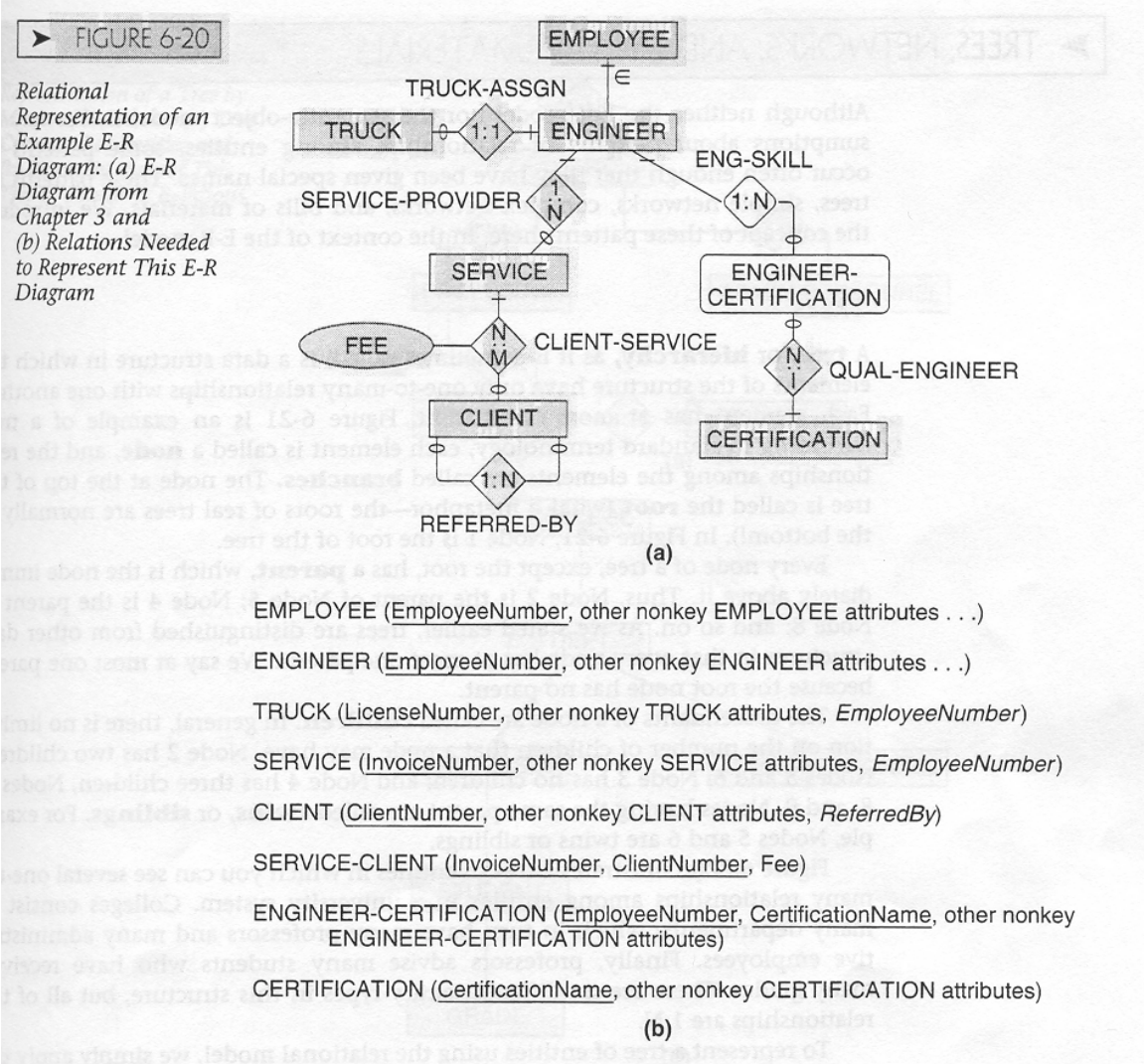

Figure 6-20(a) is a copy of an E_R diagram. It contains all of the basic elements used in E-R diagrams. To represent this diagram by means of relations, we begin by establishing one relation for each entity. We assume the keys as follows:

Relation	**Key**
EMPLOYEE	EmoloyeeNumber
ENGINEER	EmployeeNumber
TRUCK	LicenseNumber
SERVICE	InvoiceNumber
CLIENT	ClientNumber
ENGINEERING-CERTIFICATION	(EmployeeNumber, CertificationName)
CERTIFICATION	CertificateName

The next step is to examoine each of these relations against the normalization criteria. The example does not tell us what attributes must be represented, so we cannot determine the constraints. We will assume that these relations are in DK/NF, although in practice we would need to check out that assumption against the attribute lists and constraints. For now, we will focus on the representation of relationships. The relations and their key attributes are listed in **figure 6-20(b).**

The relationship between EMPLOYEE and ENGINEER is already represented because the relations have the same key, EmployeeNumber. ENGINEER and TRUCK have 1:1 relationship and so can be related by replacing the key of one in the other. Because a truck must be assigned to an employee, there will be no null values if we place EmployeeNumber in TRUCK, and so will do that.
For the 1:N relationship between ENGINEER and SERVICE, we place the key of ENGINEER in SERVICE. The relationship between SERVICE and CLIENT is M:N, so we must create an intersection relation. Because this relationship has an attribute, Fee, we add that attribute to the intersection relation. For the 1:n recursive relationship, REFERRED-BY, we add the attribute RefferedBy to CLIENT. The name *ReferredBy* implies, correctly, that the key of the parent—the one client doing the referring—is being placed in the relation.
Because ENGINEER-CERTIFICATION is ID-dependent on ENGINEER, we know that EmployeeNumber must be part of its key; thus the key is a composite(EmployeeNumber, CertificationName). The dependency relationship is 1:N and so will be carried by EmployeeNumber. Finally, the relationship between CERTIFICATION and ENGINEER-CERTIFICATION is 1:N, so we would normally add the key of CERTIFICATION(the parent) to engineer-certification. But that key is already part of the relation, so we need not do this.