First Letter of your last name:_____

NAME:_____

COM S 363: Exam 1

Time: 75 minutes

NOTES:

- This is a closed book closed notes exam.
- Write your name and answer legibly; if the grader can't read, you receive no point.
- Attempt all problems. Write solutions on these sheets.
- Fill in your name now, but do not turn the page until the signal is given.
- Mark the session where you are in:

Ying Cai's Session[ ] Shashi Gardia's Session[ ]

Problem	Max Points	Points
1	30	
2	20	
3	8	
4	12	
5	30	
Total	100	

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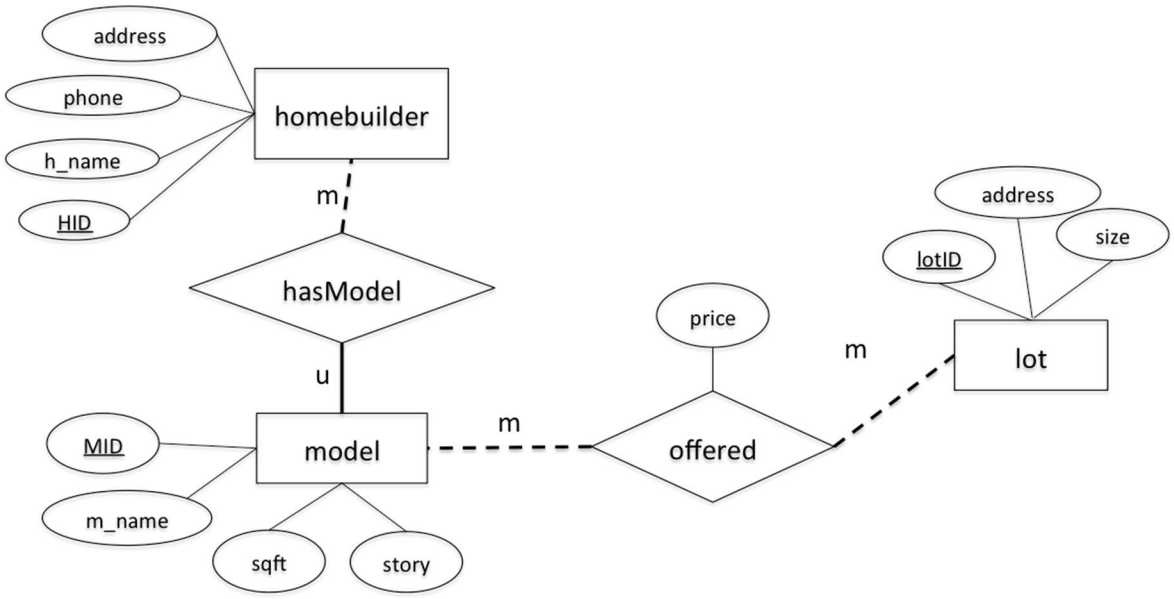
1. (30 points) Construct an E-R diagram for a hospital to record the following information.
   (a) The hospital has a set of patients and a set of medical doctors
   (b) Each patient has SSN, PName, IC (insurance company), DateIn and DateOut.
   (c) Each doctor has a DID, DName, and Specialization.
   (d) Each patient must have at least one doctor as his/her primary doctor
   (e) A patient may undergo a medical test, each of which has a TID, TName, Date, Time, and Result
   (f) A patient may have multiple tests, but each test is only for one patient
   (g) Each test is performed by one and only one doctor

2. (20 points) Explain the following E-R diagram and convert it into a set of relations. For each relation, use SQL's "create table" to specify its name, attributes, and constraints (i.e., key, primary key, and foreign key).



3. (8 points) Prove the following implied dependencies or disprove using counter examples:

(a) (3 points) {W --> Y, X --> Z} ==> {WX --> Y}

(b) (3 points) {X --> Y, X --> W, WY --> Z} ==> {X --> Z}

(c) (2 points) {X --> Y} ==> {X --> YZ}

4. (12 points) Consider a relation R with five attributes A, B, C, D, and E and the set of dependencies F={A --> BC, B --> C, BCD --> E, A-->B}.

(a) (4 points) Compute $\{A\}^+$

(c) (8 points) Compute a minimum cover of F

5. (30 points) Consider a relation R with five attributes A, B, C, D, and E and the set of dependencies

F ={A --> B, BC --> E, ED --> A}

(a) (5 points) For each of the following attributes, determine if it is a key. Explain.

i. ACD

ii. AE

iii. BCDE

iv. BCD

v. CDE

(b) (3 points) List all dependencies in F, if any, which violate BCNF.

(c) (2 points) List all dependencies in F, if any, which violate 3NF.

(d) (10 points) Suppose R is decomposed into R1(AB) and R2(ACDE).

i. Is this decomposition lossless? Explain.

ii. Is this decomposition dependency-preserving? Explain.

(e) (10 points) Give R a 3NF decomposition that is lossless and dependency preserving.