SECTION: _____ ROLL NUMBER: _____ NAME: _____

DATABASE SYSTEMS FINAL EXAM OBJECTIVE PART

[Fall 2012] [Total Points: 20] [Time: 30 min.]

Encircle the best option for each of the following:

1. Which of the following statements are true?

I. Each super key is a superset of some candidate key.
II. Each primary key is also a candidate key, but there may be candidate keys that are not primary keys.
III. The referential integrity constraint states that no primary key value can be NULL

a) I
b) II
c) I and II
d) II and III
e) I, II and III

2. Which of the following update operations may cause a violation of the key constraint?

a) A deletion of one tuple from the relation
b) An insertion of one tuple into the relation
c) An update of one tuple in the relation
d) Both (b) and (c)
e) Both (a) and (b)

3. Suppose relation R(A,B,C) has the following tuples. How many tuples appear in the result of

$$\pi_{A,B}(R) \bowtie_{R.B<S.B} (\rho_{S(A,B)}(\pi_{B,C}(R))) \text{ ?}$$

A	B	C
1	2	3
1	2	3
3	2	1

a) 2
b) 4
c) 6
d) 9
e) 3

4. Consider the following relation 'Grades' and the query given below:

Student	DB_grade	Algo_grade
A	45	NULL
B	NULL	90
C	100	80

SELECT student FROM Grades
WHERE (DB_grade>Algo_grade AND Algo_grade>75 AND DB_grade>90) OR (DB_grade<50)

Which students' tuples are returned?

a) A
b) B
c) B and C
d) A and C
e) A, B, and C

5. Consider the relation **Grade** given in the last question and the query given below:
SELECT COUNT(DB_grade) from Grades

What does the above query returns?

a) 145
b) NULL
c) 3
d) 2
e) None of the Above

6. Which of the following anomalies result from a transitive dependency?

a) Insertion
b) Deletion
c) Modification
d) All of the above
e) None of the above

7. A relation R(a,b) may have duplicate tuples. Which of the following queries has a result that is **guaranteed** not to have duplicates, regardless of what tuples R contains?

I) SELECT a FROM R WHERE a = 1
II) SELECT MAX(b) FROM R GROUP BY a
III) SELECT a, b FROM R GROUP BY a, b
IV) SELECT a FROM R WHERE a NOT IN (SELECT a FROM R)

a) III and IV
b) I and II
c) III only
d) I and III
e) I, II and III

8. Consider a relation R with attributes R(A, B, C, D, E). The following FDs hold on R: $AB \rightarrow C$, $BC \rightarrow AD$, and $D \rightarrow E$ hold. Which of the following is the key of R?

a) A
b) AB
c) ABD
d) ABC
e) BCD

9. Let R(A, B, C) satisfy the following FDs: AB → C, BC → A, and AC → B. The closure of A (i.e., A^+) is
   a) A
   b) AB
   c) AC
   d) BC
   e) ABC

10. Two sets of FDs, FD_1 and FD_2 are equivalent if
   a) FD_1 and FD_2 contain no redundant FDs
   b) FD_2 is a subset of FD_1
   c) FD_1 and FD_2 have the same number of FDs
   d) FD_1 and FD_2 have the different number of FDs
   e) FD_1 covers FD_2 and FD_2 covers FD_1

11. Given the relation SalesOrder(ONo, Oname, Date, Items) with FDs F = {ONo→Oname, {ONo, Date}→Items }, then SalesOrder could suffer from
   a) Insertion anomalies
   b) Redundancy and inconsistency
   c) Deletion anomalies
   d) Updation anomalies
   e) All of the above

12. Which of the following statements are correct?
   I. All relations in 3NF are also in BCNF.
   II. All relations with only two attributes are in BCNF.
   III. For any relation schema, there is a dependency-preserving decomposition into 3NF.
   a) I
   b) III
   c) II and III
   d) I and III
   e) I, II and III

13. For which of the following normal forms there is always a lossless-join decomposition for any relation schema?
   a) BCNF
   b) 3NF
   c) 4NF
   d) All of the above
   e) None of the above

14. Which of the following statements about ER models are correct?
   I. Many-to-many relationships cannot be represented in ER diagrams
   II. Relationship sets can have attributes of their own
   III. All many-to-one relationships are represented by a relationship between a weak and a non-weak entity set
   a) II
   b) III
   c) II and III.
   d) I and II
   e) I, II and III

15. Which of the following statements are true about weak entity sets:
   I. A weak entity set cannot have a primary key.
   II. A weak entity set must have a local attribute in primary key
   III. A weak entity must borrow an attribute from another entity set to form a primarykey.
   a) None of them
   b) I and II
   c) II and III
   d) III
   e) I, II and III

16. Suppose we have a relationship type, R that has a cardinality ratio of M: N, where the entity types involved are E1 with 2 instances and E2 with 3 instances. Also E1 and E2 have partial participation in R. What is the minimum and the maximum number of instances of the relationship type R?
   a) A min of 2 and a max of 3
   b) A min of 0 and a max of 6
   c) A min of 0 and a max of 3
   d) A min of 2 and a max of 6
   e) None of the above

17. Consider the following schedule of two transactions T1 and T2 on two data items X and Y.
   S: r1(x), r2(x), w1(X), r1(Y), w2(X), w(Y)

   The above schedule suffers from
   a) Lost Update
   b) Temporary Update
   c) Incorrect Summary
   d) All of the above
   e) None of the above

18. Which of the following is not true?
   a) The System log keeps track of all transaction operations that affect the values of database items
   b) The System log is kept on disk, so it is not affected by any type of failure except for disk failure.
   c) The effect of write operations of a transaction T can be undone or redone using the System
   d) The roll back of a transaction is needed if there is no commit entry [commit,T] in the log.
   e) None of the above

19. Consider the following schedule of three transactions T1, T2 and T3
   S: w1(X), r3(Y), w2(X), w3(Y), abort1
   a) Schedule S is strict
   b) Schedule S is cascadeless
   c) Schedule S is cascadeless and not strict
   d) Schedule S is strict and cascadeless
   e) None of the above

20. Two operations Op1 and Op2 in a schedule are said to be in conflict if
   a) Op1 and Op2 belong to different transactions
   b) Op1 and Op2 access the same item X
   c) At least one of the operations Op1 or Op2 is a write operation
   d) All of the above
   e) None of the above