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MANIPAL INSTITUTE OF TECHNOLOGY

MANIPAL

A Constituent Institution of Manipal University

VI SEMESTER B.TECH. (INFORMATION TECHNOLOGY / COMPUTER AND COMMUNICATION ENGINEERING)

END SEMESTER EXAMINATIONS, APRIL/MAY 2017

PROGRAM ELECTIVE III: PATTERN RECOGNITION [ICT 4020]

REVISED CREDIT SYSTEM
(29/04/2017)

Time: 3 Hours MAX. MARKS: 50

Instructions to Candidates:

- Answer ALL the questions.
- Missing data, if any may be suitably assumed.

1A. For class conditional probabilities of independent binary features for two category problem, derive the equations for w_i and w_0. Using the same, construct the Bayesian decision boundary for $P(\omega1)=0.6$, $P(\omega2)=0.4$ and $p_i=0.7$, $q_i=0.4$ for i=1,2,3. 5

1B. With a neat diagram, explain the components of pattern recognition system. 3

1C. Explain the concept of bagging. How bagging can be used to improve the accuracy of the classifier model? 2

2A. Define chain code. Explain how it is represented. Illustrate with an example. How the limitations of chain code be overcome? 5

2B. How pattern classifiers are represented using discriminant functions? Arrive at the function for the same and relate it with respect to minimum risk classifier. Explain the decision rule for dichotomizer classifier. 3

2C. How does pattern recognition find its application in face recognition problem? Explain identification of criminals in a photograph as an example. 2

3A. For the given set of feature vector X, use K-L transform to check whether they are correlated or decorrelated. 5
X={(3,4),(4,3),(4,4),(4,5),(5,4),(5,5),(5,0),(6,5)}.

3B. Define the following terms with respect to Bayesian belief network with a suitable example. 3
i) Node
ii) Link
iii) Conditional probability table

3C. Write the decision rule for the probability of error, when it is represented in terms of a priori probability and likelihood state of nature for two category case. 2

4A. Construct a deterministic finite automata for the following scenarios: 5
i) To recognize the strings of a's and b's except those having the substring aab.
ii) To accept the strings of a's and b's ending with ab or ba.

4B. What are the two type of features for recognizing objects? Explain with an example. Also explain the various other ways in which features can be extracted. 3

4C. Derive Bayes formula from joint probability distribution. Write the Bayes decision rule for discrete features. 2

5A. What are the different types of states in Hidden Markov Model? Construct the HMM having three states. Also, discuss the three central issues. 5

5B. Explain the following terms with an example 3

i) Supervised Learning
ii) Unsupervised Learning
iii) Reinforcement Learning

5C. Obtain a regular expression to accept a language containing at least one a and at least one b where $\Sigma=\{a,b,c\}$. 2