6.1

address
driver_id   name
model
license   year
person   owns   car
location
report_number
driver   participated   accident
date
damage_amount

6.2 a.

sid   name
time   secno   room
student   takes   course offerings   courseno
program   marks   year   semester
eid   exam   time
name   place

b.

sid   name
time   secno   room
student   takes   course offerings   courseno
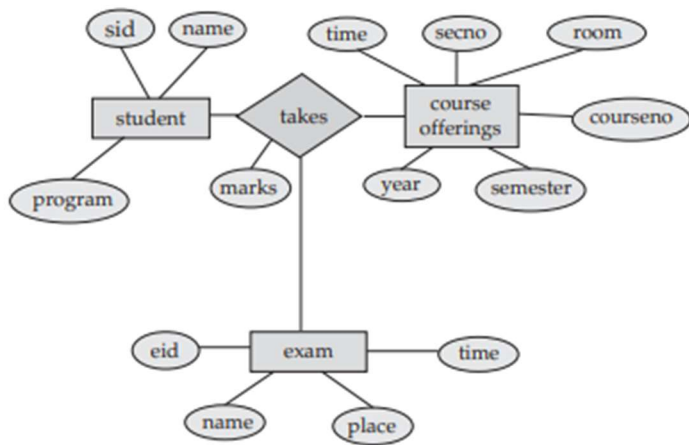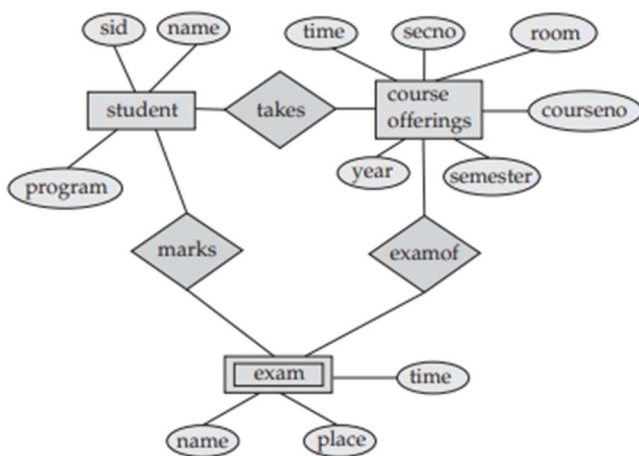program   year   semester
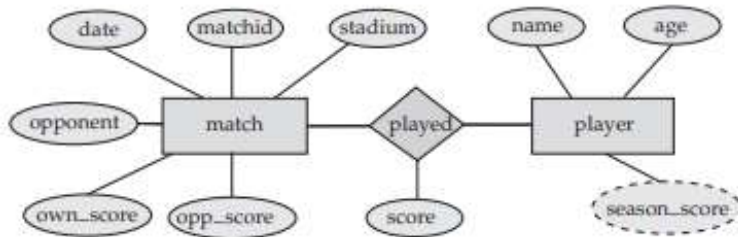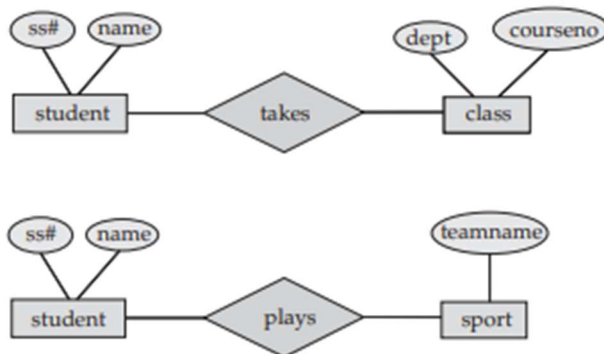marks   examof
exam   time
name   place

6.3

Figure 6.5 E-R diagram for favourite team statistics.

6.4

By using one entity set many times we are missing relationships in the model. For example, in the E-R diagram in Figure 6.6: the students taking classes are the same students who are athletes, but this model will not show that.

6.5

a. If a pair of entity sets are connected by a path in an E-R diagram, the entity sets are related, though perhaps indirectly. A disconnected graph implies that there are pairs of entity sets that are unrelated to each other. If we split the graph into connected components, we have, in effect, a separate database corresponding to each connected component.

b. As indicated in the answer to the previous part, a path in the graph between a pair of entity sets indicates a (possibly indirect) relationship between the two entity sets. If there is a cycle in the graph then every pair of entity sets on the cycle are related to each other in at least two distinct ways. If the E-R diagram is acyclic then there is a unique path between every pair of entity sets and, thus, a unique relationship between every pair of entity sets.

6.6

a. Let $E = \{e_1, e_2\}$, $A = \{a_1, a_2\}$, $B = \{b_1\}$, $C = \{c_1\}$, $R_A = \{(e_1, a_1), (e_2, a_2)\}$, $R_B = \{(e_1, b_1)\}$, and $R_C = \{(e_1, c_1)\}$. We see that because of the tuple (e_2, a_2), no instance of R exists which corresponds to E, R_A, R_B and R_C.

b. See Figure 6.11. The idea is to introduce total participation constraints between E and the relationships R_A, R_B, R_C so that every tuple in E has a relationship with A, B and C.

c. Suppose A totally participates in the relationhip R, then introduce a total participation constraint between A and R_A.

6.7

A weak entity set can always be made into a strong entity set by adding to its attributes the primary key attributes of its identifying entity set. Outline what sort of redundancy will result if we do so.

Answer: The primary key of a weak entity set can be inferred from its relationship with the strong entity set. If we add primary key attributes to the weak entity set, they will be present in both the entity set and the relationship set and they have to be the same. Hence there will be redundancy.