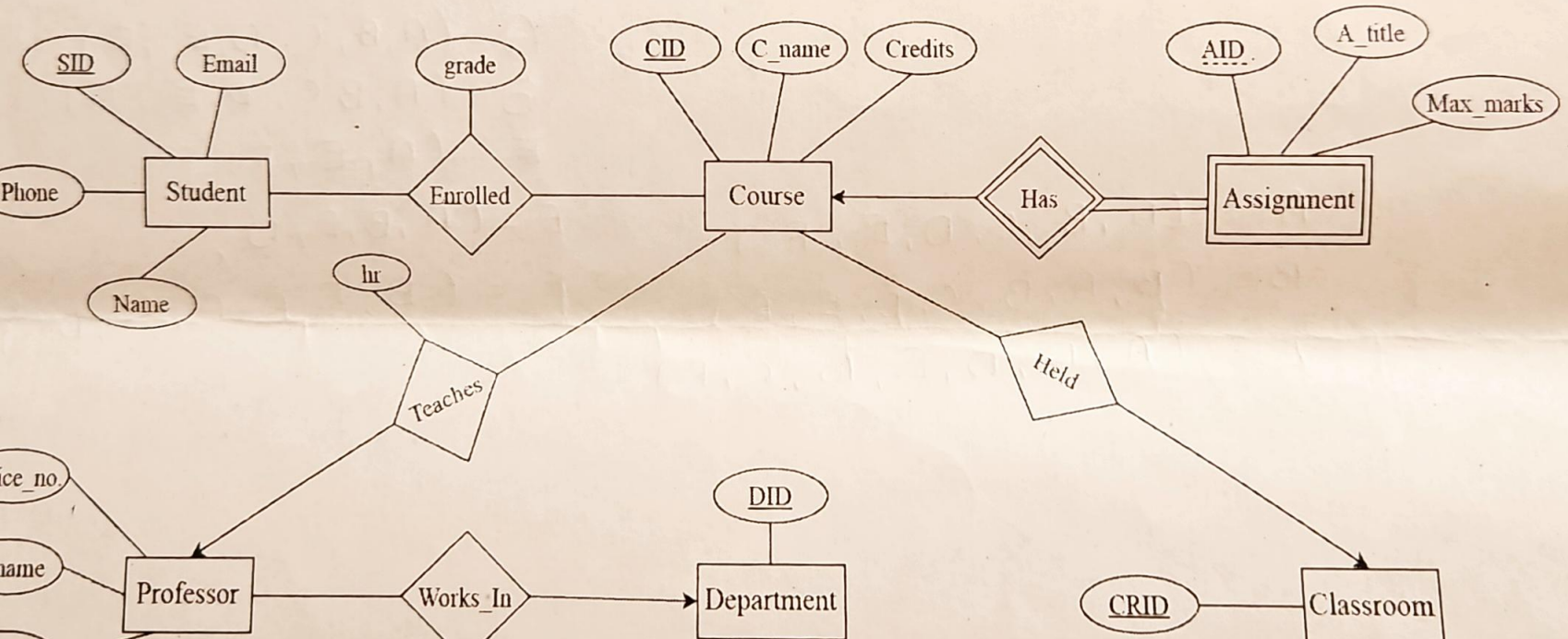
Duration: 2 Hours | Max. Marks: 30

September 27, 2024 (Friday)

Q.1 Consider a relation R1 (A, B, C, D, E, F, G, H, I, J) and following functional dependencies:
{AB → C, BC → D, CD → E, EF → G, FG → H, GH → I, AI → J, AG → B, BJ → F}
Find all the candidate key(s) for the relation R1. [6 Marks]

Q.2 Define the following terms with example: relation schema, relational database schema, attribute, tuple, attribute domain, relation instance, relation cardinality, and relation degree. [4 Marks]

Q.3 Convert the following E-R diagram into a relational model. Identify the minimum number of tables required, and provide the table names along with their corresponding attributes and primary key. [7 Marks]



Q.4 Let R2 (A, B, C, D, E, F, G, H) has the following functional dependencies:
{A → B, CH → A, B → E, BD → C, EG → H, DE → F}. Which of the following functional dependency is also guaranteed to be satisfied by R2? Justify your answer. [3 Marks]

i. BFG → AE ii. ACG → DH iii. CEG → AB

Q.5 Consider the relation, R3 = (A, B, C, D, E, F) and two sets of functional dependencies, F1 and F2:

F1 = {A → BC, B → CDE, AE → F},

F2 = {A → BCF, B → DE, E →AB}

Check whether F1 and F2 are equivalent. If they are not, identify which functional dependency covers the other. [4 Marks]

Q.6 Consider the relation R4 (Roll No, Name, Year, Branch, Marks, CGPA). Show the following functional dependencies in a single table by taking at least 8 tuples in it. If the dependency does not hold, explain why, by specifying the tuples that may cause the violation. [6 Marks]

i. {Roll No, Name → Year} is a valid FD.

ii. {Name, Year, CGPA → Branch} is a valid FD.

iii. {Name, Branch → Marks} is not a valid FD.