Introduction  
  
**1) Kaj je SUPB?**

Sistem za Upravljanje s Podatkovnimi Bazami. Je programski sistem za shranjevanje podatkov in upravljanje s podatkovnimi bazami.  
  
**2) Datoteke vs. SUPB?**

Težave pri tem, da bi imeli podatke shranjene v datotekah so naslednje:

* Nimamo dovolj velikega spomina, da lahko shranimo vse podatke. Datoteke moramo shraniti na kakšen disk ali trak, nato pa prenesti datoteke v glavni spomin, da jih lahko obdelujemo.
* Tudi če imamo dovolj velik glavni spomin z 32-bitnim sistemom lahko dostopamo samo do 4GB podatkov na enkrat. Moramo sprogramirati metodo za prepoznavanje vseh datotečnih elementov.
* Spisati moramo programe, da lahko odgovorimo vsako vprašanje, ki bi jih naj uporabnik zastavil, glede podatkov. Programi bodo zahtevni, zaradi velike količine podatkov.
* Podatke moramo zaščititi pred nedoslednimi spremembami, ki jih naredijo drugi uporabniki, ki hkrati dostopajo do podatkov. Če mora program obravnavati podatke s sočasnim dostopom in hkrati zaščiti ostale, to zelo prispeva k njihovi kompleksnosti.
* Zagotoviti moramo, da se podatki obnovijo v prvotno stanje, če se sistem zruši medtem, ko se podatki spreminjajo.
* Operacijski sistemi imajo samo geslo za zaščito. To ni dovolj prilagodljivo, da bi lahko uveljavili varnost in kontrolo dostopa, da bi lahko dovolili, da uporabniki dostopajo do svojih datotek, ki so v različnih podskupinah

SUPB, je programska oprema, ki je narejena zato, da so zgoraj naštete težave lahke za obravnavo. Ko shranimo v SUPB sistem podatke, lahko uporabimo SUPB lastnosti za njihovo obravnavo. Bolj ko naša baza raste bolj nepogrešljiv je SUPB sistem.

**3) Kaj je podatkovni model?**

Podatkovni model je zbirka konceptualnih gradnikov za opis podatkov.

Shema ja opis konkretne zbirke podatkov z uporabo danega podatkovnega modela.

Relacijski podatkovni model je najbolj pogosto uporabljan model danes.

Osnovni koncepti:

* Relacija, ki je v osnovi tabela s stolpci in vrsticami.
* Vsaka relacija ima shemo, ki opisuje stolpce in vrstice.

**4) Kaj je podatkovna neodvisnost?**

**5) Describe the levels of abstraction in DBMS.**  
**6) What is a transaction?**  
**7) Describe the structure of a DBMS.**  
  
Relational data model  
  
**1) What is the relational database model?**  
**2) What is the integrity constraint?**  
**3) Describe the concept of a primary key.**  
**4) What is referential integrity?**  
**5) Describe the relational algebra.**  
**6) Describe the relational calculus.**  
**7) Present the basic syntax of SQL query language.**  
**8) Describe the concept of join in SQL.**  
**9) Describe aggregation functions in SQL.**  
**10) Describe the query language QBE.**  
  
Data model ER  
  
1) Describe the data model ER.   
  
2) What is the cardinality of a relationship?   
  
3) What is a weak entity?   
  
4) Present the Chen's notation of the ER model.  
  
5) Present the constructs for modeling the generalization/specialization hierarchy of entities.  
  
6) How to model the aggregation of entities?  
  
7) Present the rules for translating the ER model into the relational database model.  
  
  
Disks and files  
  
1) Describe the architecture and the use of disks.  
  
2) Present the organization of DBMS data on disks.  
  
3) Present the main principles of RAID disks.  
  
4) Present the memory hierarchy in DBMS.  
  
5) Describe the function of a DBMS buffer pool.  
  
6) What are the possible implementations of records?  
  
7) How a table is stored in DBMS?  
  
  
Indexes  
  
1) Name and describe a few external storage devices.  
  
2) What is a file organization? What alternatives we have?  
  
3) What is an index? Describe the concepts a search key, a data entry, an index entry, and a data record.  
  
4) What are the alternatives for a data entry k\*?  
  
5) What is a primary/secondary index? What is a clustered/unclustered index?  
  
6) Present the ISAM index.   
  
7) Present the B+ tree index.  
  
8) Describe the B+ tree operations insert and delete.  
  
9) Describe hash-based indexes. What are the alternatives?  
  
  
Query evaluation  
  
1) What is the access method? What kind of access methods do you know?  
  
2) Describe common techniques used for the evaluation of relational operations.  
  
3) Present the general external merge sort algorithm. What is the complexity of the external merge sort?  
  
4) How to implement the selection operation?  
  
5) Present the methods for the implementation of the projection.  
  
6) Describe the nested loops join, the index nested loops join, and the block nested loops join.  
  
7) Present the sort-merge join algorithm.  
  
8) Describe the hash-based join algorithm.  
  
  
Query optimization  
  
1) How to estimate the cost of a query?  
  
2) Present the relational algebra equivalences?   
  
3) How to obtain all equivalent query expressions for a given query expressed in the relational algebra?  
  
4) Describe cost estimation for single-relation query plans.   
  
5) Describe left-deep and bushy join trees?

Concurrency control  
  
1) What is the transaction?  
  
2) Explain possible anomalies of the interleaved execution of transactions.  
  
3) What is a conflict serializable schedule of a transaction?  
  
4) Describe the strict and non-strict two-phase locking protocols.  
  
5) What happens when a transaction is aborted?  
  
6) Describe the deadlock prevention methods.  
  
7) What is index locking? How is it implemented?  
  
8) Describe the optimistic concurrency control.  
   
  
Crash recovery  
  
1) Explain the ACID properties of a relational DBMS.  
  
2) Explain the trade-offs of "stealing" pages from the buffer pool and "forcing" pages to be stored to a disk.  
  
3) Describe the Write-Ahead Logging (WAL) protocol.  
  
4) Describe what data is stored and where it is stored for the execution of the WAL protocol.  
  
5) Present the analysis, redo and undo phases of the crash recovery.  
  
  
Logical design  
  
1) Why redundancy can appear in relational databases?  
  
3) What is the functional dependency?   
  
4) How can we reason about the functional dependencies?  
  
5) What is the purpose of the normalization of a relation? What is a normal form?  
  
6) Present the Boyce-Codd normal form of a relation.  
  
7) Present the 3rd normal form (3NF) of a relation.  
  
8) What is lossless-join decomposition of a relation?  
  
9) What is dependency preserving decomposition of a relation?  
  
10) Present the algorithm for the decomposition of a relation into the BCNF.