Name and Student ID:

Pattern Recognition and Analysis BBL514E, Jan 12, 2010, Final Exam (25%).

1 25	2 20	3 15	4 25	5 15	Total

Name:
Number:
Signature:
Duration: 120 minutes.
Write your answers neatly in the space provided for them. Write your name on each sheet.
Books, notes and cellphones are closed.
Good Luck!

QUESTIONS

QUESTION1) [25 points, 5 points each] What is (use at most three sentences per question, you can use drawings, formulas, etc. also):

a) the difference between a Bayesian Network and a Markov Random Network?

b) the difference between bagging and Adaboost?

c) the difference between k-means clustering and Gaussian Mixture Model (GMM) clustering?

d) the Naïve Bayes classifier?

e) the backpropagation algorithm?

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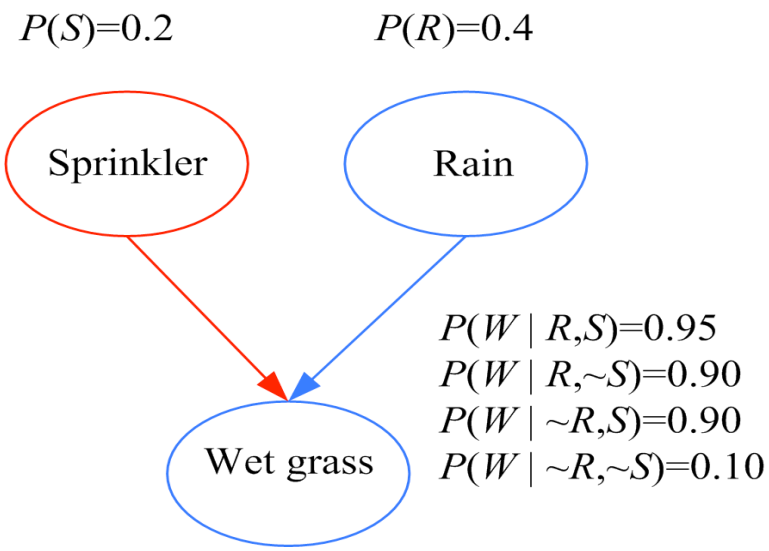
QUESTION 2) [20 points]
Consider the Bayesian network given below and compute P(R|W).



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QUESTION 3) [15 points]

The following are the actual outputs and outputs produced by 7 classifiers for a classification problem. The outputs on 3 training instances and 2 test instances are given.

Use **bagging** to compute the outputs for the test instances. What outputs do you produce and what is the confusion matrix for the test samples? Show all steps of your solution.

	Actual	$g_1(x)$	$g_2(x)$	$g_3(x)$	$g_4(x)$	$g_5(x)$	$g_6(x)$	$g_7(x)$
Train	0	0	1	0	0	0	1	1
	1	0	1	1	0	1	0	0
	0	1	0	0	1	1	0	0
Test	1	1	1	1	0	0	1	0
	0	0	1	0	1	0	0	0

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QUESTION 4. [25 points]
Given an HMM $\lambda = (\pi, A, B)$ with state transition probability matrix A, emission probabilities B, initial state probabilities π, and two states and two symbols red and green,

$\pi = [0.3\ 0.7]^T$

$$A = \begin{vmatrix} 0.8 & 0.2 \\ 0.7 & 0.3 \end{vmatrix}$$

	red	green	
B=	0.7	0.2	State1
	0.1	0.1	State2

What is the $Pr(O|\lambda)$ where O = {green,green,green}

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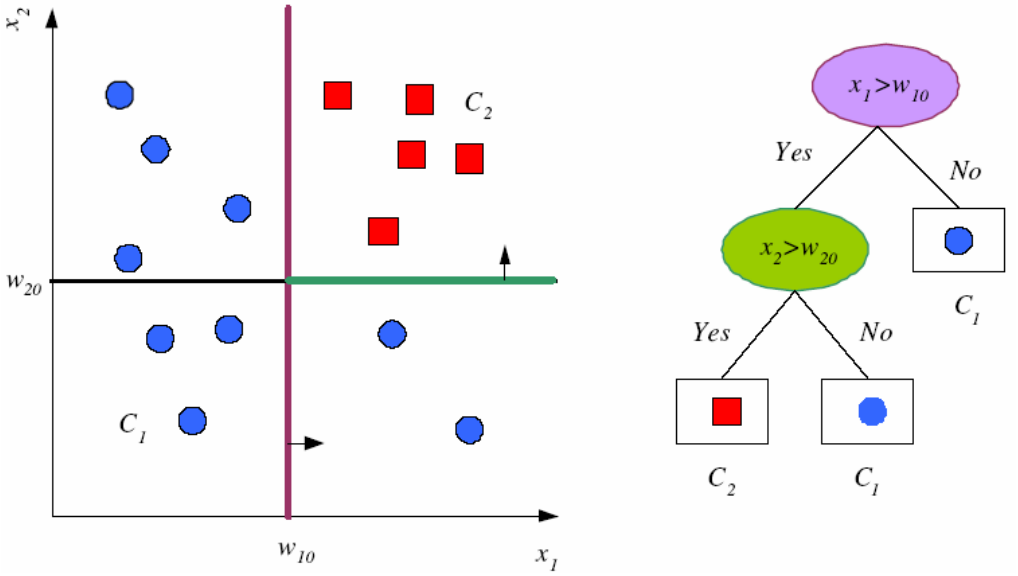
QUESTION 5. [15 points]

[7 points] Given the decision tree below and w10=10, w20=20, which class does the data point $[25,23]^T$ belong to?



[8 points] How do you produce a decision tree using using the entropy as the impurity criterion? Assume that you have a classification problem and binary inputs.

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Extra sheet