6.5 Let the following relation schemas be given:

$$R = (A, B, C)$$
$$S = (D, E, F)$$

Let relations $r(R)$ and $s(S)$ be given. Give an expression in the tuple relational calculus that is equivalent to each of the following:

a. $\Pi_A(r)$

b. $\sigma_{B=17}(r)$

c. $r \times s$

d. $\Pi_{A,F}(\sigma_{C=D}(r \times s))$

Answer:

a. $\{t \mid \exists q \in r\ (q[A] = t[A])\}$

b. $\{t \mid t \in r \wedge t[B] = 17\}$

c. $\{t \mid \exists p \in r\ \exists q \in s\ (t[A] = p[A] \wedge t[B] = p[B] \wedge t[C] = p[C] \wedge t[D] = q[D] \wedge t[E] = q[E] \wedge t[F] = q[F])\}$

d. {t | ∃ p ∈ r ∃ q ∈ s (t[A] = p[A] ∧ t[F] = q[F] ∧ p[C] = q[D]}

Warmup #2:

a.

TRC: {t | ∃ s ∈ works (t[person_name] = s[person_name] ∧ s[company_name] = “First Bank Corporation”)}
Datalog: query(X) :- works(X, “First Bank Corporation”, Y)

b.

TRC: {t | ∃r ∈ employee ∃ s ∈ works (t[person_name] = r [person_name]
∧ t[city] = r [city] ∧ r [person_name] = s[person_name]
∧ s[company_name] = ’First Bank Corporation’)}
Datalog: query (X, Y) :- employee (X, Z, Y), works(X, “First Bank Corporation”, W)

c.

TRC: {t | t ∈ employee ∧ (∃ s ∈ works (s[person_name] = t[person_name]
∧s[company_name] = “First Bank Corporation”∧s[salary] > 10000))}
Datalog: query (X, Y, Z) :- employee (X, Y, Z), works(X, “First Bank Corporation”, W), W > 10000

d.

TRC: {t | ∃ e ∈ employee ∃ w ∈ works ∃ c ∈ company
(t[person_name] = e[person_name]
∧ e[person_name] = w[person_name]
∧ w[company_name] = c[company_name] ∧ e[city] = c[city])}
Datalog: query (X) :- employee (X, Y, Z), works(X, V, W), company(V, Z)

7.3 **Answer:** The diagram is shown in Figure 7.4.

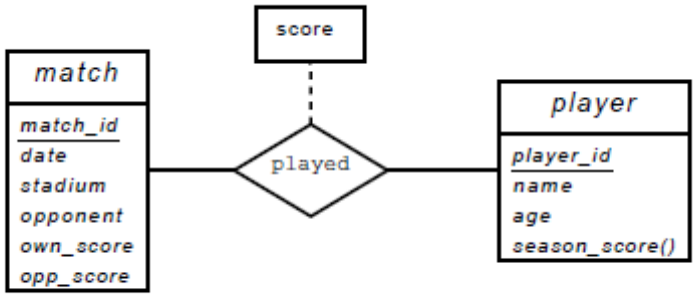

Figure 7.4 E-R diagram for favourite team statistics.

7.29 Explain the distinction between total and partial constraints.

Answer: In a generalization–specialization hierarchy, a total constraint means that an entity belonging to the higher level entity set must belong to the lower level entity set. A partial constraint means that an entity belonging to the higher level entity set may or may not belong to the lower level entity set.