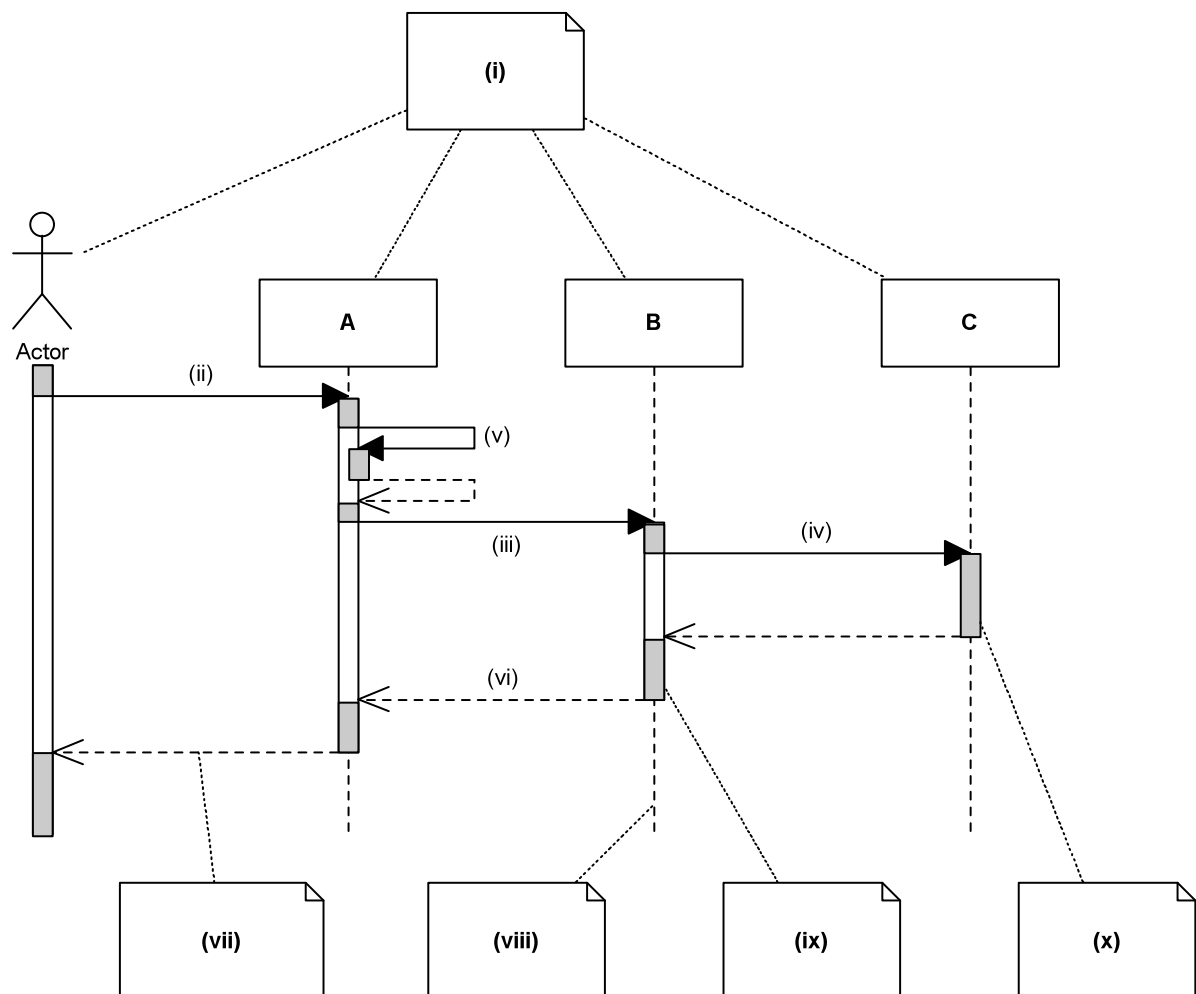## Exercises 9: Sequence Diagrams, State Machine Diagrams and Activity Diagrams

Exercise 1

Consider the UML diagram shown below and answer the questions that follow it.


(a) What kind of diagram is this and what are such diagrams usually used to represent?

(b) Does this diagram represent the structure or the behaviour of a system?

(c) What are the elements labelled (i)?

(d) What do the arrows labelled (ii), (iii) and (iv) represent?

(e) Which happens first: (ii), (iii) or (iv)?

(f) Explain the difference between a synchronous and an asynchronous message.

(g) Does this diagram contain synchronous or asynchronous messages?

(h) What does the arrow labelled (vii) represent?

(i) What does the dashed line labelled (viii) represent?

(j) What do the thin vertical rectangles labelled (ix) and (x) represent?

(k) Does the diagram represent a concurrent or a procedural interaction?

(l) If (vi) were replaced with a label, what would that label represent?

(m) What does the arrow labelled (v) represent and what would this correspond to if A was an object in an object-oriented system?

(n) What does the grey shading represent on the thin vertical rectangle labelled (ix)? Why is only part of the rectangle shaded?

(o) If A and C represent objects, is there necessarily an association in the class model for this system between the classes to which A and C belong? Explain your answer.

Exercise 2

(a) Consider the following state machine diagram which shows how the state of a Book object in a library software system changes between "borrowable" and "not borrowable".
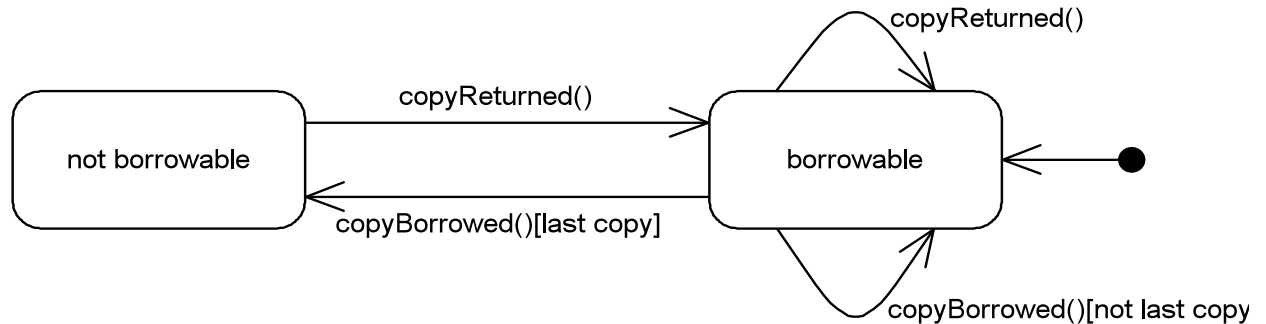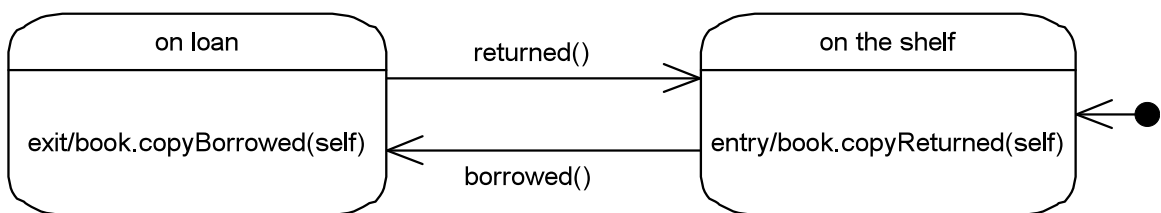

(i)   According to this diagram, what state does a Book object start off in, "borrowable" or "not borrowable"?

(ii) Under what conditions does the state of a Book object change from being "borrowable" to "not borrowable"?

(b) Consider the following diagrams which relate to a Copy object in a library software system and answer the questions that follow.
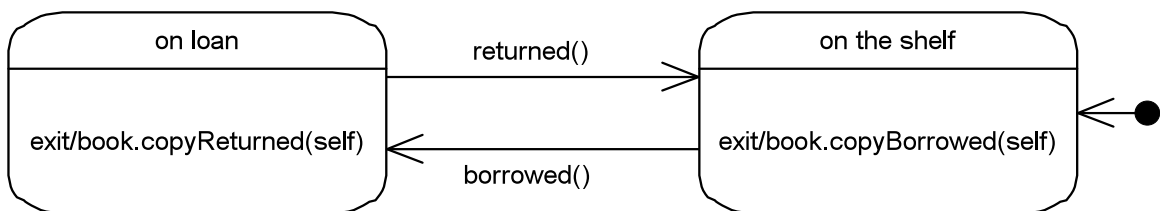
(1)
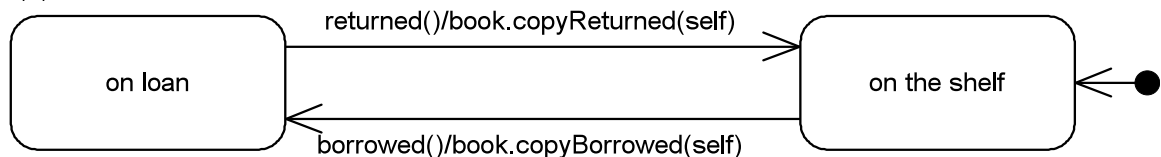
(2)

(3)

(i)   Which two of the three diagrams, (1), (2) and (3), are equivalent?

(ii)   In diagram (2), under what conditions is the
`book.copyBorrowed(self)` message sent?

(iii)   To what does the argument "self" refer?

(c) A hardware update wizard can be in three states as follows:

1.   Displaying a hardware update window.

2.   Searching for new hardware.

3.   Displaying new hardware found.

The wizard starts by displaying a hardware update window. While displaying this window, the user can press a "Search" button to cause the wizard to start searching for new hardware, or the user can press a "Finish" button to leave the wizard. While the wizard is searching for new hardware, the user may cancel the search at any time. If the user cancels the search, the wizard displays the hardware update window again. When the wizard has completed searching for new hardware, it displays the new hardware found.

Draw a state machine diagram that represents the function of the hardware update wizard just described