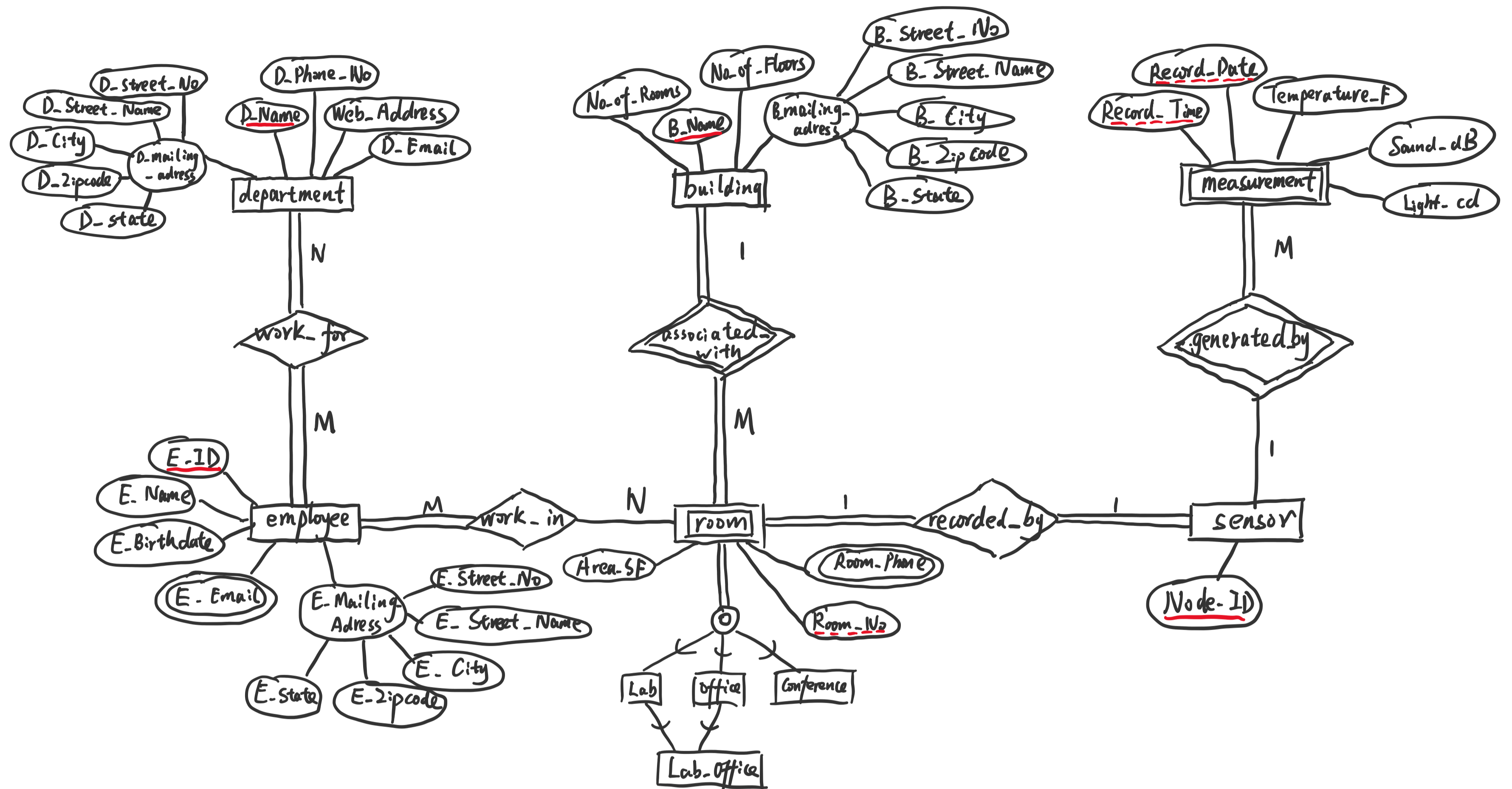


Homework1_LongZhang

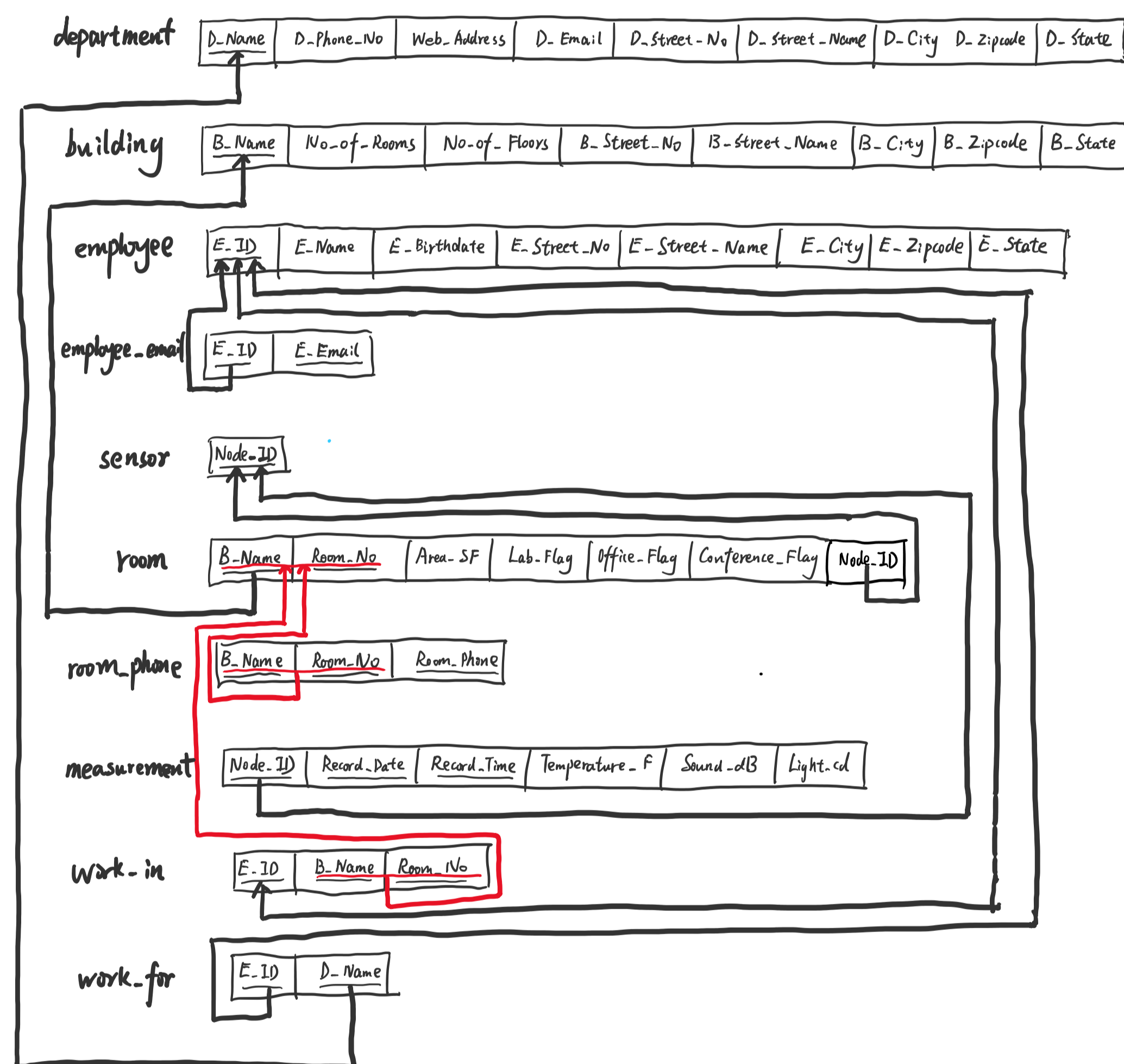
Part 1: (E)ER data model

Assumptions:

- Each room has only one sensor node which will generate temperature, sound, and light measurement records.
- Each sensor node generates measurement records 5 times a day:
 - 10:30:00
 - 12:30:00
 - 14:30:00
 - 16:30:00
 - 18:30:00



Part 2: Map the (E)ER diagram into relational schema



department
 (D_Name: VARCHAR(30),
 D_Phone_No: INT,
 Web_Address: VARCHAR(30),
 D_Email: VARCHAR(30),
 D_Street_No: INT,
 D_Street_Name: VARCHAR(30),
 D_City: VARCHAR(30),
 D_Zipcode: INT,
 D_State: VARCHAR(30),
 PRIMARY KEY(D_Name))

employee
 (E_ID: VARCHAR(30),
 E_Name: VARCHAR(30),
 E_Birthdate: DATE,
 E_Street_No: INT,
 E_Street_Name: VARCHAR(30),
 E_City: VARCHAR(30),
 E_Zipcode: INT,
 E_State: VARCHAR(30),
 PRIMARY KEY(E_ID))

room
 (B_Name: VARCHAR(30),
 Room_No: INT,
 Area_SF: FLOAT,
 Lab_Flag: IN {0,1},
 Office_Flag: IN {0,1},
 Conference_Flag: IN {0,1},
 Node_ID: INT, PRIMARY KEY(B_Name, Room_No),
 FOREIGN KEY(B_Name) REFERENCES building,
 FOREIGN KEY(Node_ID) REFERENCES sensor)

work_in
 (E_ID: VARCHAR(30),
 B_Name: VARCHAR(30),
 Room_No: INT,
 PRIMARY KEY(E_ID, B_Name, Room_No),
 FOREIGN KEY(E_ID) REFERENCES employee,
 FOREIGN KEY(B_Name, Room_No) REFERENCES room(B_Name, Room_No))

building
 (B_Name: VARCHAR(30),
 No_of_Rooms: INT,
 No_of_Floors: INT,
 B_Street_No: INT,
 B_Street_Name: VARCHAR(30),
 B_City: VARCHAR(30),
 B_Zipcode: INT,
 B_State: VARCHAR(30),
 PRIMARY KEY(B_Name))

employee_email
 (E_ID: VARCHAR(30),
 E_Email: VARCHAR(30),
 PRIMARY KEY(E_ID, E_Email),
 FOREIGN KEY(E_ID) REFERENCES employee)

room_phone
 (B_Name: VARCHAR(30),
 Room_No: INT,
 Room_Phone: INT,
 PRIMARY KEY(B_Name, Room_No, Room_Phone),
 FOREIGN KEY(B_Name, Room_No) REFERENCES room(B_Name, Room_No))

measurement
 (Node_ID: INT,
 Record_Date: DATE,
 Record_Time: TIMESTAMP(2),
 Temperature_F: FLOAT,
 Sound_dB: FLOAT,
 Light_cd: FLOAT,
 PRIMARY KEY(Node_ID, Record_Date, Record_Time),
 FOREIGN KEY(Node_ID) REFERENCES sensor)

Part 3: Create a relational database based on part 2 and query the database

- The experiment environment: Oracle
- The 300 tuples values of table 'measurement' are inserted via loop clause 'for' and random-number generation clause 'dbms_random.value'.
- Because each measurement record is generated by random-number, every new experiment will produce a different result.
- Attachments:
 - output_LongZhang.txt
 - HW1_LongZhang.sql
- Query the database

```

/***** Query the database *****/
prompt 'Q1: List the phone number and department name for each department';
SELECT D_Name, D_Phone_No
FROM department;

prompt 'Q2: Find the names of the buildings that have less than 4 floors';
SELECT B_Name, No_of_Floors
FROM building
WHERE No_of_Floors < 4;

prompt 'Q3: Find the ids of the employees that work in any labs';
SELECT DISTINCT W.E_ID
FROM work_in W, room R
WHERE W.Room_No = R.Room_No AND W.B_Name = R.B_Name AND Lab_Flag = 1;

prompt 'Q4: Find the average temperature for each room';
-- Because each measurement record is generated by random-number, every new experiment will produce a different result.
SELECT R.B_Name, R.Room_No, M.Node_ID, M.AVG_Temperature_F
FROM room R
INNER JOIN
(
    SELECT Node_ID, AVG(Temperature_F) AS AVG_Temperature_F
    FROM measurement
    GROUP BY Node_ID
    ORDER BY Node_ID
) M -- Table M consists of values of average temperature for each sensor node
ON R.Node_ID = M.Node_ID;

prompt 'Q5: Count the number of employees for each department';
SELECT D_Name, Count(*)
FROM work_for
GROUP BY D_Name;
    
```

```

prompt 'Q6: Find the room number of the brightest room (based on daily average of measured light value)';
-- Because each measurement record is generated by random-number, every new experiment will produce a different result.
SELECT A.B_Name, A.Room_No, A.AVG_Light_cd AS Max_AVG_Light_cd
FROM
(
    SELECT R.B_Name, R.Room_No, M.Node_ID, M.AVG_Light_cd
    FROM room R
    INNER JOIN
    (
        SELECT Node_ID, AVG(Light_cd) AS AVG_Light_cd
        FROM measurement
        GROUP BY Node_ID
        ORDER BY Node_ID
    ) M -- Table M consists of values of average light for each sensor node
    ON R.Node_ID = M.Node_ID
) A -- Table A is the joined table of table R and table M.
WHERE
A.AVG_Light_cd =
(
    SELECT MAX(M.AVG_Light_cd)
    FROM
    (
        SELECT Node_ID, AVG(Light_cd) AS AVG_Light_cd
        FROM measurement
        GROUP BY Node_ID
        ORDER BY Node_ID
    ) M -- Table M consists of values of average light for each sensor node
);
    
```