Answer any FOUR questions out of SIX. All questions carry equal marks.

Time: TWO hours

Answer any Section A questions you attempt in Answer Book A
Answer any Section B questions you attempt in Answer Book B

The marks given in brackets are indicative of the weight given to each part of the question.

Calculators are NOT allowed in this examination.
Wheelies Bicycle Manufacturer

Wheelies is a bicycle manufacturing company based in Holland. Wheelies buy all the parts for its bicycles from various suppliers around the world. The parts are then assembled in the factory in Holland to produce a number of different bicycle models.

Customers of Wheelies place orders for the bicycles they require over the Internet, and delivery is estimated to take three weeks. Each customer order can consist of more than one model of bicycle, and the required quantity of each model is also recorded on the order.

At the end of each week, a forecast is produced so the manufacturing department knows how many of each bicycle model it needs to produce in the following week. The forecast is based on the number of each model in stock and the quantity of each model ordered by customers. The forecast is also used to place purchase orders for parts from the suppliers so that all the necessary parts are available for the week’s production.

Each individual bicycle that is assembled has a unique code stamped on the frame. When a customer order is ready for dispatch, the frame code of each actual bicycle allocated to that customer order is recorded so that each bicycle can be traced to a particular customer. The customer order is dispatched together with a corresponding dispatch note by the Sales Department.
B6
a) Discuss briefly the purpose of sequence diagrams and state machines/charts.
   (4 marks)

c) Produce a sequence diagram for the use case ‘Place purchase order’ in the Wheelies system described above. A brief description of this use case is given below.

   “A list of all current suppliers is displayed by the system. A manager selects the required supplier from the list and the system displays the selected supplier’s details and a list of parts provided by this supplier. Next the manager creates the purchase order by selecting the relevant parts from the list of parts. The manager also enters the required quantity for each part.”
   (13 marks)
d) Produce a state machine/chart for the class Customer Order in the Wheelies system.

   You may assume that the objects of this class are affected by the following ‘events’ (listed below in alphabetical order):
   - Amend an order
   - Cancel an order
   - Despatch an order
   - Fulfil an order
   - Place an order
   (8 marks)

End of Examination
This question refers to the case study described on page 2 (i.e. Wheelies Bicycle Manufacturer). The table below shows an example of a list of customer orders:

<table>
<thead>
<tr>
<th>Order No:</th>
<th>Order date:</th>
<th>Customer No:</th>
<th>Customer tel. no:</th>
<th>Customer address:</th>
<th>Model code:</th>
<th>Model name:</th>
<th>Quantity:</th>
</tr>
</thead>
<tbody>
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<td>Model code:</td>
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<td>Model code:</td>
<td>Model name:</td>
<td>Quantity:</td>
</tr>
</tbody>
</table>

a) Normalise the table to produce a set of relations in the Third Normal Form. You must show all of your working, explaining each step.

(18 marks)

b) Draw an entity relationship diagram (ERD) based on the relations produced in part a).

(7 marks)