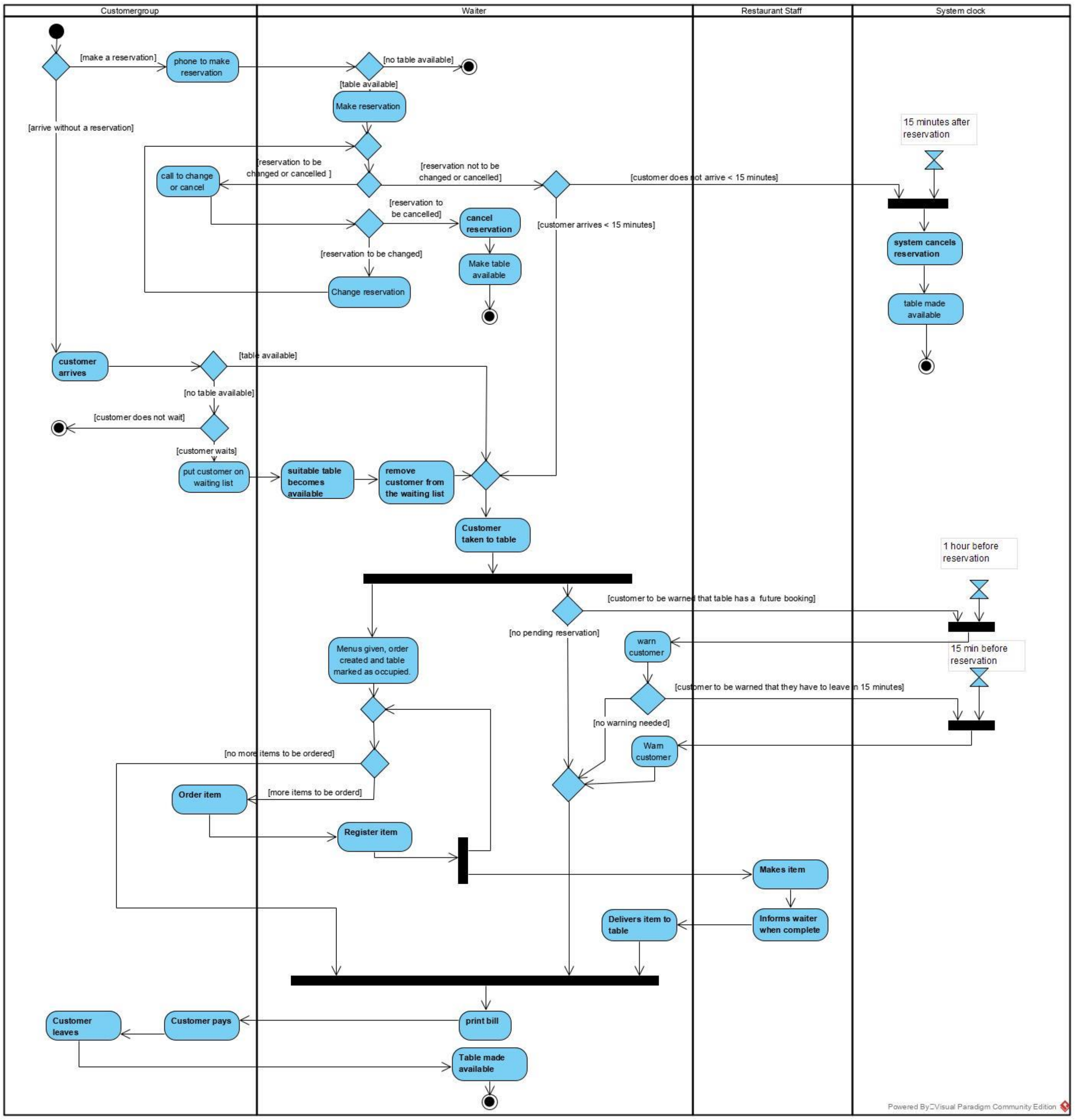
Software Systems Design Test 12 December 2019 – Solutions

More than 10% of the students did not read the instructions in the block on the front page.

Marks were given for correct parts of the drawing. No marks were deducted for errors.

Question 1 (Activity Diagram) (25%)

One suggested version of the activity diagram. Several other options are possible.



Customergroup
Waiter
Restaurant Staff
System clock
[make a reservation]
phone to make reservation
[no table available]
[table available]
Make reservation
[arrive without a reservation]
15 minutes after reservation
[reservation to be changed or cancelled]
[reservation not to be changed or cancelled]
call to change or cancel
[customer does not arrive < 15 minutes]
[reservation to be cancelled]
cancel reservation
[customer arrives < 15 minutes]
system cancels reservation
[reservation to be changed]
Make table available
Change reservation
table made available
customer arrives
[table available]
[no table available]
[customer does not wait]
[customer waits]
put customer on waiting list
suitable table becomes available
remove customer from the waiting list
Customer taken to table
1 hour before reservation
[customer to be warned that table has a future booking]
[no pending reservation]
Menus given, order created and table marked as occupied.
warn customer
15 min before reservation
[customer to be warned that they have to leave in 15 minutes]
[no warning needed]
[no more items to be ordered]
Warn customer
Order item
[more items to be orderd]
Register item
Makes item
Delivers item to table
Informs waiter when complete
Customer leaves
Customer pays
print bill
Table made available
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Notes: The way we use activity diagrams in this course is to map very high level activities in a business/section of a business/other environment. This is the first diagram that is drawn when you try and find out what the customers are doing in their business. Activity diagrams can be used on other levels of the design process as well, then they will be more focused and can contain more detail. Several of you included too much detail. The purpose is to understand what **activities** take place so that you can identify the ones that relate to the software system that needs to be built and you will, therefore, have to explore further.

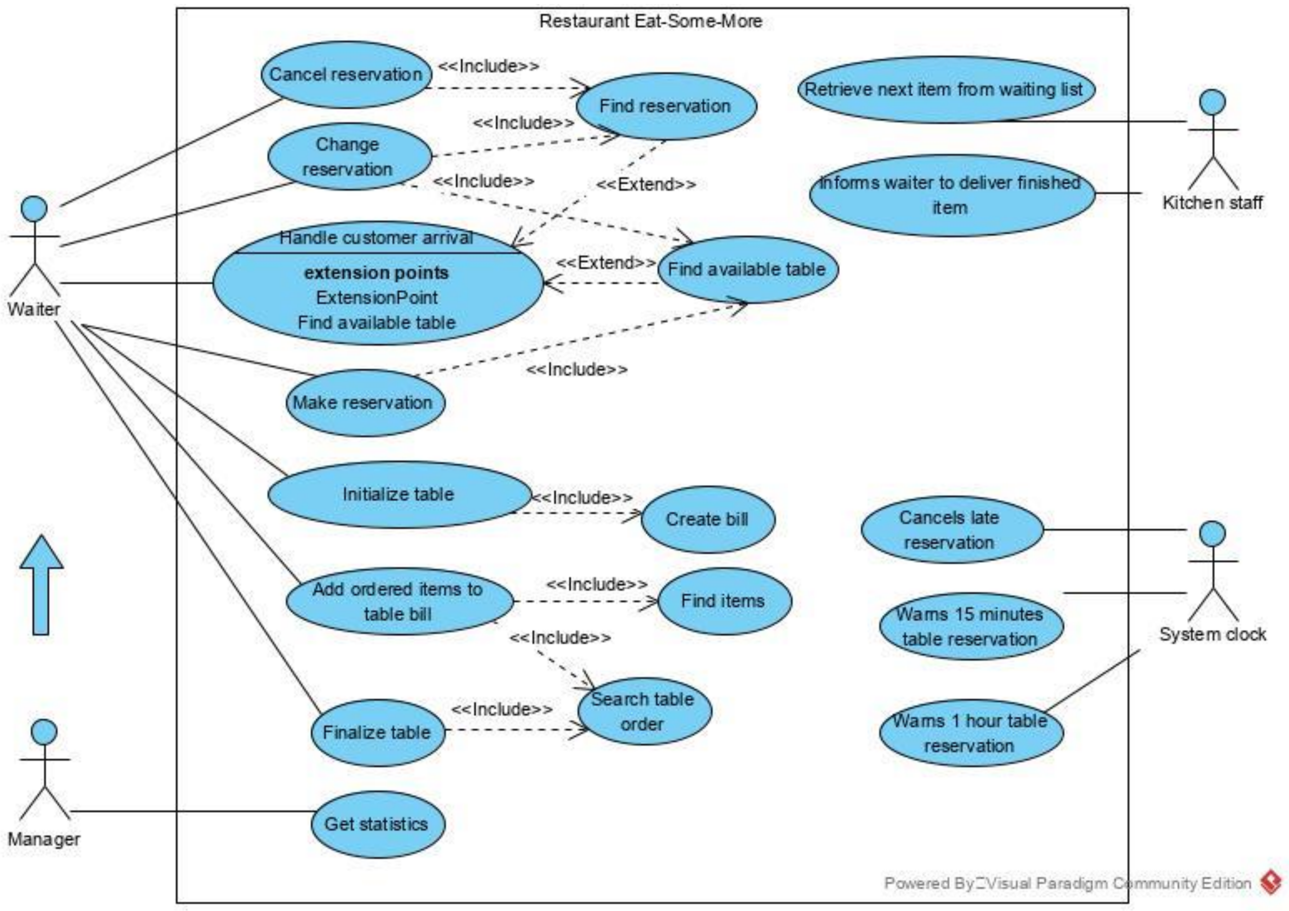
A common problem was that the 1 hour and 15 minutes warnings were included in the reservation section of the diagram. This has nothing to do with the reservation that a customer makes. It has to do with the fact that if a certain customer group is sitting at a table that is reserved by **another** customer these current customers will be warned, not the customer that has made the reservation. This happens in parallel with the current customer's ordering and eating.

A call for a late reservation is treated the same as a change in reservation in this diagram, because the same activities take place. This could be modelled in different ways.

Different versions can be drawn for this activity diagram. The marks were given for having the right types of activities and a sensible flow.

Question 2 (Use Cases) (30%)

Question 2a(Use Case Diagram) (20%)



Notes: The use case diagram is for high level activities that will be interactions between the user and the computer. Each bubble represents one interaction. The customer does not interact with the computer so is not included. A general mistake was to add low level functions which are part of other activities. For example, checking availability of tables is a subfunction of the main function which is to make or change a reservation, or handle customer arrival.

Question 2b(Use Case Description)(10%)

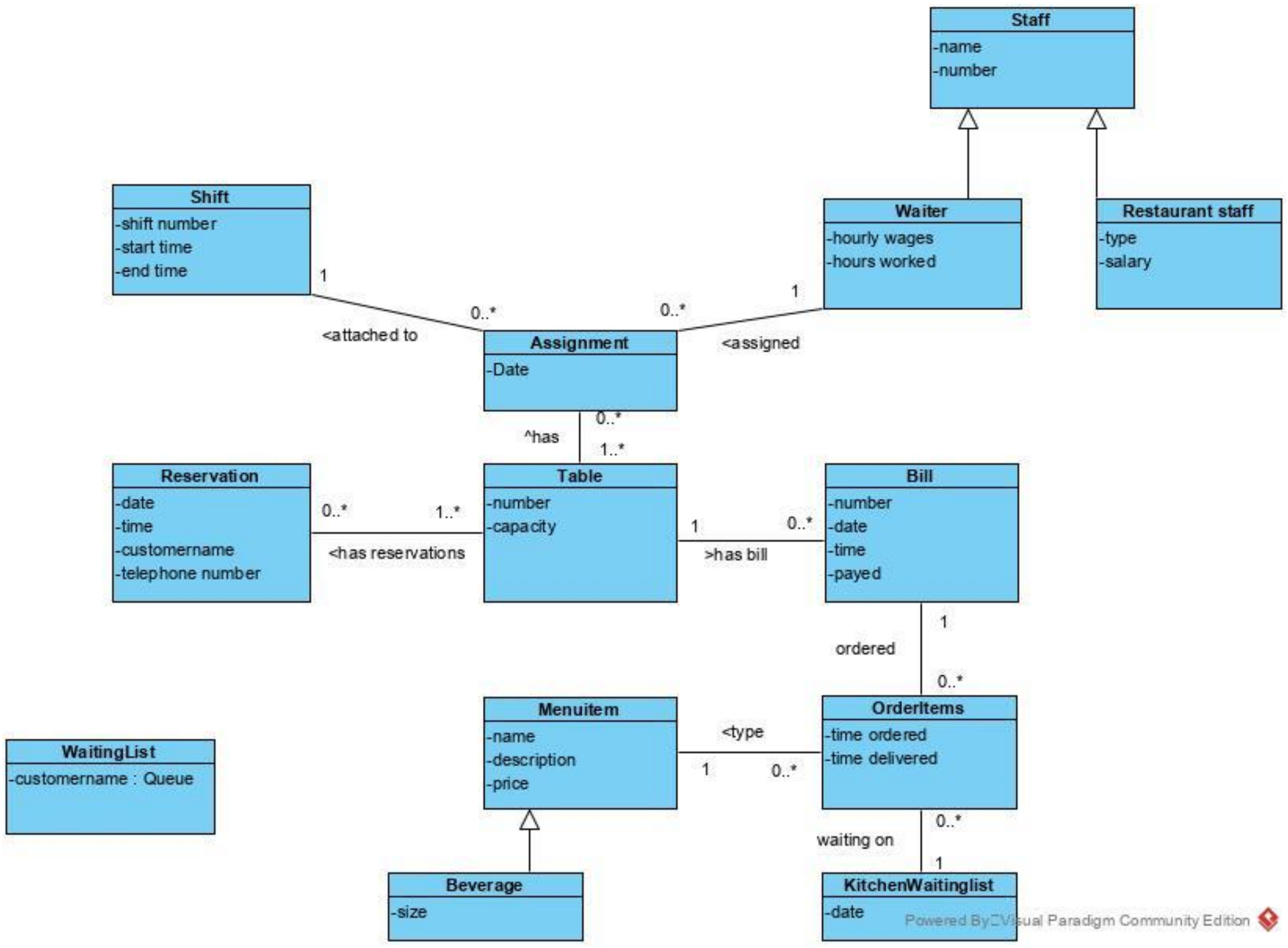
Waiter	System Response
1. Selects to make a reservation	2. Displays calendar
3. Selects date	4. Displays time selection screen
5. Selects time and duration	6. Displays table screen with table numbers, table sizes, colour coded whether available, pre-reserved or reserved
7a. Table available 7b. Table not available but wants to try another date/time 7c. Table not available and does not want to make another reservation	8a. Reserves table and displays customer information screen 8b. Repeat from 2 8c. Stop
9. Asks customer for the name and telephone number	10. Confirms reservation

7b and 7c can be done as Alternatives.

4, 5, 6 can be done in different ways.

Notes. Many did not read this question properly.

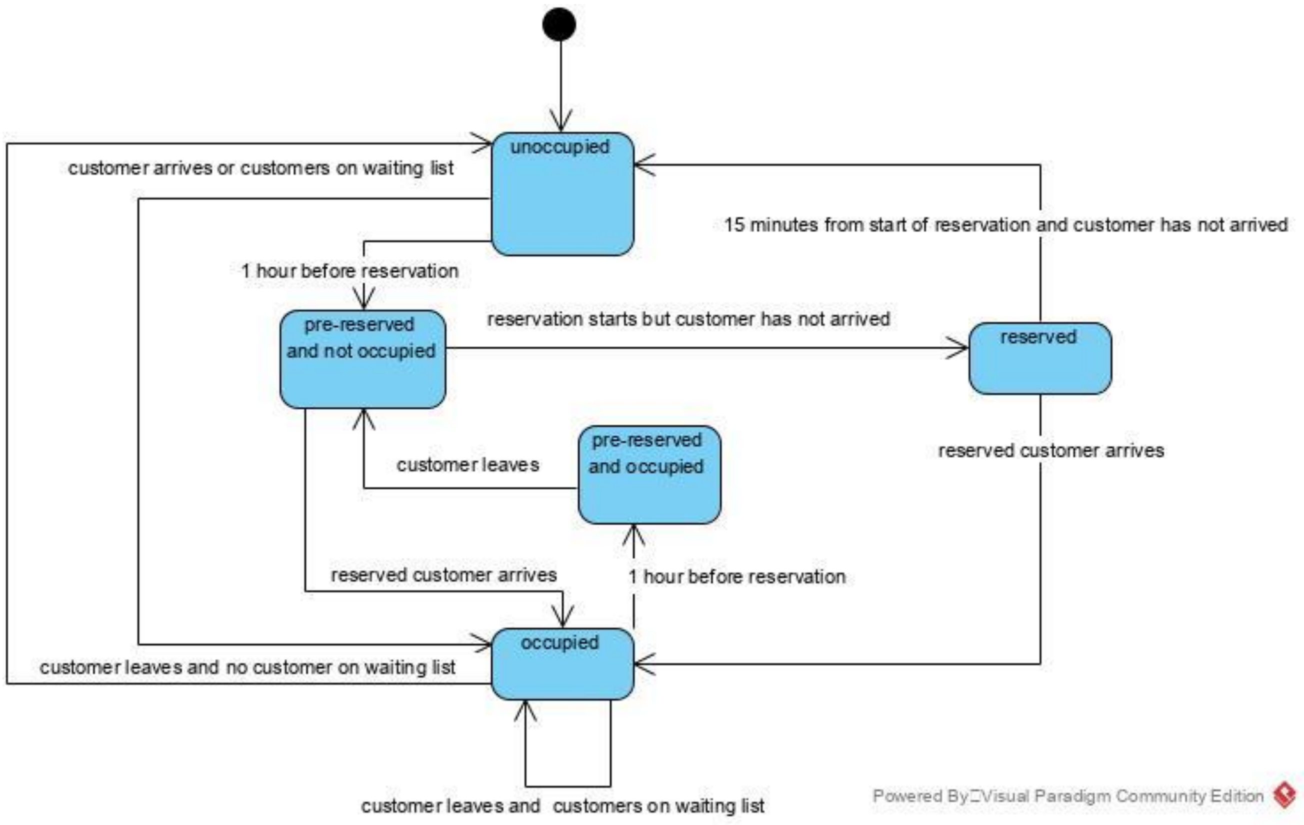
Question 3 (Class Diagram) (20%)



Notes: In this class diagram the manager was taken to be one of the restaurant staff. This could have been modelled differently depending on the functions of the manager.

The manager could have been included in several ways. The manager is not linked to Bills or Orders, as the statistics would just draw a summary from all data during a specific time period for the manager and is not linked to a certain manager.

Question 4 (State Machine Diagram)(10%)


unoccupied
customer arrives or customers on waiting list
15 minutes from start of reservation and customer has not arrived
1 hour before reservation
pre-reserved and not occupied
reservation starts but customer has not arrived
reserved
customer leaves
pre-reserved and occupied
reserved customer arrives
reserved customer arrives
1 hour before reservation
occupied
customer leaves and no customer on waiting list
customer leaves and customers on waiting list
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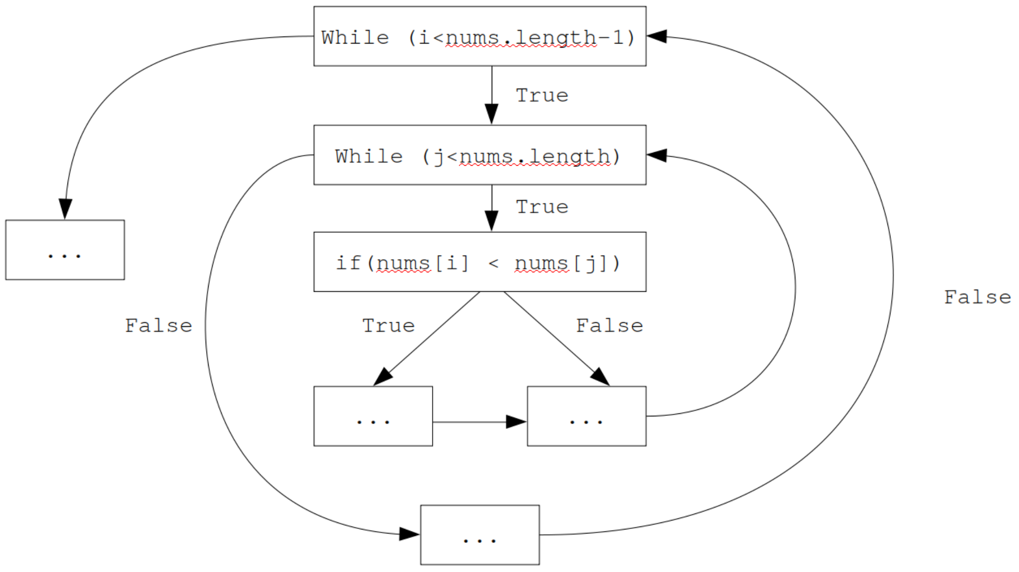
Question 5 (Software Metrics) (15%)

Q5a)
To get full marks, it is expected to have the correct answer alongside some way of showing how it was reached.

The main two ways were:

1) Drawing the correct graph and using the formula C = E - V + 2 = 4



2) The corollary from the slides: CC = # Binary Decisions + 1 = 4

Q5b)
Low cyclomatic complexity is considered good practice for code maintainability.

This can be achieved by overall reducing the amount of (binary) decision points, e.g. via splitting methods into sub-methods, or other code refactoring methods.

Mentioning specifics (like splitting up a method into smaller parts) is awarded more points than mentioning general statements (like 'rewrite the code').
Note in particular that 5b is to be answered independently from 5a, i.e. the question is not how to reduce the CC in 5a.