1. (10 points) Moved here from H2.
   A. A business service is characterized by the value it offers one or more stakeholders
   \[\text{Solution: A is true:}\]
   B. A business service is characterized by an underlying or associated financial exchange
   \[\text{Solution: B is false: a business service is about value transfer. Notice the contrast here is between “business” service and “technical” service. Although a financial exchange can occur with some business services, finance doesn’t characterize business services. A business service can occur without financial exchange as when a consulting practice (such as IBM Global Services) installs network equipment from an equipment vendor (such as Cisco): their customer pays both parties but the vendor and the practice provide services to each other in addition to the services they provide their customer}\]
   C. A business service offering is different from a goods offering in that a business service inherently involves coproduction
   \[\text{Solution: C is true: coproduction means that the parties to a service engagement (nominally, service consumer and provider) interact to realize the value transferred during the service engagement}\]
   D. A business service is intangible but goods are tangible
   \[\text{Solution: D is false: many goods are intangible (e.g., digital media) and some services include components that are tangible (e.g., food at a restaurant)}\]
   E. Accounting and auditing are examples of business-level responsibilities that can be understood as cross-cutting concerns on par with logging at a technical level
   \[\text{Solution: E is true:}\]

2. (6 points) Of the following statements, identify all that hold about XML.
   A. XML is valuable for e-business because it provides the desired level of conceptual modeling needed in e-business
   \[\text{Solution: A is false: XML doesn’t offer conceptual modeling as such}\]
   B. XML has a natural match with messaging middleware but can be effectively used even without messaging middleware
   \[\text{Solution: B is true:}\]
   C. The XML Schema instance namespace offers some essential terms (elements or attributes) to be used within a schema-compliant XML document
   \[\text{Solution: C is true:}\]

3. (16 points) Of the following statements, identify all that hold about XML Schema.
A. Specifying the schema of an XML document helps catch certain errors in an incoming document even before trying to use that document

**Solution:** A is true:

B. Using XML syntax for a language is most valuable from the tooling perspective, and not necessarily so for human readability

**Solution:** B is true: you know about the readability challenges if you have tried to read XML Schema and XSLT documents!

C. XML InfoSet specifies that the attributes of an element are unordered

**Solution:** C is true:

D. XML InfoSet specifies that comments may occur only before the main element of an XML document

**Solution:** D is false: comments may occur in other places as well

E. XML Schema provides a way to specify minimum and maximum bounds on the number of values an attribute of an element can take

**Solution:** E is false: attributes may take exactly one value

F. Since attributes can only take string values, XML Schema doesn’t allow types on attributes

**Solution:** F is false: attributes may have types, although these types must be simple, i.e., based on the string type

G. In XML, a text node under an element includes the largest possible contiguous block of text not interrupted by a subelement

**Solution:** G is true:

H. Attributes are a convenience but anything that attributes can represent we can represent using elements

**Solution:** H is true:

4. (8 points) Of the following statements, identify all that hold about keys and other database-related concepts.

A. The document-centric view was generally not promoted by Database Administrators (DBAs) in large enterprises because they preferred to give a central role to existing enterprise databases

**Solution:** A is true:

B. Although XML doesn’t allow the keys on an element to refer to its parents, this is mainly based on implementation ease: there is no fundamental or logical reason why keys referring to parents could not be defined
**Solution:** B is true: you should be able to state what selected elements are unique or exist without regard to what is a parent or not, although the needs of indexes are simplified when all the selectors and fields point downwards.

C. To define a keyref presupposes that a corresponding key or unique is defined.

**Solution:** C is true:

D. Let $K_1$ be a key with one selector and three fields that applies on a context node. Let $K_2$ be another key on the same context node, with the same selector, and with exactly two of the three fields. Then given $K_1$, $K_2$ is redundant.

**Solution:** D is false: $K_2$ is more informative than $K_1$ because it says that two of the three fields are adequate to ensure uniqueness; thus any document that satisfies $K_2$ will satisfy $K_1$; that is, given $K_2$, $K_1$ is redundant.

5. (20 points) Of the following statements, identify all that hold about XML keys, integrity constraints, and other aspects of relating XML to databases:

A. Common business documents such as real-life purchase orders and repair manuals are typically better treated in the document-centric view than the data-centric view.

**Solution:** A is true: business documents are typically structured in semiregular ways.

B. In the document-centric view, we would generally find real-life documents that have no or few elements with mixed content.

**Solution:** B is false: although mixed content is not fundamentally needed, mixed content elements would be common in document-centric settings, e.g., in XHTML documents or snippets that contain natural language words, some of them marked up with formatting elements.

C. The XML Root as defined in SQL/XML is identical to the root of the XML InfoSet.

**Solution:** C is false: XML Root as defined in SQL/XML allows a forest whereas the root in XML InfoSet allows only a single tree.

D. XML supports creating null elements for each element type that we wish to define as nillable.

**Solution:** D is true.

E. SQL/XML Publishing functions can be used in a SELECT query to output serialized representations of XML elements, possibly even including subelements and attributes.

**Solution:** E is true.

F. What makes it difficult to represent an XML document as a set of tables is that every table has a key but not every XML document has a key.
Solution: F is false:

G. Except for the introduction of XML Type as a data type, SQL/XML makes no substantial change to the traditional SQL DDL.

Solution: G is true:

H. In a number of settings, SQL/XML treats char, varchar, and clob as if they were more or less interchangeable string-like data types.

Solution: H is true: for xmlparse, extractValue, and so on

I. SQL/XML SELECT queries output rows some of whose cell values may be XML elements.

Solution: I is true:

J. When defining a table in SQL/XML, the XML Type must always be marked NOT NULL, since we should express a null value in the style of ⟨elem xsi:nil='true'/⟩

Solution: J is false: our example schema allows NULL, for instance