**Birla Institute of Technology & Science, Pilani**

**Work-Integrated Learning Programmes Division**

**Second Semester 2019-2020**

**Mid-Semester Test (EC-2 Regular)**

Course No. : CSI ZG518

Course Title : DATABASE DESIGN AND APPLICATIONS

Nature of Exam : Closed Book

No. of Pages = 2

# No. of Questions = 6

Weightage : 30%

Duration : 2 Hours

Date of Exam : Sunday, 08/03/2020 (AN)

Note:

1. Please follow all the *Instructions to Candidates* given on the cover page of the answer book.
2. All parts of a question should be answered consecutively. Each answer should start from a fresh page.
3. Assumptions made if any, should be stated clearly at the beginning of your answer.
4. Relation schema, relation instance, and relation have been explained to you in class. Explain these terminologies with technical definitions. Use examples to support your definitions. [3x0.5 + 3x0.5 =3]
5. Design an ER schema for keeping track of information about votes taken in the U.S. House of Representatives during the current two-year congressional session. The database needs to keep track of each U.S. STATE's Name (e.g., 'Texas,' 'New York,' 'California') and include the Region of the state (whose domain is {'Northeast,' 'Midwest,' 'Southeast', 'Southwest', 'West'}). Each CONGRESS\_PERSON in the House of Representatives is described by his or her Name, plus the District represented, the Start\_date when the congressperson was first elected, and the political Party to which he or she belongs (whose domain is {'Republican', 'Democrat,' 'Independent,' 'Other'}). The database keeps track of each BILL (i.e., proposed law), including the Bill\_name, the Date\_of\_vote on the bill, whether the bill Passed\_or\_failed (whose domain is {'Yes', 'No'}) and the Sponsor (the congressperson(s) who sponsored—that is, proposed—the bill). The database also keeps track of how each congressperson voted on each bill (the domain of Vote attribute is {'Yes', 'No,' 'Abstain,' 'Absent'}). Draw an ER schema diagram for this application. State clearly any assumptions you make. [8]
6. Consider the following GRADEBOOK relational schema describing the data for a grade book of a particular instructor. (Note: The attributes A, B, C, and D of COURSES store grade cutoffs.)

CATALOG(Cno, Ctitle)

STUDENTS(Sid, Fname, Lname, Minit)

COURSES(Term, Sec\_no, Cno, A, B, C, D)

ENROLLS(Sid, Term, Sec\_no)

Specify and execute the following queries using the Relational Algebra interpreter on the GRADEBOOK database schema.

* 1. Retrieve the names of students enrolled in the Automata class during the fall 2009 term.
  2. Retrieve the Sid values of students who have enrolled in CSc226 andCSc227.
  3. Retrieve the Sid values of students who have enrolled in CSc226 orCSc227.
  4. Retrieve the names of students who have not enrolled in any class.
  5. Retrieve the names of students who have enrolled in all courses in the CATALOG table. [5]

***CSI ZG518 (EC-2 Regular) Second Semester 2019-2020 Page 2***

1. Consider the following EER diagram that describes the computer systems at a company. Write a complete narrative description of what this EER diagram represents. (You can provide your own attributes and key for each entity type.)Reasonably assuming max cardinality constraints and justifying your choice describe the EER diagram. [5]



1. Consider the following relations for a database that keeps track of student enrollment in courses and the books adopted for each course:

STUDENT(Ssn, Name, Major, Bdate)

COURSE(Course#, Cname, Dept)

ENROLL(Ssn, Course#, Quarter, Grade)

BOOK\_ADOPTION(Course#, Quarter, Book\_isbn)

TEXT(Book\_isbn, Book\_title, Publisher, Author)

Specify the foreign keys for this schema, stating any assumptions you make. You can also use a diagrammatic description of the schema with arrows pointing from the foreign key. [4]

1. Consider the universal relation R = {A, B, C, D, E, F, G, H, I, J} and the set of functional dependencies F = {{A, B}→{C}, {A}→{D, E}, {B}→{F},{F}→{G, H}, {D}→{I, J}}. What is the key for R? Decompose R into 2NF and then 3NF relations. [5]

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