Here is a quick overview of what I did for my design:

1. Unplace the cells in the region

```
for {set i 0} {$i<=49} {incr i} {
        for {set j 32} {$j<=89} {incr j} {
                unplace_cell [get_cells -of [get_sites SLICE_X[expr $j]Y[expr $i]]]
        }
}
```

2. Use an array to store the available columns

```
set data(0) 36
set data(1) 40
.
.
.
set data(9) 76
set data(10) 82
```

3. Place cells

```
set count 0
for {set i 0} {$i<=49 && $count<=255} {incr i 2} {
        for {set j 0} {$j<=10 && $count<=255} {incr j} {
                place_cell design_1_i/…/inout2_1_inferred__0_i_1 SLICE_X[expr $data($j)]Y[expr $i]/D6LUT
                place_cell design_1_i/…/inout2_1_inst SLICE_X[expr $data($j)]Y[expr $i]/C6LUT
                place_cell design_1_i/…/inout2_3_inst SLICE_X[expr $data($j)]Y[expr $i]/B6LUT
                place_cell design_1_i/…/inout2_5_inst SLICE_X[expr $data($j)]Y[expr $i]/A6LUT
                incr count
        }
}
```

The detailed steps are on the next page.

To manually place components, you can either use the GUI or the TCL command window in Vivado.

Note: net=routing; cell=LUT or FF

The GUI is good for small scale placement, here is how to do it:

1. Run Implementation on your design
2. Open Implemented Design, and you will see a window called “Device”
3. Locate the component you want to manually place in the Device window
    a. I did this by going to the Netlist window, locate the component I am looking for
    b. There will be two folders in the component’s subtree, one is called Nets, one is called Leaf Cells
    c. Open the Leaf Cells folder, select everything inside there
    d. The LUTs and FFs will be selected and highlighted in white in the Device window
4. Now you can drag the component to anywhere that is not occupied

The TCL command is good for larger scale placement, especially if the placement follows some pattern so that you can use loops to place them.

The two commands required are

unplace_cell [CELL_NAME]

place_cell CELL_NAME SITE

The general workflow is this:

1. Run Implementation on your design
2. Open Implemented Design
3. Decide where you want to place the component
4. Unplace all the cells in that region
    a. Determine the slice’s x-coordinate and y-coordinate
    b. Unplace cells by running this command:
        i. unplace_cell [get_cells -of [get_sites SLICE_Xx-coordinateYy-coordinate]]
        ii. For example, if the slice is: x=100, y=200, the command is
            unplace_cell [get_cells -of [get_sites SLICE_X100Y200]]
    c. Use loops to unplace more cells if necessary
5. Find the names of the cells in the component
    a. Go to the Netlist window, locate the component you are looking for
    b. There will be two folders in the component’s subtree, one is called Nets, one is called Leaf Cells
    c. Open the Leaf Cells folder
    d. Select a cell, right click, select Cell Properties
    e. The name attribute is the name of the cell (it looks like a path to the cell)
6. Place cells
    a. Each site in a slice has a name, you can see the name by placing your cursor over the site

b. place_cell design_1_i/…/inout2_1_inst SLICE_X72Y30/C6LUT
    i. This command places a cell called “design_1_i/…/inout2_1_inst” at a site (C6LUT) in the slice (coordinate=72,30)
c. Use loops to place more cells if necessary

Since I chose places that have identically routing resources, I did not do anything for the routing manually. However, I did find a possible example of doing manual routing, but I did not try it.

Here is the link to the PDF:
https://www.xilinx.com/support/documentation/sw_manuals/xilinx2019_2/ug986-vivado-tutorial-implementation.pdf

The example is in Lab3/Step5.

Reference:

https://www.xilinx.com/support/documentation/sw_manuals/xilinx2019_2/ug986-vivado-tutorial-implementation.pdf

http://www.cs.cmu.edu/~tanja/Lectures/JRTkDoc/JanusBasics/BasicTcl.html