



4.2.3 Stacks

- 1) A photo-editing program allows a user to repeatedly undo their previous actions and redo an action that has been undone.

The **undo** action results in the state changing from the current state to the state previous to the user's most recent action. The user is able to keep using the **undo** action to go back through all previous states.

The **repeat** action results in the user's most recent action being applied again. The user is able to keep using the **repeat** action to apply the most recent action multiple times. The **repeat** action will only work when there is a most recent action that can be applied again.

- a) Explain how a single stack can be used in the implementation of the repeat action **and** the undo action.

[5 marks]

- **Stack / data structure is used to store the (user's) actions**
Accept. by implication;
- **Each time an action is completed it is pushed/added onto the top of the stack;**
- **unless it is an undo (or repeat) action;**
- **When repeat action is used, the top item from the stack is used to indicate the action to complete**
// when repeat action is used, the result of peek function is used to indicate the action to complete;
Reject. implication that top item of stack is popped/deleted from stack – unless it is clear it is subsequently pushed/added back to the stack
Accept. when repeat action is used a copy of the top item from the stack is pushed/added to the top of the stack
- **When undo action is used the top item is popped/removed from the stack of actions;**

- b) State the type of error that occurs if the user tries to complete an undo action before they have completed any other actions.

[1 mark]

- **Stack empty (error) // (stack) underflow;**





2) **Figure 1** shows data that has been stored in a stack implemented using an array S.

Figure 1

[7]	
[6]	
[5]	
[4]	
[3]	
[2]	Jerry
[1]	Jane
[0]	Nigel

a) What value will be returned by applying the peek operation to S?

[1 mark]

- **Jerry;**

b) What value will be returned by applying the pop operation to S?

[1 mark]

- **Jerry;**

c) Explain how a single stack can be used to reverse the order of the items in a queue.

[2 marks]

- **Repeatedly remove the front item from the queue and push it on to the stack until the queue is empty;**
- **Until the stack is empty, repeatedly pop items from the stack and add them to the rear of the queue;**

