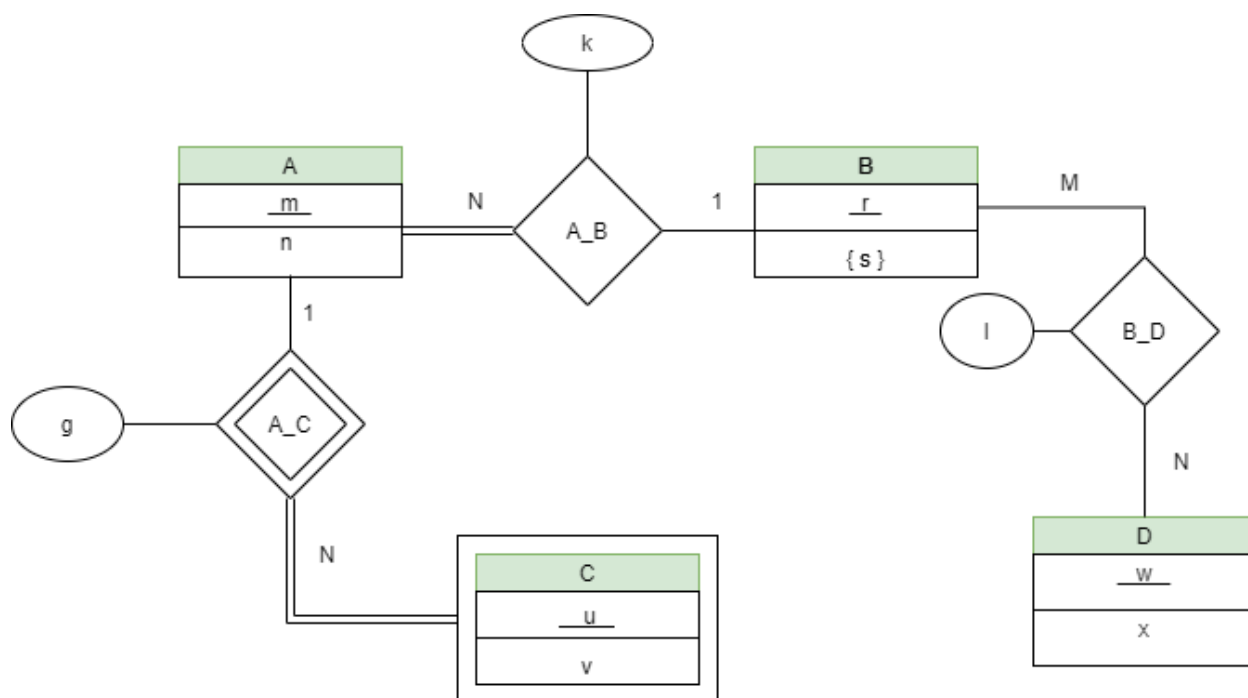


**Birla Institute of Technology and Science Pilani, Pilani campus**  
**Department of Computer Science and Information Systems**  
**2<sup>nd</sup> Semester 2020-21**  
**Database Systems (CS F212)**  
**Mid-Semester Examination, 3<sup>rd</sup> March 2021**  
**Regular (Closed Book)**

Maximum Marks: 90 (30%)

Time: 90 Minutes

Q1. Convert the following ER diagram into Relational model



(15 Marks)

Q2.. Find the canonical cover/ minimal cover for the following functional dependencies

$ABC \rightarrow DE$

$A \rightarrow BD$

$D \rightarrow C$

$B \rightarrow CD$

(10 Marks)

Q3. Given a Relation R (A,B,C,D,E) with following functional dependencies.

$BD \rightarrow E$

$E \rightarrow C$

$B \rightarrow A$

$C \rightarrow D$

- Find the candidate key of R
  - Assuming there are no multi-valued attributes. Identify the normal form that R satisfies. Give reasons for your answer.
  - Normalize the relation up to 3NF showing all intermediate steps
  - Normalize the relation up to BCNF. You can continue from where you left in part c. Make sure that the decomposition is lossless join decomposition. Check whether it is dependency preserving.
- (4+4+12+10 = 30 Marks)**

Q4. Consider the following relation schemas. Write **Relational algebra** expression to answer.

**Teacher** (TID, name, designation, salary, address, date\_of\_joining, highest\_qualification, DNo)

**Department** (DNo, Dname, strength, Dtype)

**Journal** (Jname, ISSN, frequency, year\_of\_inception)

**Publication** (TID, ISSN, No\_of\_paper, VolumeNo, Month, Year)

- Find the name of the teachers belonging to CSE department.
  - Find the ISSN of the journal where all the teachers of CSE department have published papers.
  - Find the name of the teacher who has published in the journal whose name as "IJMDM".
- (5+5+5 = 15 Marks)**

Q5. The following relational schema contains three tables (relations) named EMPLOYEE, WORKS, and COMPANY as detailed below:

**EMPLOYEE**(e\_no Number(5), e\_name Character(35), e\_address Character(150), city Character(35), mgr\_cd Number(5))

Primary key (e\_no), Foreign Key (mgr\_cd) references EMPLOYEE(e\_no) e\_name Unique

**WORKS**(e\_no Number(5), c\_name Character(35), salary Number(6))

Primary key (e\_no), Foreign Key (c\_name) references COMPANY(c\_name)

Foreign Key (e\_no) references EMPLOYEE(e\_no)

**COMPANY**(c\_name Character(35), c\_address Character(150), city Character(35))

Primary key (c\_name)

Write SQL for the following:

- Find all such employees' e\_no and e\_name who live in the same city as city in which the company where he/she works is located and that company has more than 10 employees working with it.
- Find all employees' e\_no, e\_name, c\_name who earn less than every employee of company 'The Signature'.

- c) Find those companies located in a city and all resident employees (irrespective of company where they work) of that city earn higher salary than the average salary of the employees not working in that company.
- d) Modify the database so that 'Radhika Electronics Pvt. Ltd.' has now been shifted to city 'Surat' from 'Chandigarh' and now it has a new employee named 'Cheeranjiv Patel' residing in 'Surat' at 'House#125, Ring Road, Near Railway Station' and this new employee now manages all the other employees of this company.
- e) Delete all employees who manage less than six employees and each of these employees has salary less than the half of the salary of his/her manager.

**(4X5 = 20 Marks)**