1. (30 points) Identify all of the following statements that are true about agents
   A. If an agent does not send any messages, then it is no longer an agent but an object—at least until it starts sending messages out again
   B. We need exactly one agent to build a service-oriented system; additional agents may be helpful but are not necessary
   C. An action performed by an agent counts as an action performed by its principal
   D. Once a principal configures (“appoints”) an agent, the agent becomes accountable for all actions it performs on behalf of the principal and the principal is off the hook
   E. Because exceptions can terminate any long-lived interaction, we must model each agent to have a short-lived identity
   F. In real-life business and personal settings, the parties involved are often proactive and able to deal with exceptions
   G. If we that say a thermostat (viewed as an agent) believes it is freezing cold, that means the designer of the thermostat believes it is freezing cold
   H. A major benefit of modeling the goals of agents is that goals are an abstraction that is clearer to stakeholders and largely independent of low-level implementation details
   I. Web services can be understood to be the effectors of an agent who lives in an information environment
   J. A reactive agent senses and acts in its environment but doesn’t directly communicate with any other agent
   K. The sending or receipt of a message are natural kinds of events for an agent applied in an information environment
   L. ECA rules and inference rules both describe how to transition from one world state to the next
   M. Rule-based approaches presume an explicit storage of “facts” or beliefs
   N. We require that the action of an ECA rule has at least one variable that is not bound in the event or condition parts
   O. A shortcoming of rule-based approaches compared to an imperative language is that rules handle if then or if then else constructs, but have no way of accomplishing what a while loop can do

2. (30 points) Identify all of the following statements that are true about multiagent systems
   A. A basic problem in thinking about MAS is how to distribute control across the agents in the system
   B. It is possible to statically allocate tasks to agents in a MAS
   C. A brokerage service can set up a coalition of agents that dissolves when their interaction completes
   D. A TMS, viewed as an agent’s knowledge base, maintains a network of beliefs on behalf of the agent
   E. A justification consists of a set of conjuncts, each of which combines premises as well as inference rules
   F. A suitable standard of correctness for a MAS whose members are autonomous agents is that the knowledge bases of the agents are mutually consistent
   G. Once we figure out the algorithm we want to use to query and share information in a MAS, we can figure out the standard of correctness we should adopt
H. An organization can guarantee that any errors within its scope will be corrected
I. A standard operating procedure captures the idea of coherence as it is realized in human organizations
J. The legal concepts are inherently multiagent in nature since they involve two or more parties
K. The legal concepts apply in service-oriented systems because these concepts provide a way of getting around contracts
L. In a health care setting, when a patient consents to taking anesthesia he gains immunity from pain
M. The organizational context of a commitment provides the scope within which the commitment arises and typically holds powers such as to release a commitment
N. The Uniform Commercial Code captures the legal requirements common to all business transactions
O. The virtual enterprise scenario demonstrates how to handle an exception in a manner that reduces the external impact (on a customer)

3. (30 points) Identify all of the following statements that are true about communication
A. A communication preserves the autonomy of the communicating parties
B. An interaction violates the autonomy of the participants
C. A communication must be realized over some physical medium, which in general would not preserve the autonomy of the communicating parties
D. An essential idea about communication is that it involves a system of conventions
E. With respect to communication, pragmatics refers to the aspects of meaning that can be computed based solely on the language structures involved
F. An essential idea about communicative act theory is that it treats communication as a form of action
G. An essential idea about communicative act theory is that it deals with communications that do not readily map to statements of fact (i.e., statements that are potentially true or false)
H. Any statement of the form “I eat salad for lunch” that begins with “I” and next specifies a verb (here “eat”) is a declarative
I. All communicative acts can potentially be rewritten in the stylized form of a declarative
J. A declarative brings about a change in the social state of the participants
K. A commissive does not bring about a change in the social state of the participants
L. Conventions correspond to the rules of encounter in a society
M. The internal representation of each party is crucial to how a convention is defined
N. The use-based approach to message classifications considers the uses of different messages in particular application domains, and formalizes them accordingly
O. Approaches such as BPMN, the Business Process Modeling Notation, emphasize how different parties may communicate from their internal behaviors and hide the patterns of communication involved

4. (40 points) Identify all of the following statements that are true about communication
A. The contract net protocol enables stating policies that yield a self-organizing distribution of tasks
B. Commitment protocols formalize the social state using which we can compute the transitions in the social state caused by each message
C. The traditional representation of the NetBill protocol demonstrates that it is straightforward to accommodate legitimate business variations in an FSM
D. In any practical distributed system, the transmission of a message is causally prior to its reception
E. LoST is based on the idea that all control information necessary for a protocol must be conveyed through the messages in that protocol
F. The point of LoST is that we cannot use a central relational database but should instead use a central XML datastore.

G. In LoST, an incoming message can be rejected if it arrives too late.

H. To implement LoST, all you need is to implement a custom finite state machine that captures the control logic of the specific protocol.

I. A BSPL protocol must have at least two roles and at least one public parameter.

J. An \( \text{\texttt{out}} \) adornment on a parameter indicates that the parameter will be the part of a response to a request.

K. Because business partners are autonomous, they may choose to send no message defined in a protocol.

L. The completion criterion for a protocol enactment means that we can force a core subset of roles to send some messages.

M. Each BSPL protocol has a central role that knows if any role has sent or failed to send a message to any of the other roles.

N. If the same parameter occurs as \( \text{\texttt{out}} \) in two messages with different message names but with the same key parameters, then both messages can be sent with the same key parameter bindings.

O. In BSPL, every protocol that can be implemented must have at least one \( \text{\texttt{in}} \) parameter.

P. A choreography is a way to organize a distributed web application in terms of the interactions of the parties involved.

Q. Designing a choreography is easy since there is no way to over-specify or under-specify how it constrains a distributed computation.

R. When a commitment completes that means it is not active any more.

S. Any time a debtor cancels a commitment, it suffers a penalty or other sanction.

T. We can compute how a commitment progresses based on the propositions involved in a manner that is independent of the specific discourse.