

Information Systems Prelim 0708

Section I

1. Each time a borrower borrows a book, multiple unnecessary entries such as address and phone number will have to be made. This will be time consuming and open the possibility of making typographical errors to affect the integrity of the data.
2. two people from the same family could join the sports centre and they would have the same phone number which would break one key aspect of entity integrity, i.e. entries must be unique. There may be someone who does not actually have a phone number and this would be left out of their record. This breaks the 2nd aspect of entity integrity, i.e. no null values are allowed.
3. This entity would have a problematic compound key using several attributes. Using a compound key, would provide a straightforward single attribute key.
4. A foreign key is an attribute in an entity which is a primary key in another entity.
5. Data integrity can be enforced by ensuring appropriate validation checks are in place in a database system, such as ensuring key values are unique and using restricted choice values where appropriate.
6. a. 1 : M
b. A data dictionary describes the conditions to be applied to each attribute in an database systems, such as describing the type, format and validation checks that apply to attributes.

Information Systems Prelim 0708

Section I

7. A multi-valued attribute is one which can have more than one value in a particular record within an entity.
E.g. In the table the first record shows that the attribute borrower ID has 3 values, as opposed to book ISBN and Book Title which have only one.
Borrower ID is a multi-valued attribute.

Book ISBN	Book Title	Borrower ID
340850450	Higher Information Systems	23 34 72
9.78034E+12	Standard Grade Computing Studies	34

8. The ratio of white beads to brown beads in the container is 23:86. When the measurement was previously taken the week before, the ratio was 5:17.
9. a. Nature: Formal and quantitative.
b. it is formal in that it has a well-structured, detailed and somewhat “official” format. It is quantitative in that it displays a statistical measure of figures, and is not based on opinion.
10. a. Timing of information relates to when information is available in relation to when it is required.
b. If a valuable piece of information informing you that marathon bib numbers are to be collected the day before the race only reaches you on the day of the race then the information is worthless.

Information Systems Prelim 0708

Section 1

11. Two types of report may be a summary report, extracting only the key information from a project perhaps such as total revenue figures.
Another would be a periodical report, such as an annual report on the progress of a health club in its first year.
12. Timelining and critical path analysis are two components of project management software.
13. The police and the National Health Service.

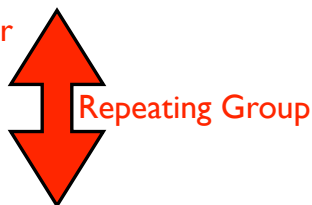
Information Systems Prelim 0708

Section 2

14. UNF

Masterclass (Masterclass

Title
Room
Speaker
Visitor number
Name
School
Address
Telephone)



INF

Masterclass Masterclass

Title
Room
Speaker

Session Visitor number

Name
School
Address
Telephone
Masterclass *

Information Systems Prelim 0708

Section 2

For 2NF

Masterclass	<u>Masterclass</u> Title Room Speaker	Session	<u>Visitor number</u> Name School Address Telephone <u>Masterclass*</u>
--------------------	--	----------------	--

2NF

Masterclass	<u>Masterclass</u> Title Room Speaker	Session	<u>Visitor number</u> * <u>Masterclass*</u>	Visitor	<u>Visitor number</u> Name School Address Telephone
--------------------	--	----------------	--	----------------	---

For 3NF

Masterclass	<u>Masterclass</u> Title Room Speaker	Session	<u>Visitor number*</u> <u>Masterclass*</u>	Visitor	<u>Visitor number</u> Name School Address Telephone
--------------------	--	----------------	---	----------------	---

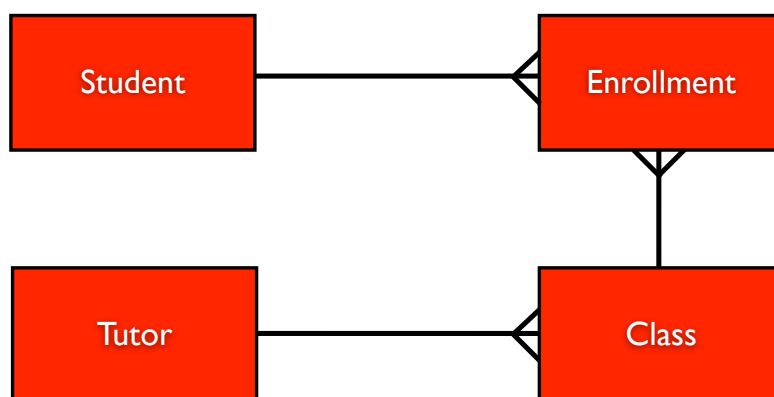
Information Systems Prelim 0708

Section 2

3NF

Masterclass	<u>Masterclass</u> * Title Room Speaker	Session	<u>Visitor number*</u> <u>Masterclass</u>	Visitor	<u>Visitor number</u> Name School *
				School	<u>School</u> Address Telephone

15. a.



15. b. (i). Number (real)

(ii). Text

c. (i). Lookup value from student table.

(ii). Unique

(iii). Range check (e.g. from £1 to £10)

d. A facility to produce summary information, in this case to count across records and the ability to include a sub-summary part within a report.

16. a. A suitable backup strategy would involve having a daily backup that runs on each of Monday through Friday using a separate storage media, such as magnetic tape for each day (labelled Monday daily etc). Each time Monday comes around the previous Monday's backup would be overwritten.

This would allow version control in that if a file become corrupt on Wednesday, then if there is only one backup, by Friday you could only recover the corrupt copy of the file. With this system come Friday you could recover a version from Tuesday before the corruption occurred, providing a working copy of the data file.

A weekly backup could then be taken on a Friday on a four week schedule (different tapes labelled week1 through to week4) which would allow 4 weeks of data to be held even although daily tapes are overwritten each week.

Finally, a monthly backup could be taken on the last Friday of the month which would backup the 4 weekly storage media.

This would provide a rigorous system involving a lot of different storage media and would involve a long time to perform the backups when doing the weekly and especially monthly backup.

16. b. Allowing staff home access would open up the network to possible infiltration from unwelcome, external sources.

It could allow unauthorised users access to sensitive files stored on the servers.

There would be the possibility of viruses being brought into the system either maliciously or unintentionally by staff using their own computers containing viruses they are unaware of.

The company would have to ensure that staff have a clear understanding of policies regarding home access including legal implications such as Data Protection and Computer Misuse.

They would have to ensure that staff access a secure network via a password and perhaps a physical security measure such as using a fob to provide a secure access code.

A robust firewall will be in place on the company's servers with suitable anti-virus software and network monitoring software to gauge potential unauthorised access to the system. Staff's personal machines would have to be checked to see they also have the most up to date virus detection software.

Furthermore, steps will have to be taken to secure data in transmission from home user's machines to servers via the use of encryption.

16. c. Network strategy

This deals with consideration of the topology to be used on the network, such as a star, ring or a bus.

This would also involve the hardware to be used on the network such as servers, switches, structured cabling etc.

Considerations of software such as network operating systems and performance management systems will have to be accounted for.

Another consideration would be the type of data being carried on the network such as voice and video and how the structure will support this.

Backup Strategy

A backup strategy involves choosing the storage media to be used in performing backups such as tapes or hard discs. The choice of which to use often depends on the budget available.

A methodology should be considered such as a full, differential or incremental backup.

Consideration should then be taken of when and how often backups should be done, with implementation of a system such as Grandfather-father-son being a common method used to revolve the usage of available storage media.

Finally, think about how the backup resources will be protected in the event of a disaster such as a fire etc. Will media be stored in flame-proof cases or stored off-site?

17. a. A master slide could involve the placement of a company logo on all slides.

It could be used to set the text formatting for all slides.

It could also set the text positioning for each slide in the presentation.

Items such as headings and page numbering can also be controlled via the master slide.

b. Dissolve - where next slide gradually dissolves into the screen.

Slide up - the slide appears from the bottom gradually covering the previous slide.

Checkerboard - the slide appears with an initial checkerboard effect displayed.

18. a. Jacob could create a web site to take customer orders directly via the Internet, opening his business to a mass potential customer base.

He could also advertise on other web sites and have sponsored links on search engines such as Google to publicise his business.

His lists of customers, orders, products etc. could also be stored using a RDBMS accessible to all of his staff, giving quick and easy access to reports, sales figures etc.

b. Jacob will have initial costs in buying the hardware and software for his business - computers, printers, network gear etc.

He will also incur costs in having an ISP host his web site, and possible payments to search engine providers for the advertising and promotion of his site.

Information Systems Prelim 0708

Section 3

25. a. A decision support system (DSS) is a mechanism for collating information that is used as part of the process by users allowing them to make decisions.

An expert system is designed to provide the actual advice that is used to treat a patient.

It uses a knowledge base of facts and rules, and from such the experts system itself infers new knowledge.

A DSS is used mainly at a tactical level within an organisation whereas an expert system operates at all levels.

b. Category: Planning

Main Characteristics: Provided instructions to allow a robot to navigate a room.

Major influence in development of planning expert systems.

26. a. If vessel is pleasure boat and power is by an engine THEN this boat is a power boat.

If this boat is a power boat and engine is mounted outside the stern THEN engine type is an outboard engine.

If this boat is a power boat and engine is inside the hull of the boat THEN engine type is an inboard engine.

If vessel is pleasure boat and power is by the wind THEN this boat is a sail boat.

b. Classification. It is being used to take an item's characteristics to state a particular group (such as pleasure boat) the item belong to. This is a means of classification.

c. (i). Many domains have information which is uncertain in nature, i.e. how sore is the pain. Using certainty factors allows the system to more accurately reflect advice in a way that a human expert would be able to.

Certainty factors allow the user to see there is an element of doubt in accepting the system's advice so they are unlikely to be completely surprised if problems arise.

Information Systems Prelim 0708

Section 3

26. c. (ii). Some expert systems do not use certainty factors because the nature of the domain may be such that there is no uncertainty in advice provided and answers offered.

Another chosen expert system may not support certainty factors without the Knowledge Representation Language.

d. (i). Conflict resolution strategies are required as at any particular point during a consultation there may be more than one rule that could fire. A rule is in a state to fire when the conditions attached to the rule match the facts held in working memory.

(ii). The RETE algorithm provides a conflict set at each point during a consultation by examining the facts held in working memory in comparison to rules in the knowledge base to evaluate which rules could fire.

(iii). The refractoriness strategy works by removing any rule that has already fired from the conflict set to remove the possibility of infinite loops.

27. a. Using an expert system will provide the engineers with immediate access to the specialist knowledge of one or more human experts.

It also can be used to provide the engineers with a valuable second opinion when they are not completely convinced of their own diagnosis of a problem.

b. The service engineer is responsible in that he is meant to be a professional in solving such problems and it is part of his job to ensure that the advice he provides is correct.

Information Systems Prelim 0708

Section 3

27. c. (i). The domain expert could provide information which turns out to be incorrect.

(ii). The knowledge engineer could wrongly code the (correct) information that he has received from the domain expert.

d. Representation of data/knowledge

A RDBMS stores data as fields and records in tables of data.

An expert system stores data as facts and rules in a knowledge base.

Extraction of data/knowledge

With an RDBMS data is extracted by the use of queries where users choose the criteria to enter in one or more fields to isolate records that match the query constraints.

An expert system extracts data by the user answering questions during a consultation via the user interface until one or more pieces of advice are generated.

With an RDBMS, the user has to know exactly what they are looking for in terms of deciding query constraints. They will have used the expert system because there is no need for this knowledge. The onus on the user is simply to answer questions posed by the system which will then provide the required advice.

Information Systems Prelim 0708

Section 3

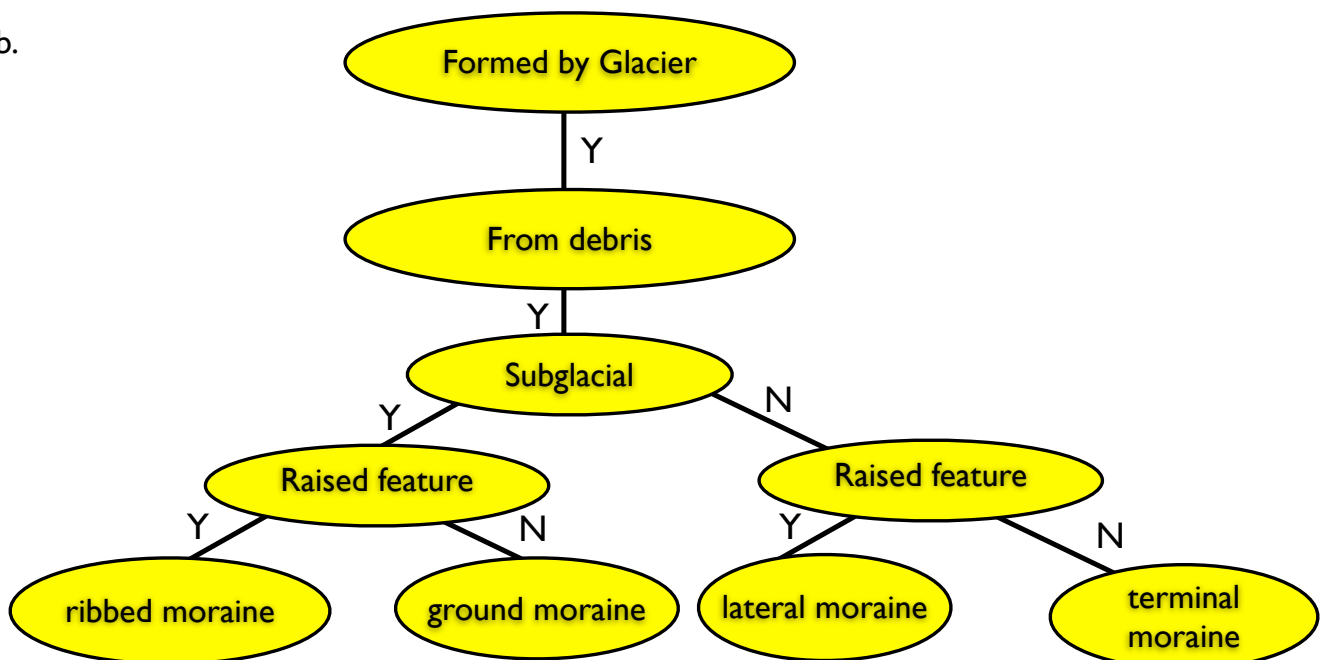
28. a. gorge(landform, extends_beneath_terrain, has_steep_cliffs, formed_by_erosion)

valley(depression_between_two_mountains)

rivervalley(valley_formed_by_river)

glacialvalley(valley, formed_by_glacier)

b.



28. b. (ii). Decision trees provide a more visual representation of domain knowledge and make it easier to trace how advice is provided during a consultation.

Factor tables give a detailed breakdown regarding how every domain constraint affects each and every possible outcome.

Factor tables can be easier to update in light of new or amended knowledge.

c. A deductive database is a system that combines the search/sort and storage facilities of a database with the inferencing capacity of an expert system.

d. (i). The inference engine starts with an initial hypothesis of what the advice to be generated should be. It then works backwards to collect evidence to confirm this hypothesis. If the hypothesis is rejected, then another one is chosen and the same system repeats again.

(ii). Structure is arete IF feature is a thin ridge of rock between two valleys.

Structure is plateau IF feature is a raised area of land consisting of a flat region.