1. (20 points)
Give an EER diagram for a sports database which include the following
(indicate your assumptions):
(a) composite attribute
(b) multivalued attribute
(c) derived attribute
(d) attribute on a relationship
(e) Binary relationships with cardinality constraints 1:1, 1:N, N:M
(f) recursive relationship
(g) class/subclass relationship
(h) total and partial participation constraints
(i) overlapping and disjoint subclasses
(j) multiple inheritance

answer:
EER diagram is posted separately on the web page. Note the key and
other attributes have not been indicated in the diagram to make the
diagram look less crowded. However they should be included. The
attributes are indicated with the tables defined in the next problem.

2. (20 points)
Give relational schemas for the above EER diagram. You need NOT
indicate the domains. Your relation schemas must guarantee all con-
straints such as key constraints, referential integrity constraints, full
participation, disjoint subclasses, etc.

answer:
Only some of the entity and relationship types of the EER diagram are
mapped into tables here. Others can be done in a similar way.
Employee(Eid, FirstName, LastName, EmployedBy)
EmployeePhoneNumbers(Eid, HomePhone, OfficePhone)

Note, you have to create a separate table for multivalued attribute.
Manager(Eid)
Coach(Eid)
Player(Eid, Type)
Endorses(Eid, AgentId, CompanyId)
Type: {regular, Bench, other}
PlayFor(Eid, GameId, Score)
Team(TeamId, TeamName, hasLeague)
Stadium(Sid, Sname)

Foreign Key References:
Employee: EmployedBy is a foreign key reference to Team.
Team: hasLeague (non-Null field) is a foreign key reference to League
EmployeePhoneNumbers: Eid is a foreign key reference to Employee
Manager: Eid is a foreign key reference to Employee.
Coach: Eid is a foreign key reference to Employee.
Player: Eid is a foreign key reference to Employee.
Endorses:
Eid is a foreign key reference to Player
AgentId is a foreign key reference to Agent
CompantId is a foreign key reference to Company.
PlayFor:
Eid is a foreign key reference to Player
GameId is a foreign key reference to Game.

3. (10 points)
Indicate which one of the following two ER diagrams has the Qty attribute defined correctly. Justify your answer with some example entities for Suppliers and Parts.

Answer:
Diagram 2 is semantically correct. By definition Quantity supplied implies which supplier is supplying which parts in what quantity. Therefore, it will not make sense to have an entity juno: p1, Pname: n1, Qty: 50 if do not know what is this quantity 50 for.

ER diagram 1:
Sid  Sname   Pid  Pname  Qty  
--- |     | --- |     |     | Qty: Quantity supplied
  | |     | / \ | | /
  | |     | / \ | | /
  | |     | / \ | | /
  | |     | / \ | | /
  | |     | / \ | | /
|Suppliers|--Supplied--|Parts|

ER diagram 2:

<table>
<thead>
<tr>
<th>Qty</th>
</tr>
</thead>
</table>

Sid  Sname   Pid  Pname
--- |     | --- |     |
  | |     | / \ | |
  | |     | / \ | |
  | |     | / \ | |
  | |     | / \ | |
  | |     | / \ | |
|Suppliers|--Supplied--|Parts|

4. More Challenging Problem:

(10 points)

Consider the EER diagram (on next page) with **probationalStudents** and **GraduateInstructors** as examples of multiple inheritance. Note that **GraduateInstructors** are both Graduate students and instructors while **probationalStudents** are either (usually) graduate students or undergraduate students and not both.

Under usual semantics of student information, do you see any problem with multiple inheritance for **probationalStudents** in the above EER diagram. If there are problems, correct it by redrawing the EER diagram. In either case, you must justify your answer. Clearly indicate your assumptions.

answer:

Yes, there are problems. PROBATIONAL inherits attributes of both UNDERGRAD and GRAD which may be conflicting. Further, PRO-
Figure 1:

BATIONAL may be different for UNDERGRAD and GRAD. We can have two different subclasses; one is UNDERGRAD-PROBATIONAL a subclass of UNDERGRAD and GRAD-PROBATIONAL a subclass of GRAD.