Question 1: (Concepts – keep the answers short !)

a) What are typical applications of entity beans, stateless session beans and stateful session beans? Give 3 examples.

b) Give 3 examples of functions that an Object Transaction Monitor provides, which a traditional Transaction Monitor does not provide.

c) Give 3 examples of mechanisms for reusing definitions in XML-Schema and 1 example of a mechanism for reuse in XML DTDs.
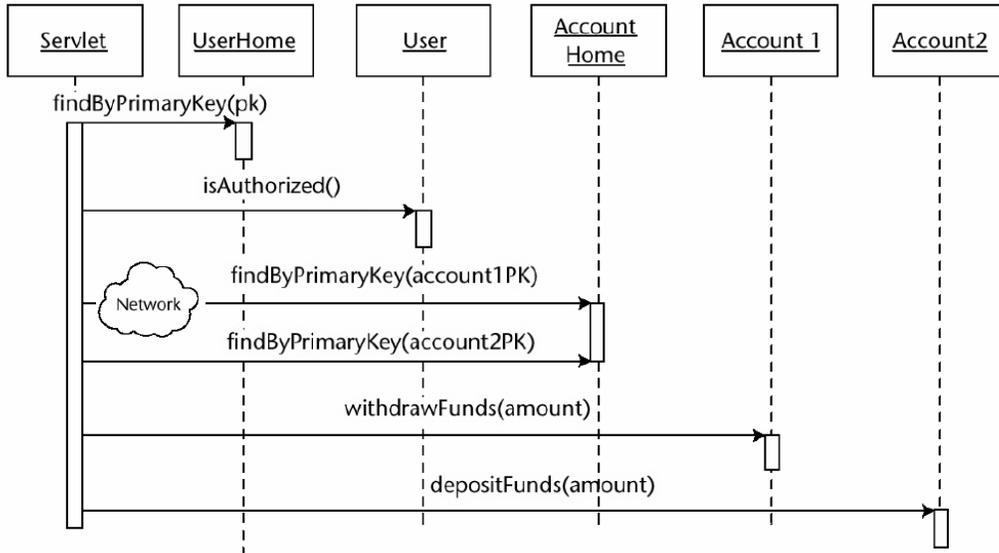
Question 2: (Technology selection - there exists not necessarily a unique correct answer to the questions. It is important that you back up your answers with the correct arguments!)
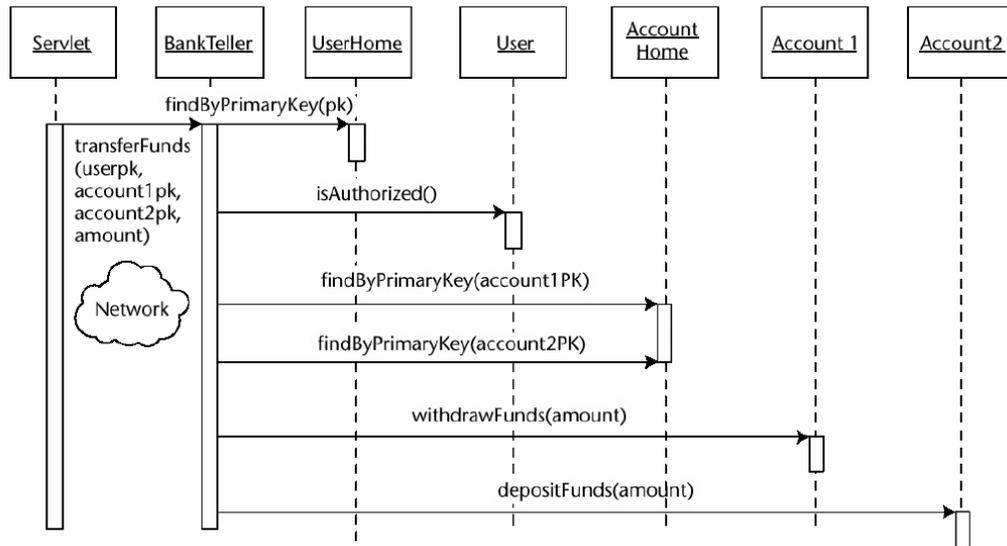
Assume a Web client is accessing a banking application implemented as entity beans User and Account through a servlet as show in the following sequence diagram.

The servlet is executed on a Web server that accesses the EJB application server through the network. The servlet executes all method calls to the beans from within the same transaction. Experience shows that such an approach results among others in the following problems:

- High network overhead
- Poor concurrency
- Poor reusability
- Poor maintainability

A possible solution to these problems is depicted below.

The diagram shows that a BankTeller bean has been introduced, that handles the transfer. Answer the following questions:

a) Explain why the problems mentioned for the original approach occur and how they are solved by the changed software architecture?

b) What type of bean is BankTeller?

c) Characterize the kind of applications for which this solution would be appropriate, and try to identify applications where the approach would not be appropriate?

Question 3 (Technology use)

The following XML document contains information about the books in a library and the book authors who will be signing their books in the library. Can you provide an XML schema definition for this XML document by adding definitions of the Book and Library elements (a definition of the GuestAuthors element is already provided for you) in the XML schema on the next page? The content of the ISBN elements must be unique within the Books element, whereas each ISBN element within GuestAuthors element must refer to an ISBN element that already exists within the Books element.

Document:

```
<?xml version="1.0" encoding="UTF-8" ?>
<Library xmlns:xsd="http://www.w3.org/2001/XMLSchema-instance"
         xsd:noNamespaceSchemaLocation="libsign.xsd">
    <Books>
        <Book>
            <Title>My Life and Times</Title>
            <Author>Paul McCartney</Author>
            <Date>1998</Date>
            <ISBN>94303-12021-43892</ISBN>
            <Publisher>McMillin Publishing</Publisher>
        </Book>
        <Book>
            <Title>Illusions The Adventures of a Reluctant Messiah</Title>
            <Author>Richard Bach</Author>
            <Date>1977</Date>
            <ISBN>0-440-34319-4</ISBN>
            <Publisher>Dell Publishing Co.</Publisher>
        </Book>
        <Book>
            <Title>The First and Last Freedom</Title>
            <Author>J. Krishnamurti</Author>
            <Date>1954</Date>
            <ISBN>0-06-064831-7</ISBN>
            <Publisher>Harper &amp; Row</Publisher>
        </Book>
    </Books>
    <GuestAuthors>
        <Author>
            <Name>Richard Bach</Name>
            <BookForSigning>
              <Title>Illusions The Adventures of a Reluctant Messiah</Title>
              <ISBN>0-440-34319-4</ISBN>
            </BookForSigning>
        </Author>
    </GuestAuthors>
</Library>
```

```xml
<?xml version="1.0" encoding="UTF-8" ?>
<xsd:schema xmlns:xsd="http://www.w3.org/2001/XMLSchema" >
 <xsd:element name="Book">




 </xsd:element>
 <xsd:element name="GuestAuthors">
  <xsd:complexType>
   <xsd:sequence>
    <xsd:element name="Author" minOccurs="0" maxOccurs="unbounded">
     <xsd:complexType>
      <xsd:sequence>
       <xsd:element name="Name" type="xsd:string" />
       <xsd:element name="BookForSigning" maxOccurs="unbounded">
         <xsd:complexType>
          <xsd:sequence>
           <xsd:element name="Title" type="xsd:string" />
           <xsd:element name="ISBN" type="xsd:string" />
          </xsd:sequence>
         </xsd:complexType>
       </xsd:element>
      </xsd:sequence>
     </xsd:complexType>
    </xsd:element>
   </xsd:sequence>
  </xsd:complexType>
 </xsd:element>
 <xsd:element name="Library">








 </xsd:element>
</xsd:schema>
```