70-451 MANAGEMENT INFORMATION SYSTEMS (SPRING 2012)
Tepper School of Business, Final exam, Dr. Wolfgang Gatterbauer, May 14, 2012

Name: ________________________________________________________________

Andrew ID: ____________________________________________________________

Rules:
• Don’t turn the page unless advised to do so
• This exam has more open-ended questions than the midterm. Remember to be as concise in your answers as possible. You have 120min, budget your time carefully.
• Please write clearly
• Don’t forget to put down your name and Andrew ID above
• Closed books, closed notes, no laptops or other mobile devices
• An extra page is provided in case you run out of space (make sure to put a forward reference)
• Finally: take a breath and relax! You are here to learn.

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* Your total points will be normalized to 25 and contribute 1/4th to the class grade.
1. Binary-Choice section (circle True or False)

(1) Almost all security breaches can be traced back to technology lapses; personnel or procedural factors rarely factor in.
   
   True  False

(2) Challenge questions offered by Web sites to automate password distribution and resets are excellent for protecting the privacy of email accounts.

   True  False

(3) Moore's law exponential increase in processing speed guarantees that even the best implemented encryption programs today will not be immune to brute-force attacks by hackers in a few years.

   True  False

(4) Facebook is now the biggest photo-sharing site on the Web, ahead of Picasa, Flickr, and Photobucket.

   True  False

(5) When performing a search via Google or another search engine, a user actually searches what amounts to a copy of the Web, stored and indexed on the search engines’ computers.

   True  False

(6) Clicking on links in the organic search results directs a user to the stored copy of the Web page in the search engine’s cache.

   True  False

(7) Even if an advertiser’s competitors are willing to pay the highest cost-per-click rate, greater quality ads might be ranked higher by Google’s PageRank system.

   True  False

(8) Law firms are consistently the top cost-per-click rate bidders for keyword ads.

   True  False

(9) Ad rates are often quoted in terms of cost per million (CPM) rates.

   True  False
(10) A cookie is a line of identifying text that gets assigned by a user’s Web browser and is then transmitted and stored at the Web server
   True   False

(11) If you search for "Toyota Prius" on Google, it is more likely that Honda Hybrid appears in sponsored search than in organic search
   True   False

(12) If an attribute is selected by using SELECT in a query with a GROUP BY clause, and the attribute does not appear in an aggregation function, then it must appear in the GROUP BY statement.
   True   False

(13) Every table in a database requires a primary key.
   True   False

(14) When illustrating the progression of Google+ through the Gartner Hype cycle, it is currently on the peak of inflated expectations.
   True   False

(15) A necessary criterion for a crowd to be “smart” is that it should be homogenous to reduce incidence of contradictory insights.
   True   False

2. Multiple-Choice section (circle the correct answer)

(16) Consider the following query
   SELECT  distinct name
   FROM     Table
   WHERE    name LIKE 'B_%n'
Which of the following names will be returned by the query (if they appear in the database).
   a. 'Berlin'
   b. 'Bin'
   c. both
   d. neither
(17) Google’s stated mission is to:
   a. demonstrate that it is very important to do one thing really, really well.
   b. organize the world’s information and make it universally accessible and useful.
   c. pair Internet surfers with advertisers and take a cut along the way.
   d. foster technological innovation and spirit to promote a knowledge-driven culture.
   e. promote the spread of democracy and make money without doing evil.

(18) Which of the following represents the market capitalization of a firm? ("/" = divided by)
   a. Market share x Industry size
   b. Share price x Number of shares
   c. Net income / Total assets
   d. Earnings per share x Share price
   e. Net income / Market price

(19) Which of the following parameters decides the rank of Web pages in Google’s organic searches?
   a. Number of pages linking to them
   b. Maximum bid for click-through rates
   c. Quantity of content found in the Web pages
   d. Number of keyword matches in the content
   e. Ratings by visitors

(20) Which of the following represents a major barrier for newer search engine firms that attempt to compete with Google? Read the question one more time and think before answering. [4 points]
   a. Search engine technology
   b. Investment in server farms
   c. Google’s formidable market cap
   d. Strategic partnerships with social media firms
   e. Large amounts of data from user profiles

(21) Which of the following factors is largely responsible for online advertising growth trends?
   a. Decrease in time spent online
   b. Advent of “smart” phones
   c. Rub-off effect from print advertising
   d. Moore’s law
   e. Improved measurement

(22) Identifying a user’s physical location for the purpose of delivering tailored content is called ___.
   a. IP tracing
   b. geotargeting
   c. triangulation
   d. network parallax
   e. trilateration
(23) Why is linking ads to search results considered a brilliant move?
   a. Users can research products when they chance upon an ad.
   b. User’s search term indicates an overt interest in a given topic.
   c. Users can browse through advertisements while looking up other information.
   d. Users resent having to create separate sets of online identities to access search results and
      advertising services.
   e. Most users appreciate getting the two services on the same window, which saves them the
      trouble of toggling between an ad and a search page.

(24) Which of the following formulae is used by Google to determine the rank order of sponsored links
    appearing on its search results pages?
   a. \( Ad \text{ rank} = \text{Minimum CPC} \times \text{Click-through rate} \)
   b. \( Ad \text{ rank} = \text{Cost-per-thousand impressions} \times \text{Number of impressions} \)
   c. \( Ad \text{ rank} = \text{Maximum CTR} \times \text{Number of impressions} \)
   d. \( Ad \text{ rank} = \text{Churn rate} \times \text{Average cost-per-click} \)
   e. \( Ad \text{ rank} = \text{Maximum CPC} \times \text{Quality score} \)

(25) Among the following classes of advertisers, the highest cost-per-click rates for keyword ads on
    Google are paid by:
   a. law firms.
   b. automobile manufacturers.
   c. credit card companies.
   d. real estate firms.
   e. telecommunications firms.

(26) Which of the following measures can advertisers take up to prevent embarrassment through
    content adjacency issues?
   a. Using negative keywords
   b. Turn off “comments” feature on Web sites
   c. Migrating to contextual advertising
   d. Switching over to graphical ads and interstitials
   e. Using collaborative filtering software

(27) Which of the following is one of the reasons why IP targeting cannot reliably identify individual
    users?
   a. The cookies containing IP address information are assigned by Web servers and this
      practice is prone to duplication.
   b. Different users use different log-in accounts on the same computer to browse the Internet.
   c. The explosion in Internet-enabled mobile devices has resulted in an acute shortage of IP
      addresses.
   d. Internet service providers assign arbitrary IP addresses to devices accessing the Internet
      from the same network.
   e. Individual users use different browsers and different devices to surf the Web.
(28) Which of the following is a valid statement on information security?
   a. Security breaches cannot be prevented despite the adoption of the best security policies.
   b. Technology lapses are solely responsible for almost all security breaches.
   c. Information security is everybody’s responsibility.
   d. Greater expenditure on security products is the only way to contain security breaches.
   e. A reactive, rather than proactive, approach is better suited for dealing with security breaches.

(29) Posting sensitive personal information and details about your workplace on social networking sites is one way of opening yourself up to which of the following types of infiltration techniques?
   a. Phishing
   b. Social engineering
   c. Password theft
   d. Virus infections
   e. Physical threats

(30) A domain name service is a collection of software that:
   a. allots domain names to different Web sites.
   b. assigns IP addresses to different systems.
   c. directs the flow of traffic across the Internet.
   d. maintains a registry of different IP addresses.
   e. maps an Internet address to an IP address.

(31) Having an advertisement for Samsonite suitcases on the same page as a news article describing the explosion of a suitcase-bomb is most precisely an example of:
   a. Contextual advertising
   b. An interstitial
   c. Content adjacent problems
   d. Geotargeting

(32) What is Depleting Click Fraud?
   a. When site operators generate false page views in order to boost their site's CPM earnings
   b. Clicking a rival's ads to exhaust their PPC advertising budget
   c. Generating bogus impressions to exhaust rival's CPM ad budget
   d. When site operators generate bogus ad clicks to earn PPC income

(33) What is the best way to go to a specific slide in the middle of your presentation?
   a. Use arrow keys to move to the slide
   b. Go into Slide Sorter view and choose the slide in the overview
   c. Use Number + Enter
   d. Use Ctrl + Number
(34) What type of online advertising fraud is attempted when site operators generate bogus ad clicks to earn PPC income?

   a. Spamdexing
   b. Enriching click fraud
   c. Click stuffing
   d. Depleting impression fraud
   e. Link farming

(35) Link farming is a type of online advertising fraud where fraudsters attempt to:

   a. pack a Web site with unrelated keywords in hopes of luring users who wouldn’t normally visit a Web site.
   b. search keywords linked to rival ads or access pages where rival ads appear, in hopes of generating impressions without clicks to lower rival ad ranks.
   c. frame a rival by generating bogus clicks or impressions that appear to be associated with the rival, in hopes that this rival will be banned from an ad network or punished in search engine listings.
   d. increase a page’s results in organic search by creating a series of bogus Web sites linking back to it.
   e. generating bogus impressions that can be linked back to a rival’s ad to exhaust the rival’s CPM ad budget.

(36) The address one types into a web browser is also known as:

   a. universal redirection link.
   b. uniform resource locator.
   c. unique resource locator.
   d. universal redirection locator.
   e. uniform resource link.

(37) What is envelopment?

   a. When one company expands its value chain upstream or downstream and thus reduces its dependency on other companies.
   b. When one company enters another company’s market by making its offerings a subset, component, or feature of its primary offering.
   c. When one company buys out another company with a market that is a subset of that of the buying company.
   d. When one company develops a strategic plan to create long-term competitive advantage in order to overtake another company in its customer base.
(38) In 2010, which advertising category has more spending than online advertising?
   a. Radio
   b. Network and Cable TV
   c. Yellow Pages
   d. Magazines

(39) What is the communication protocol used behind the internet?
   a. HTML
   b. POP
   c. SMTP
   d. TCP/IP

(40) Sifteo cubes improve which skills in children:
   a. Athletic
   b. Cognitive
   c. Social networking
   d. Public speaking

(41) When a restaurant adds expensive items on their menu to steer customers towards other pricier items, they are using this technique from behavioral economics:
   a. influential comparison
   b. supply and demand
   c. anchoring
   d. combination pricing
3. Short Free-text section (use the space below the question)

(42) Complete the analogy. "Circuit-switched networks" for "telephone service" is the same as "______ networks" for "the Internet". [2 points]

(43) In the URL: "http://www.nytimes.com/tech/index.html", the term "http" describes the application transfer protocol and "www" the host name. What does the term "nytimes" describe? [2 points]

(44) In order to win customers from an established incumbent, a late-entering rival must offer a product or service that not only exceeds the value offered by the incumbent but also exceeds the incumbent’s value and ______. [2 points]

(45) What are commodities? [2 points]

(46) What does the abbreviation PPC as used in advertising stand for? [2 points]

(47) What kind of software allows you to have several different passwords for various different accounts (e.g. Facebook, Gmail, Bank account) and to access those with only one single well-composed password, from whatever device you run it on? [2 points]

(48) What does SEO stand for? [2 points]
We have learned about several “as-a-Service” terms associated with cloud computing. For what terms do the following letters stand for? [3 points]

I in IaaS:

S in SaaS:

P in PaaS:

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__as-a-Service is where you pay for ____ resources such as servers, storage devices, and network equipment. Here the placeholder stands for which of the 3 letters terms I, S, or P from above? Circle the answer. [2 points]

a. I
b. S
c. P

### 51

We have seen Blachin's four types of ability in class. What is the forth ability other than Literacy, Numeracy and Articulacy? [2 points]

### 52

Alice (A) sends a message to Bob (B) via Public-Private Key encryption. Both A and be have their private keys and their public keys. For each of the two locks below, fill in who does something (A or B), with whose key (A's or B's), and by using a private (priv) or public (pub) key? [6 points]

```
<table>
<thead>
<tr>
<th>Plaintext</th>
<th>Encryption</th>
<th>Cyphertext</th>
<th>Decryption</th>
<th>Plaintext</th>
</tr>
</thead>
<tbody>
<tr>
<td>_________</td>
<td>_________</td>
<td>%#+$&amp; ! =:/#% %/#+$# %=#+$&amp;</td>
<td>_________</td>
<td>_________</td>
</tr>
</tbody>
</table>

1. Who: A or B? __________  __________
2. Whose key: A's or B's? __________  __________
3. Pub/Priv key? __________  __________
```
The value chain is a helpful framework for analyzing the way a company performs its business. It is defined as the "set of activities through which a product or service is created and delivered to customers." There are five primary components and four supporting components. Insert the appropriate 9 terms below. Note the order in the primary components counts, in the supporting it does not (at least not in this class). [6 points, -1 for each missing component]

Support Activities

Primary Activities

Name and define the 3\textsuperscript{rd} (the middle one above) of the 5 primary components of the value chain. [2 points]

In what market that both Google and Yahoo serve does Yahoo have a larger user base than Google? And what are the reasons? [3 points]

Why do social networking sites have lower click-through rates? [3 points]
Despite having a strong brand value, what was the main reason why TiVo lost out to other digital video recorders? [3 points]

Name 3 bulleted advantages for game developers of distributing video games online instead of via physical copies [3 points]

4. Longer free-text section (use the space below the question)

How is tagging as organizational principle different from the classical file system? [3 points]

List the three bulleted recommendations of "New Rules for IT Management" that Nicholas Carr makes for managers regarding IT strategy. Hint: none of these recommendations require more than five words [3 points].
Carr defines IT as "... the technologies used for processing, storing, and transporting information in digital form." How does Information Technology in Carr's model differ from Information Systems as we talk in class? [4 points]

Define and then give an example of Horizontal Integration. [3 points]

A manufacturing company becomes the first in its industry in installing a set of widely known quality enforcement standards into its plant that will make the company's costs fall by 2% and step ahead of its competition. According to the resource-based view, can this resource yield sustainable competitive advantage? If yes then why? If not then why not? [2 points]

Our text book quotes a CMU researcher as stating "Biometrics never caught on and it never will." How come? It looks so cool in films. Give two bulleted reasons why this may be true. [2 points]
We have seen quite a bit of Gartner's hype cycle in this class. Let's step back for a bit. Wasn't this a bit too much hype for a simple framework? For example, we have not seen how it allows you to predict which technology will ultimately be successful in 5 years from now (e.g. should you as a company invest in a virtual presence in Second Life?). Concisely (<100 words) – and by dividing your answer into two parts (1 and 2) – reflect about the hype cycle and answer: 1: What can the hype cycle help you with, i.e. what is it useful for? 2: What can it not do for you? [4 points]

You see the following headlines in some business magazine (replace "ACNE" with "business success"). Concisely (<100 words) describe a way in which the study may have been conducted in which these results were obtained, but they are meaningless after all. Structure your answer into three numbered parts: 1: describe how the researchers may justify their study. 2: describe what they don't show. 3: describe how the second defeats the claim of the first. [4 points]
In May 2009, Google Wave was launched with big hopes. But one year later, Google Wave has failed miserably. So many smart Google people working on stuff and it fails. How come? What went wrong? Give 4 bulleted reasons why Google wave failed. Be concise. [4 points]

On the left you see a data-driven representation. Choose an alternative representation on the right that allows you to easily answer three questions at once: 1. Do men or women have more activities? 2. How do activities vary with age? 3. Do these variations differ between men and women? Find a suitable 1. horizontal axis, 2. vertical axis, 3. title, and 4. graph to show the data. You do not need to find the exact data points; it is enough to sketch the graph. [5 points]
We discussed the 1986 Space Shuttle Challenger disaster that was technically caused by "O-ring blow by" (you only need to know that this is bad and lead to the disaster). Below you see the "Conclusions and Recommendations" faxed by Thiokol engineers to NASA the night before the Challenger launch. Imagine you are the business analyst and for some reason you need to prepare a one-slide recommendation to the person making the decision to launch or not launch the Space Shuttle the next day. The historic data shows that the blow-by for 50F was medium, for 55F and 60F sporadic, and for above 65F almost not existent. Your slide should contain a recommendation, a data-driven figure that supports your recommendation, and a title of the figure that serves as justification of your recommendation. [6 points]

### Conclusions:
- Temperature of o-ring is not only parameter controlling blow-by
  - SRM 18 with blow-by had an O-ring temp at 63°F
  - SRM 25 with blow-by had an O-ring temp at 79°F
  - Four development motors with no blow-by were tested at O-ring temp of 47°F to 52°F
  - Development motors had putty packing which resulted in better performance
- At about 50°F blow-by could be experienced in case joints
- Temp for SRM 25 on 1-28-86 launch will be 29°F at 9AM, 25°F at 2PM
- Have no data that would indicate SRM 25 is different than SRM 15 other than temp

### Recommendations:
- O-ring temp must be ≥ 53°F at launch
- Development motors at 47° to 52°F with putty packing had no blow-by
- SRM 18 (the best simulation) worked at 53°F
- Project ambient conditions (temp & wind) to determine launch time

Recommendation: ____________________________

Title/Justification: ____________________________

Sketch the graph

x-Axis: ____________________________

y-Axis: ____________________________
(70) Flickr and Picasa are two online photo sharing sites. Explain how envelopment has worked / works / or will work against both of them? And who is the third party that takes advantage. [3 points]

(71) Your Prof has decided to try some new course management tool called Piazza and it is the product of some young start-up. The night before final exam, the website becomes very slow to respond. First you become annoyed. But then you step back and think about what it means from a business perspective. This kind of user experience can cost a company (especially a start-up) reputation and users. First, give one possible reason for the observed slow response. Second, give one technology that could have avoided this. Your response needs to contain one of the terms you defined in question 49 (IaaS, SaaS, PaaS). Name a company that would offer this technology. [3 points]

(72) What is the resource-based view of competitive advantage? [3 points]

(73) We learned about the Pyramid Principle, a way to hierarchically structure your thought process and communication. It comes in two flavors: inductive and deductive reasoning. What does inductive reasoning in this context stand for? Explain in less than 15 words. [2 points]
(74) List 7 bulleted keys for competitive advantage, i.e. types of assets that reinforce one another, creating advantages that are particularly difficult for rivals to successfully challenge, together with one company that has been using this resource to its advantage. [7 points]

(75) We learned about 12 strategies for competing in networked markets. List 8 such strategies together with one company for each that is or has been using this strategy. [8 points]
We learned about straddling in the examples of FreshDirect vs. traditional grocers, and Netflix vs. Blockbuster. Somehow, straddling implies we should avoid serving too many markets or the same market in too many ways (e.g. storefront and delivery). Now think about Skype, it is also serving several markets: Voice over IP, Video conferencing, Instant Messaging. Is Skype straddling? If yes, why? If not, why not? [2 points]

Both eBay and online video games are examples of two-sided markets. How do they differ with regards to same-side exchange benefits? [2 points]

Tweets on Twitter are somehow similar to RSS feeds. Yet not completely. List 3 differences which may be the reason why Twitter has been so successful. [3 points]

In the Facebook case we discussed that successful social websites solve problems of social failure. And that there are 5 things people do on Facebook one of which is write (content creation), arguably the most important one for a social website to be successful. What kind of social problem does FB solve with regard to content creation? [3 points]
5. Data Management section

(80) You can use alias in your SQL code (SELECT... FROM longTableAS x WHERE ...) to simplify the reference to a table. In less than 15 words explain when you *need* to use aliases. [3 points]

(81) How can you turn the universal statement "Find people for which all their favorite TV shows are on NBC" into an existential statement that has the same result? [2 points]

(82) Assume you need to translate an ER-diagram with 3 entities and 2 binary relationships between those entities into a relational schema. You do not yet know the multiplicity (one-to-one, one-to-many, etc.) of each of those relations. How many tables will be in the translated SQL schema? Specify the exact range of values that are possible. For example, if you think that any number bigger than 2 is possible, answer "≥2". If you think the range is 1, 2, 3 then answer "1-3". [3 points]

(83) Normalization is organizing a database to minimize redundancy. Normalize the following database schema for a book database. Assume a book can have several authors, and an author can write several books: [4 points]

   Author(author_id,fname,lname)
   Books(book_id,author_id,title,year)

(84) Remember our assignment 3 over the IMDB movie database.

   ACTOR (id, fname, lname, gender)
   MOVIE (id, name, year)
   DIRECTORS (id, fname, lname)
   CASTS (pid, mid, role)
   MOVIE_DIRECTORS (did, mid)
   GENRE (mid, genre)
We want to find the names of all actors who appeared in both Kill Bill: Vol. 1 and Kill Bill: Vol. 2. But we are stuck. Why does the following query not work? Describe below the problem, and then make the minimal changes (by correcting the query) to make it work. [14 points]

```
SELECT A.fname, A.lname
FROM Actor A, Casts C, Movie M1, Movie M2
WHERE M1.name = 'Kill Bill: Vol. 1'
  AND M2.name = 'Kill Bill: Vol. 2'
  AND M1.id = C.mid
  AND M2.id = C.mid
  AND C.pid = A.id
```

(85) Consider the following simplified movie database with schema:

- **Actor** (aid, name)
- **Casts** (caid, cmid, role)
- **Movie** (mid, name, year)

You would like to query all years in which actor 'Humphrey Bogart' played in a movie. We are stuck again. Make the minimal change to make it work. [5 points]

```
SELECT DISTINCT year
FROM Actor, Casts, Movie
WHERE aid = caid
  AND cmid = mid
  AND name = 'Humphrey Bogart'
```
This exercise requires some imagination. Bear with the example. Assume CMU has a badly designed website which lets CMU students look up all their personal information as stored in the database. The website asks the students for their user id (uid) and returns their current private information. The database has one table "Students" with several attributes, one of which is 'uid', i.e. their user id. Assume the website uses the following query behind the interface

```
SELECT * FROM Students WHERE uid = '$Input'
```

Construct a SQL injection response that shows you all the entries in the table Students. To be concrete, replace the parameter $Input above with a text string which results in a query that shows you all student entries. Hint: "1=1" is a true expression in SQL [5 points]
You have the following schema:

**PERSON** (id, name, age, gender, city_id)
**PERSONJOB** (person_id, job_id)
**CITY** (id, name)
**JOB** (id, title, salary)

Here id in each table is a primary key and city_id, person_id and job_id are foreign keys to **CITY**, **PERSON**, and **JOB** respectively. Also, id, city_id, person_id, job_id, salary, and age are all integers; the rest are strings.

A single person can have one or more jobs, and a single job title can have zero, one or more people with the same title. Each person only lives in exactly one city. Draw an Entity-Relationship Diagram that corresponds to above schema. If you need to choose a name for an object, choose one that makes sense. [8 points]
Using the schema from the previous question, you want to write a query that returns a list of the distinct job titles of people that work in the city 'ITVille'. A friend of yours suggests the following query below:

```
SELECT  distinct(j.title)
FROM    JOB as j, PERSONJOB as pj, PERSON as p2
WHERE   pj.person_id = p2.id
        AND pj.job_id = j.id
        AND p2.id in
            (SELECT  p.id
             FROM    PERSON as p, CITY as c
             WHERE   p.city_id = c.id
                     AND c.name = 'ITVille')
```

This query is correct. However, after looking at the query and problem formulation, you realize there is no negation. You can thus unnest the query and write it in a simpler form. Complete the lines in the following query fragment without adding any new lines [4 points]

```
SELECT  distinct(j.title)
FROM    
WHERE   
        AND
        AND
        AND  c.name = 'ITVille'
```
Find a query to return for each different city the number of workers from that city. Note that you could have different cities with the same name (but different ids). You want to make sure to list the numbers separately! Further, you want them sorted by alphabet. A possible example output would look as follows (assume in addition to Berlin as the capital of Germany, there is some other small town in Massachusetts with the same name):

<table>
<thead>
<tr>
<th>City</th>
<th>Workers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Amsterdam</td>
<td>3</td>
</tr>
<tr>
<td>Berlin</td>
<td>42</td>
</tr>
<tr>
<td>Berlin</td>
<td>1</td>
</tr>
<tr>
<td>Copenhagen</td>
<td>13</td>
</tr>
<tr>
<td>...</td>
<td>...</td>
</tr>
</tbody>
</table>

Hint: Remember from class that any attribute that appears in a select clause is either an aggregation attribute or it must appear in the grouping clause. [10 points]
6. EXTRA PAGE