1) The problem with using a binary step function to determine the output of a TLU in a backprop network is that:

a) the slope of the function is undefined at the point of transition
b) the function is not one-to-one, so there isn’t a unique input value corresponding to a particular output value
c) it is impossible to compute the inverse of the function, so you cannot determine the range of possible inputs corresponding to a particular output value
d) the output is higher for values above the threshold than it is for values below the threshold
e) it is much more time-consuming to compute the output of binary step function than a bipolar sigmoid function

2) Which of the following conclusively demonstrated that Rosenblatt’s perceptron could "do nothing interesting?" {5 points}
   a) Donald Hebb
   b) Rosenblatt and Gildenstern
   c) McClelland and Rumelhart
   d) Minsky and Papert
   e) Sejnowski and Grossberg
   f) none of the above

3) A "bias" is:
   a) an extra input whose value is fixed
   b) necessary in classification problems where the hyperplane of separation passes through the origin
   c) unnecessary in networks using the Hebb learning rule
   d) an extra value added to the connection weights of all inputs on each iteration
   e) all of the above

4) "Sensitivity analysis" refers to:
   a) a determination of which combinations of inputs in a trained neural net most significantly affect output
   b) the use of new training cases further to refine the predictive accuracy of an already-trained neural network
   c) parameterization of a neural net through the use of information provided by a genetic algorithm
   d) any hybrid system one component of which is a neural network
   e) a particularly gentle and helpful form of therapy

5) I need to train a neural net so that it learns to predict $x$ from $y$ and also $y$ from $x$, at the same time and using the same training cases. The most appropriate choice would be:
   a) a standard backpropagation network
   b) a Jordan net
   c) an Elman net
   d) an counterpropagation net
   e) a Hebb net
Neural Net Example

In a neural net with three input neurons and 2 neurons in the only hidden layer, the following connection weights obtain:

[assume wxy represents the weight of the connection between neuron x in the input layer, and neuron y in the hidden layer]

\[ w_{11} = .5 \quad w_{12} = .7 \]
\[ w_{21} = .7 \quad w_{22} = .4 \]
\[ w_{31} = .8 \quad w_{32} = .25 \]

For the current testing case, the output of neuron 1 in the input layer is .5, the output of neuron 2 in the input layer is 1, and the output of neuron 3 in the input layer is 1.

6) The total input to neuron 2 in the hidden layer is is:
   a) .53  b) .25  c) .75  d) 1.0  e) none of the above

7) Assuming the use of a sigmoid squash function with a threshold of theta = 1, the output *from* neuron 2 in the hidden layer to the single neuron in the output layer will be:
   a) \( 1/(1+e^{-x}) \)  b) 0.0  c) 1.0  d) 0.5  e) none of the above

8) The slope of the sigmoid squash function of any given neuron\( j \) can easily be calculated as:
   a) the second derivative of the function, \( 1/(1-e^{-x}) \)
   where "-" is exponentiation
   b) output\([j]\)
   c) \( (1 - \text{total_input_into}[j]) \)
   d) \( (1 - \text{output}[j]) \)
   e) output\([j]\) * (1 - output\([j]\))
   f) none of the above

9) The network described above (3 input neurons, 2 hidden neurons, 1 output neuron) might possibly be appropriate for learning:
   a) to predict tomorrow's weather, on the basis of today's average temperature, humidity and barometric pressure
   b) to predict tomorrow's Dow Jones Industrial Average on the basis of the DJIA from the day before yesterday, yesterday and today
   c) to find the bit product of three binary values
   d) to find the product of four integers
   e) none of the above

10) I am training a neural net to predict the GPA of an Eckerd student from his or her major. Let us assume for the sake of argument that there are 20 majors at Eckerd. Information about a student's major should be represented by:
   a) one input neuron of type real, allowed to range between 1 and 20
   b) one input neuron of type real, allowed to range between 0.0 and 1.0, where .05 = major 1, .10 = major 2, etc.
   c) twenty binary input neurons, where each one is set to 1 if the corresponding major applies, and 0 otherwise
   d) an integer that corresponds to the number of letters in the name of the major
   e) none of the above