Instructions

- Build your model using Oracle Data Modeler SQL Developer (ODM).
- Every entity type other than associative entity types must have at least one non-key attribute. If the situation description does not provide one, you should make one up.
- Your model must include **all attributes mentioned** in the situation description.
- Convert all many:many relationships to associative entity types.
- For all entity types – including associative – give them their own primary key. Do not use key migration
- Use proper cardinality notation for relationship degree and participation rules.
- In your completed design, you should name at least two relationships from both directions. All in all, you should therefore have at least four relationship names.

Question 1

Draw an ER diagram for the situation described below.

a Manuf Inc., (MI) manages many materials. Each material is of a specific material type (e.g., *raw material*, *finished good* or *trading good*); each material type could have many (or no) materials of its type. For each material and for each material type, MI stores an id and a name.

b Some of MI's materials are assembled out of others. One material could be part of several others (or none) and one material could also be made by assembling certain quantities of several others (or none).

c MI has many employees and for each MI stores an id, first name, last name and title. MI has many departments and each employee belongs to one. Each department can have many employees or none. For each department, MI stores an id and name. Each department belongs to one division and a division can have one or many departments under it.

d Every division and department has one manager (an employee). An employee can be the manager of at most one division or department.

e To manufacture materials, MI uses production orders (PRO). Each PRO has an id, creation-date and production date. Each PRO is for specific quantities of one or more materials. For example, we can have a production order to produce 20 units of material A, 50 units of material B and 200 units of material C.

f As production occurs against a production order, MI creates completion reports (CR). Each CR refers to one PRO, and each PRO can have zero or many CRs. (For example, for the example PRO above, we could have CRs after completing 10 units of material A, 25 units of material B and so on.

g Each CR is for a specific material and indicates the quantity completed and the report date.

h MI has many customers and each customer could place several sales orders, Each sales order could be for specific quantities of several materials at a specific unit price for each one. The same material can appear more than once in a sales order with a different delivery date. Each sales order is approved by an employee (or none) and has one employee (or none) who is assigned to track it.An employee could approve many sales orders (or none) and be assigned to track many sales orders or none.

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i MI makes shipments to customers against sales orders. Each sales order could result in zero or more shipments and each shipment is always for a specific sales order. Each shipment can be of specific quantities of various materials and has an id and a date of shipment.

j Each sales order could result in several payments and each payment is for a single sales order. Each payment specifies the date and the payment amount.