1. (12 points) Identify all of the following statements that are true about the basics of services.
   
   A. Screen scraping may not be effective for large desktops but works perfectly on mobile phones, because their screens are so much smaller

   Solution: A is false: not that kind of screen

   B. We would be closer to realizing the vision of service-oriented computing if we could install a central UDDI repository for the whole world

   Solution: B is false: the vision of service-oriented computing is decentralized

   C. A service-oriented architecture is frequently deployed in practice without a service registry

   Solution: C is true: this is quite common: the programmer discovers the service by hand

   D. One of the main challenges forestalling the expansion of service-oriented computing is the lack of an established, scalable encryption standard on the web

   Solution: D is false: encryption standards are established and common on the web: they are implemented in https, for example

   E. One of the main challenges forestalling the expansion of service-oriented computing is the lack of an established, scalable digital signature standard on the web

   Solution: E is false: digital signature standards are established and common on the web

   F. One of the main challenges forestalling the expansion of service-oriented computing is the lack of an established, scalable way for one party to determine if another autonomous party is trustworthy, e.g., can be trusted to provide a desired service

   Solution: F is true: despite encryption and digital signatures, the challenge that remains is whether each party can trust those it deals with on the web

2. (28 points) Identify all of the following statements that are true about conceptual modeling

   A. EDI refers to Electronic Data Interchange, one of the oldest approaches for integrating software applications across enterprises

   Solution: A is true:

   B. Integration reflects tight coupling and is therefore undesirable as a metaphor for building systems of autonomous and heterogeneous components

   Solution: B is true:

   C. The dimensions of abstraction are the dimensions along which we can describe services and which potentially have a bearing on their interoperation

   Solution: C is true:
D. The closing price of a stock on a day is just one of many prices that go into computing the average price for that day; therefore, closing price is a specialization of average price

Solution: D is false:

E. For an unpopular stock that has exactly one trade on a day, the closing price for that day equals its average price for that day; therefore, average price can sometimes be a specialization of closing price

Solution: E is false:

F. When we say that the hotel service either succeeds or fails but not both, that is an example of the process dimension of abstraction

Solution: F is true:

G. When we say that the hotel service allows cancellations within three days of making a booking, that is an example of the process dimension of abstraction

Solution: G is true: it is an example of a temporal constraint applied to a contingency strategy

H. When we say that a tourism service starts the airline service after the hotel service has completed successfully, that is an example of the process dimension of abstraction

Solution: H is true:

I. In connection with value maps, consistent inversion corresponds to the same intuition as that the negation of a negation of a proposition equals the original proposition

Solution: I is false: consistent inversion corresponds to triple negation (¬¬¬p ≡ ¬p) and generally not to double negation (¬¬p ≡ p)

J. The normal way to apply articulation axioms is to compose them (that is, chain them) so that we can map concepts in one service or agent ontology to another service or agent ontology

Solution: J is true:

K. The rapid expansion of the web in recent years has shifted the trade offs between procedural and declarative approaches in favor of the procedural approaches

Solution: K is false: it has shifted the trade offs toward declarative approaches

L. Frame-based representations of knowledge are reminiscent of the class diagrams and modeling of object-oriented design

Solution: L is true:

M. A desirable property of a conceptualization is that it supports a number of natural inferences without relying on hardcoding terms or meanings in the labels used (such as of properties or classes)
3. (14 points) Identify all of the following statements that are true about RDF

A. RDF is an example of an approach for declarative modeling of knowledge

Solution: A is true:

B. The common underpinning of designing vocabularies in RDF (and RDFS) and designing database schemas is conceptual modeling of the domain of interest to identify the main entities and relationships it involves

Solution: B is true:

C. In RDF, we can capture a relationship of three or more parties by reifying the relationship between any two of the parties and using the reified statement as a resource

Solution: C is false: we need to introduce a resource that interpret as an association entity (in database terms), but a reified statement is not helpful in this setting

D. In RDF, a property cannot be a resource

Solution: D is false:

E. In RDF, if a URI is null (or not known) for a resource, the resource can be used as a literal

Solution: E is false: resources must have a URI; resources and literals are nonoverlapping types

F. An RDF reasoner can crash if you give it two mutually referring statements $A$ and $B$, where $A$ says $B$ is true and $B$ says $A$ is false

Solution: F is false: the reasoner has no sense of what we might mean by a statement being “true” or “false”—these being our terms, not RDF terms

G. If two assertions regarding the domain of the same property occur in the same document that means the inferred domain is intersected, but if the same two assertions occur in different documents that means the inferred domain is unioned

Solution: G is false: the reasoner infers the domain to be the intersection of all the asserted domains regardless of where they happen to appear

4. (22 points) Identify all of the following statements that are true about OWL

A. Let $F$ be a inverse functional property in OWL DL with domain $D$ and range $R$. Then for each instance $r$ of $R$, there must be an instance $d$ of $D$ such that $d$ relates to $r$ through property $F$

Solution: M is true:

N. A desirable property of a conceptualization is that it is final or definitive, and allows as few elaborations as possible

Solution: N is false: ideally, it should allow as many elaborations as we might need
A. A is false: inverse functionality imposes uniqueness with respect to the range, not coverage of the entire range

B. Given the property hasSibling over the class Human, and using the OWL DL, we can define a class OnlyChild of humans who have no siblings and are siblings of no one

Solution: B is true:

C. If you assert in OWL that both Class-A and Class-B are domains of the same property, then the OWL reasoner would conclude that anything to which the property applies is an instance both of Class-A and Class-B

Solution: C is true:

D. If Class A has exactly one instance, then any Object Property P whose domain and range are A would have the same instances whether P was symmetric or transitive or both symmetric and transitive

Solution: D is true: the only possibilities are for Property P to be empty or to include the self-loop for the sole instance of Class A, which both satisfy P being symmetric and transitive

E. If Class A has exactly two instances, then any Object Property P whose domain and range are A would have the same instances whether P was symmetric or transitive or both symmetric and transitive

Solution: E is false: let A have instances a and b; if P has instances \{(a, b), (b, a)\}, it is symmetric but not transitive; conversely, if P has instances \{(a, a), (a, b)\}, it is transitive but not symmetric

F. Given two disjoint classes, A and B, it is possible to define an OWL Object Property P whose domain and range include both A and B

Solution: F is true: we can declare Mammal and Reptile are mutually disjoint subclasses of Animal; we can define an Object Property whose domain and range equals Animal

G. In OWL, it is possible to define a symmetric property whose domain and range are asserted to be disjoint

Solution: G is true: such a property would have no instances

H. If we declare a resource to be an instance of two OWL classes in the same OWL document—for example, via `<Person rdf:ID='Pradeep'/> <Student rdf:about='Pradeep'/>`, then the OWL reasoner concludes that one of the classes is a subclass of the other

Solution: H is false: all it concludes is that the two classes overlap

I. In OWL, the domain of an inverse functional property is the corresponding functional property

Solution: I is false: if a property is the inverse of another, their domains and ranges are flipped

J. In OWL, the domain of owl:inverseOf is owl:ObjectProperty because an inverse cannot be stated for data properties
K. In OWL DL, we can assert that Class-A and Class-B are mutually exclusive superclasses of Class-C

**Solution:** K is true: we can assert Class-A and Class-B are disjoint with each other and are superclasses of Class-C; this means Class-C is empty

5. (14 points) Problems on communications

A. We specify systems of services using protocols to obtain a neutral perspective on the interactions in the system rather than the narrow perspective of one of the parties involved

**Solution:** A is true:

B. Pragmatics is the part of meaning that carries a dependence on the context in which the communication occurs

**Solution:** B is true:

C. A communicative act such as an inform is not a performative because it does not indicate the power of the speaker (such as of a judge marrying two people would)

**Solution:** C is false:

D. If an eBay member attempts something prohibited by the eBay membership terms and is ejected from eBay, then in essence he carries out the performative of canceling his own eBay account

**Solution:** D is false:

E. The theory of performative communicative acts maps naturally to the multiagent notion of interacting autonomous agents

**Solution:** E is true:

F. The meaning of a business communication is captured by how the autonomous end points happen to reason with it, not on any explicit or implicit conventions

**Solution:** F is false:

G. The control flow established between autonomous parties is an essential aspect of formalizing communication in a system of services

**Solution:** G is false: