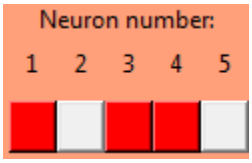
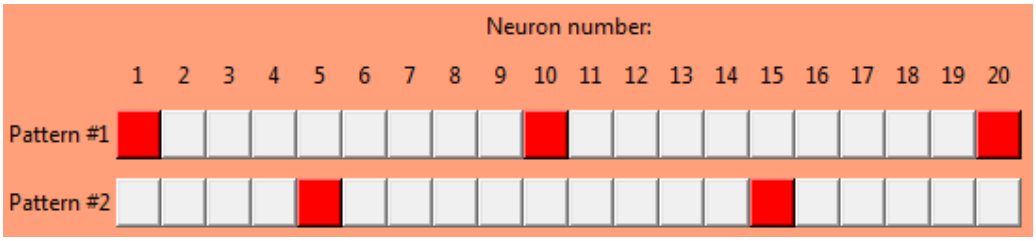
The following quiz was completed by 14 Ohio Wesleyan students both before and after working through the exercises accompanying the simulation program described in “An Interactive Simulation Program for Exploring Computational Models of Auto-Associative Memory."

In the following questions, neural activation patterns represent a set of neurons that activate (fire action potentials) in response to a sensory stimulus. For example, the following neural activation pattern represents neurons 1, 3, and 4 firing, while neurons 2 and 5 do not fire:



Question 1



For the two neural activation patterns shown above and the network connectivity shown at right, which connections should be removed in order to enable successful pattern separation? (There may be more than one connection. Choose all of them.)

_____ Connection #1

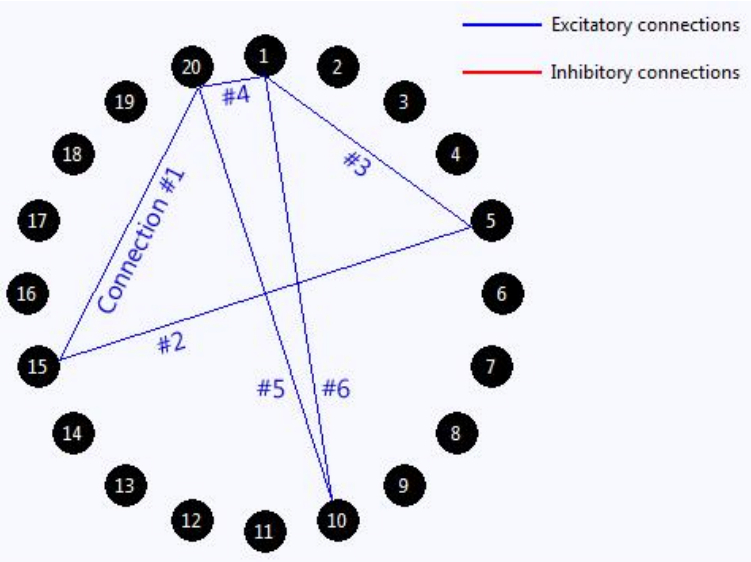
_____ Connection #2

_____ Connection #3

_____ Connection #4

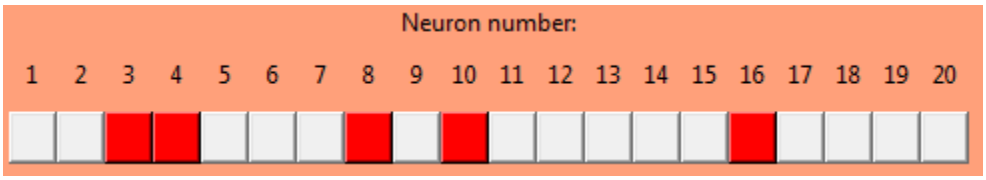
_____ Connection #5

_____ Connection #6

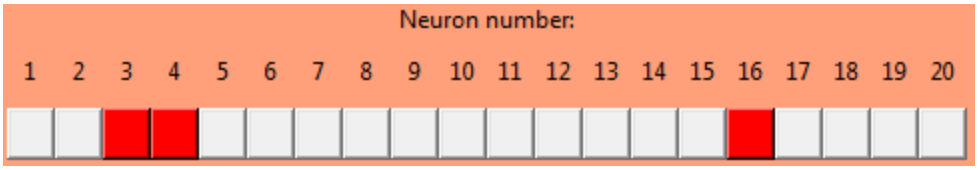


Question 2

Suppose that the following neural activation pattern was observed in response to a sensory stimulus:



Then a corrupted version of the original stimulus induces the following neural activation pattern:



How should the connectivity of the network shown at right be modified in order to enable successful pattern completion?

(Check all required modifications; there may be more than one. Assume only excitatory connections.)

_____ Delete connection btwn. neurons 3 and 4

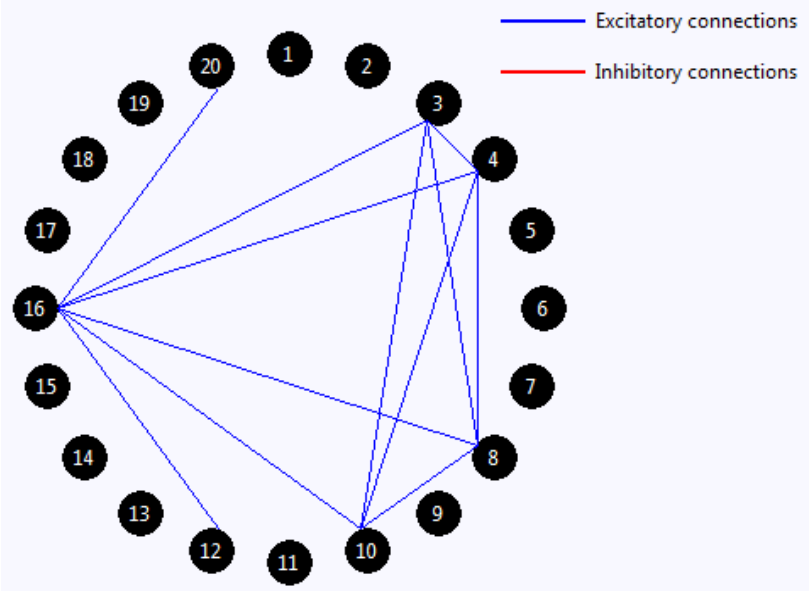
_____ Delete connection btwn. neurons 10 and 4

_____ Delete connection btwn. neurons 16 and 8

_____ Delete connection btwn. neurons 16 and 10

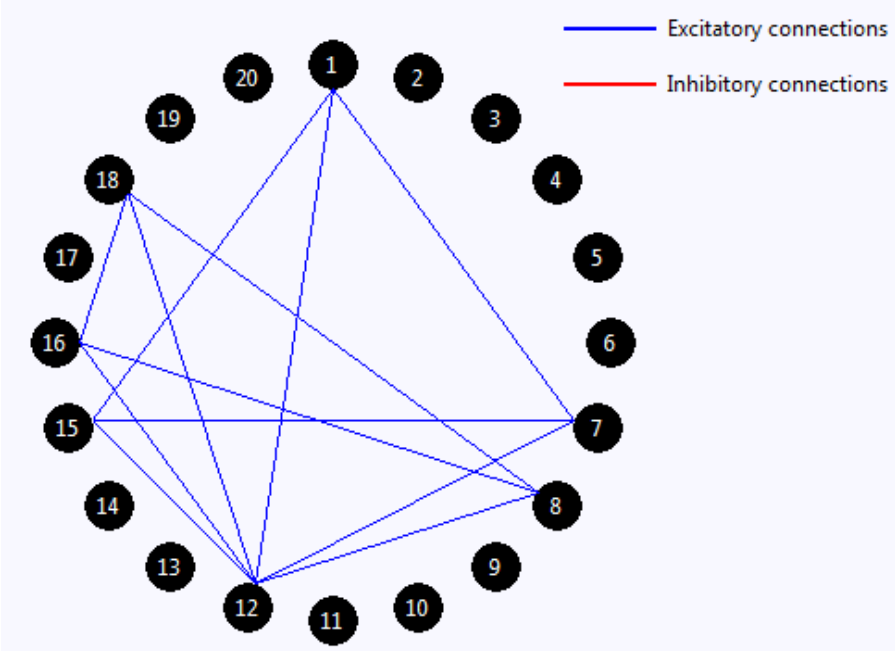
_____ Delete connection btwn. neurons 16 and 12

_____ Delete connection btwn. neurons 16 and 20

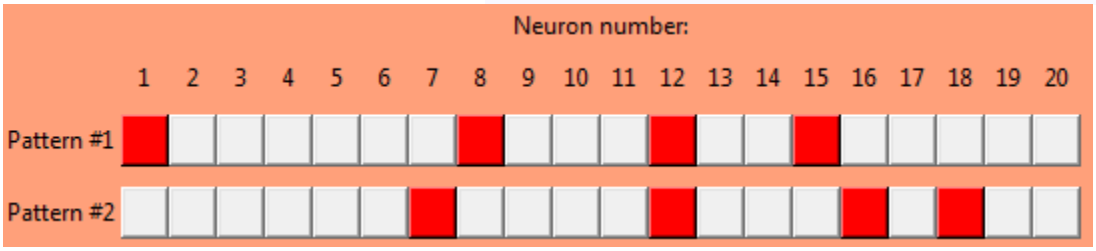


Question 3

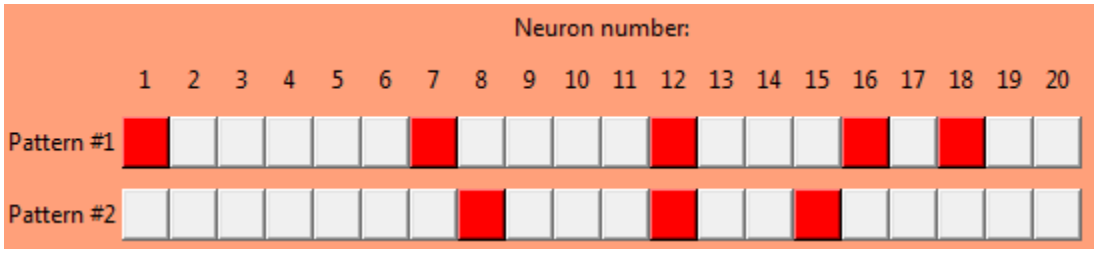
Which of the following sets of sensory patterns would lead to the network connectivity shown to the right, assuming the Hebbian learning rule? (Circle the one correct answer.)



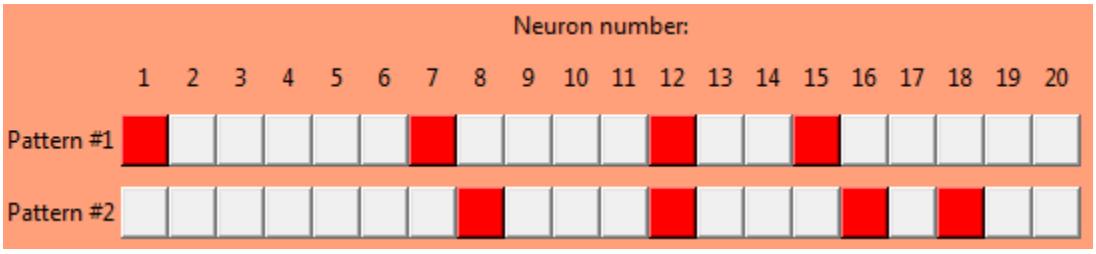
A.



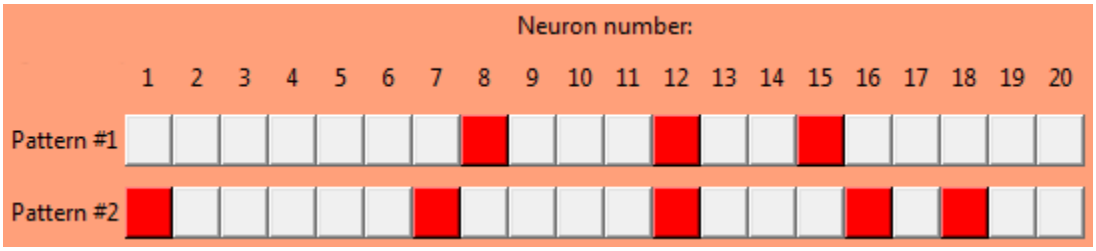
B.



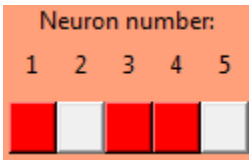
C.



D.

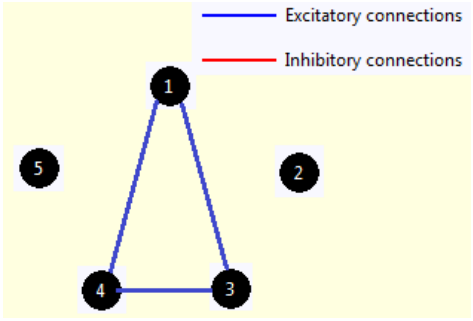


Question 4

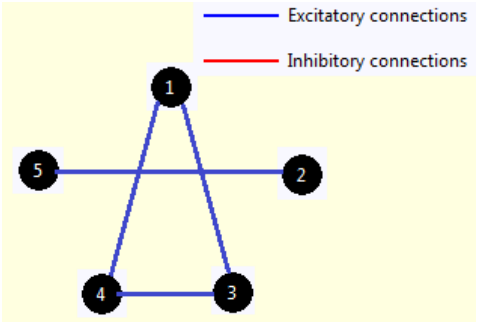


Which network connectivity would result from the Hopfield learning rule being applied to the above sensory pattern?

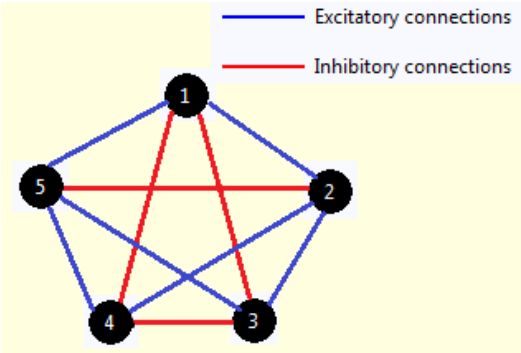
A.



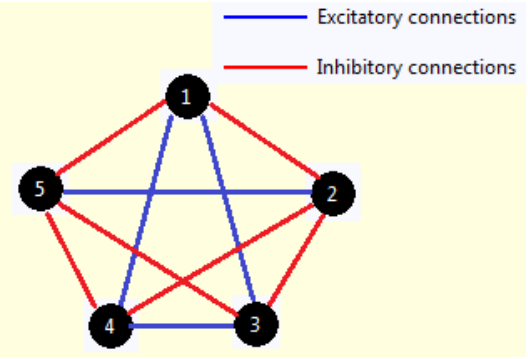
B.



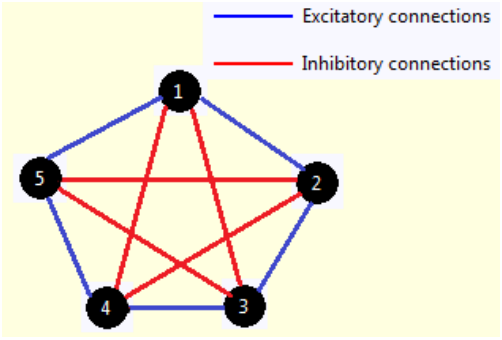
C.



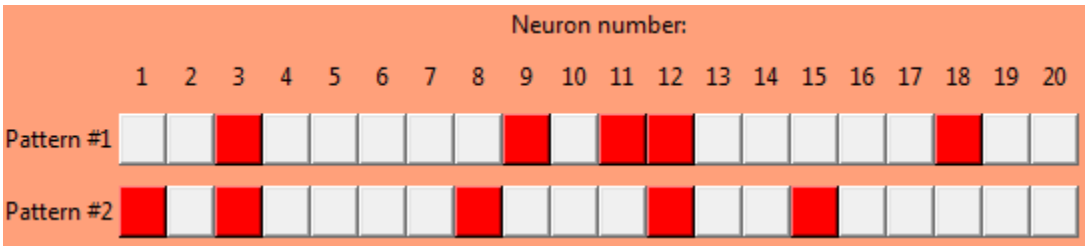
D.



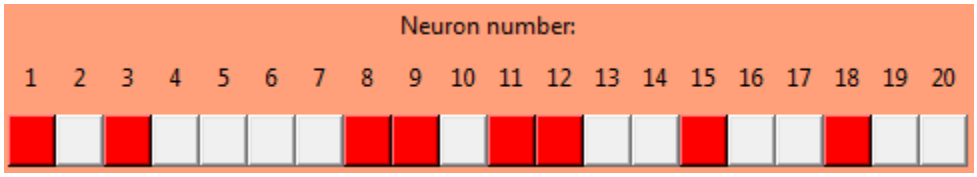
E.



Question 5



If neural activation pattern #1 encodes the face of George Clooney and neural activation pattern #2 encodes the face of Brad Pitt, then what does the following pattern most likely encode?



a. A grainy image of George Clooney.

b. A grainy image of Brad Pitt.

c. A face that has some features of George Clooney's face and some features of Brad Pitt's face.

d. A face that looks nothing like either George Clooney's face or Brad Pitt's face.