Reg. No.

MANIPAL INSTITUTE OF TECHNOLOGY
MANIPAL

A Constituent Institution of Manipal University

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

MAKEUP EXAMINATIONS, JUNE 2017

PROGRAM ELECTIVE III: PATTERN RECOGNITION [ICT 4020]

REVISED CREDIT SYSTEM
(22/06/2017)

Time: 3 Hours   MAX. MARKS: 50

Instructions to Candidates:

❖ Answer **ALL** the questions.

❖ Missing data, if any may be suitably assumed.

1A. Consider the class conditional probabilities of independent binary features of two category problem. Construct the Bayesian decision boundary for $P(\omega 1)=P(\omega 2)=0.5$ and $p_1=p_2=0.8$, $p_3=0.5$ and $q_1=q_2=q_3=0.5$.   **5**

1B. With a neat diagram, explain design cycle of a pattern recognition system.   **3**

1C. What is the goal of boosting? How is it achieved?   **2**

2A. Draw the chain code and differential chain code for the shapes given in Fig. Q.2A. Assume unit distance in each direction. Arrow indicates the starting point.
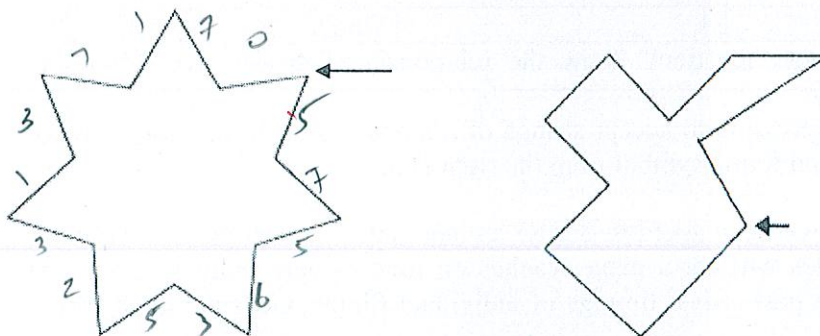

Fig. Q.2A   **5**

2B. Write the generalizations for Bayesian continuous features. Consider a two category case problem of Bayesian continuous features, arrive at the decision rule in terms of posterior probabilities and loss functions.   **3**

2C. Explain how pattern recognition finds its application in
   i) Medical signal analysis
   ii) Speech recognition   **2**

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

3B. Considering Figure Q.3B, given that a fish is wide and caught during spring, how do you classify the fish for minimum expected classification error?
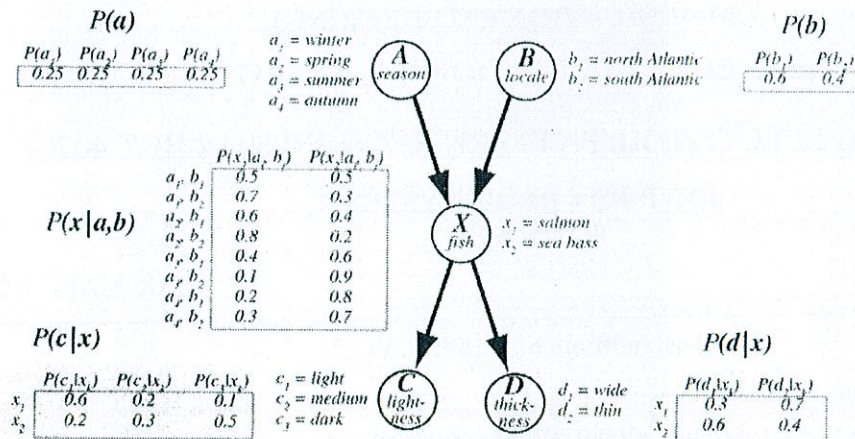

Figure Q.3B   **3**

3C. Consider the Figure Q.3B, find the joint probability that the fish is caught in winter, in the South Atlantic and is a salmon and wide.   **2**

4A. Data from a questionnaires survey is given in Table Q.4A with two attributes, durability and strength. Classify whether a special paper tissue with X1=3 and X2=7 is good or not using k-nearest neighbor algorithm (k=3).

Table Q.4A

X1(Durability)	X2(Strength)	Y(Classification)
7	7	Bad
7	4	Bad
3	4	Good
1	4	Good

5

4B. What is zero-one loss function? Show the relationship between risk factor and posterior probability.   **3**

4C. Obtain a regular expression to accept strings of **a**'s and **b**'s such that third symbol from the right is **a** and fourth symbol from the right is **b**.   **2**

5A. Assume that you have been asked to design an automated system for a newly built airport which decides whether a plane reaches on time or gets delayed. You have been given only the past arrival timings of individual flights. Generate the decision rule based on:
　　i)　　A priori probability
　　ii)　　Class conditional density function
　　iii)　　Bayes formula   **5**

5B. Analyze the decision boundary obtained for the discriminant function g(x) by taking independent binary features   **3**

5C. Write the applications of finite state machines for
　　i)　String processing and string matching
　　ii)　Bit synchronization in communication   **2**