This homework assignment has 3 problems, for a total of 74 points.

1. (28 points) Problems on agents
   
   A. Agents have an ability to enter into and break contracts
   B. A reactive agent can be understood as executing in a sense-decide-act loop
   C. Symbolic representation of knowledge is not a good match for application environments that consist of conventional information resources such as databases
   D. Understanding an agent’s internal state in terms of the traditional folk psychological cognitive concepts such as beliefs, desires, goals, and intentions has the advantage of providing a natural abstraction over low-level data structures
   E. Web services can potentially be understood to be the sensors of an agent who lives in an information environment
   F. A rational agent is a useful concept, but only where there is a direct action involving financial instruments
   G. An agent must always terminate or we would not be able to read its results
   H. Representations of services in OWL-S provide a basis for composing services through the application of automatic planning techniques
   I. The OWL-S control constructs such as sequence, split, and repeat provide a fundamentally different level of abstraction than traditional process constructs
   J. OWL-S service profile terms such as contact information and service name have no analog in traditional standards such as UDDI
   K. Rules are a way to express knowledge that is naturally executable
   L. One of the important de facto standard agent types is a shopping cart agent
   M. Backward chaining involves going from the consequent of an inference rule to its antecedents
   N. In general, in an ECA rule the event and condition parts of the rule would use variables introduced in the action

2. (30 points) Problems on multiagent systems
   
   A. We can think of the knowledge base underlying a TMS as consisting of a database of facts and rules
   B. The DTMS ensures consistency of shared beliefs among agents
   C. Once a belief is shared between two agents, the DTMS continues to ensure their consistency even if it might be better to forget about the sharing
   D. A TMS can refuse to store premises that are inconsistent with its prior conclusions
   E. A TMS can store an unjustified belief but only if that belief was previously justified and though its justification went away, that belief was never proved false
   F. In a system built using the DTMS if one agent represents a proposition (e.g., Bob is a preferred customer), then no other agent may represent its negation (e.g., Bob is not a preferred customer)
   G. A DTMS helps ensure robustness by undoing erroneous actions performed by a service
   H. The practically most effective notion of consistency across agents in a multiagent system would be global consistency
I. In a typical usage of rules, an outgoing message would be part of the event specification and an incoming message would be part of the action

J. A vendor who commits to providing refunds for returned goods suffers from the liability that a customer could claim a refund

K. The legal concepts are interesting to us because we need a way to specify interactions among autonomous parties and a way to ensure that they are compliant

L. Commitments, unlike beliefs, are conceptualized as a relationship between two parties and can thus serve as a basis for judging compliance

M. A commitment may be released by its creditor but generally not be created by the creditor: in this sense, the creditor has the power to remove the duty of the debtor but generally not the power to impose a new duty upon the debtor

N. An institution can be thought of as an organization that has a fixed identity of its own even though its membership may change (even entirely) over time

O. Organizational models such as virtual enterprises help ensure the coherence of computations even in the face of exceptions and the resulting impact on business transactions

3. (16 points) Problems on communications

A. We can place an incoming message as an antecedent of a rule and the commitment corresponding to the meaning of the message in the consequent of the rule

B. If a protocol has a public parameter adorned ⌜out⌟, then at least one of its constituent messages must have the same parameter bound ⌜out⌟, or else the protocol would not be enactable

C. If a protocol has a private parameter adorned ⌜out⌟, then one of its constituent messages must have the same parameter bound ⌜in⌟, or else the protocol would not be enactable

D. For a protocol enactment to complete, each of its constituent messages must have been sent and received

E. The local state of an agent playing a role in a protocol is generally different from the internal state of the same agent

F. A parameter must be adorned ⌜in⌟, ⌜out⌟, or ⌜nil⌟, and cannot be left unadorned

G. All the possible business meanings in any application domain can be captured by the handful of message types defined by existing agent communication languages such as FIPA’s

H. One of the benefits of employing commitments as a basis for communication protocols is that they provide a standard of correctness that is independent of implementation details