

Roll No.: \_\_\_\_\_

Amrita Vishwa Vidyapeetham  
Amrita School of Engineering, Coimbatore  
B.Tech. First Assessment Examinations – January 2019  
Sixth Semester  
Computer Science and Engineering  
**15CSE361 Pattern Recognition**

[Time: Two hours

Maximum: 50 Marks]

CO	Course Outcomes
CO01	Understand the working principles of pattern recognition system and algorithms
CO02	Apply statistical methods for decision making
CO03	Understand non parametric decision making system
CO04	Apply and evaluate Non-metric approach for real world problems
CO05	Apply and analyze unsupervised learning methods for real world problems.

**Answer all Questions**

**PART A**

**(5 x 2 =10 Marks)**

1. Differentiate discrete and continuous random variables. [CO01]
2. Write the cumulative distribution function of continuous random variable. [CO01]
3. State the necessary conditions for the Poisson distribution when the random variable is discrete. [CO01]
4. The sample space of a random experiment is {a, b, c, d, e} with probabilities 0.1, 0.1, 0.2, 0.4, and 0.2, respectively. Let A denote the event {a, b, c}, and let B denote the event {c, d, e}. Determine the following:  $P(A)$ ,  $P(B)$ ,  $P(A \cup B)$ ,  $P(A \cap B)$ . [CO02]
5. State the difference between Training set and Test set? [CO01]

**PART B**

**(4 x 10 =40 Marks)**

6.
  - a) Decide whether a discrete or continuous random variable is the best model for each of the following variables:
    - i. The time until a projectile return to earth.
    - ii. The number of times a transistor in a computer memory changes state in one operation.
    - iii. The volume of gasoline that is lost to evaporation during the filling of a gas tank.
    - iv. The outside diameter of a machined shaft.
    - v. The current in an electronic circuit. [5] [CO01]
  - b) Each sample of water has a 10% chance of containing a particular organic pollutant. Assume that the samples are independent with regard to the presence of the pollutant. Find the probability that in the next 18 samples, exactly 2 contain the pollutant. [5] [CO02]

7.

- a) The number of telephone calls that arrive at a phone exchange is often modeled as a Poisson random variable. Assume that on the average there are 10 calls per hour.
- What is the probability that there are exactly five calls in one hour? [2.5] [CO02]
  - What is the probability that there are three or fewer calls in one hour? [2.5] [CO02]
- b) A new medical procedure has been shown to be effective in the early detection of an illness, a medical screening of the population is proposed. The probability that the test correctly identifies someone with the illness as positive is 0.99, and the probability that the test correctly identifies someone without the illness as negative is 0.95. The incidence of the illness in the general population is 0.0001. Consider you are taking the test, and the result is positive. What is the probability that you have the illness? [5] [CO02]

8.

- a) A desk lamp produced by The Luminar Company was found to be defective ( $D$ ). There are three factories ( $A, B, C$ ) where such desk lamps are manufactured. A Quality Control Manager (QCM) is responsible for investigating the source of found defects. This is what the QCM knows about the company's desk lamp production and the possible source of defects:

Factory	% of total production	Probability of defective lamps
A	0.35	0.015
B	0.35	0.010
C	0.30	0.020

Now, if a randomly selected lamp is defective, what is the probability that the lamp was manufactured in factory A? And, if a randomly selected lamp is defective, what is the probability that the lamp was manufactured in factory B? [5] [CO02]

- b) Feature  $X$  is normally distributed for class A with mean 0 and standard deviation 1. For class B, the feature  $X$  is normally distributed with mean 2 and standard deviation 2 where  $P(A)=1/4$  and  $P(B)=3/4$ . Find the optimal decision regions. [5] [CO02]
9. Two binary tests,  $X$  and  $Y$  are relevant in determining three disease states A, B, and C, which are mutually exclusive. The probabilities that  $X$  is positive, given states A, B and C are 0.3, 0.5 and 0.7 respectively. For test  $Y$ , these numbers are 0.8, 0.2, and 0.6. The prior probabilities of A, B, and C are  $1/6$ ,  $1/3$ , and  $1/2$ . What are the probabilities of A, B, and C if  $X$  is positive and  $Y$  is negative? [10] [CO02]

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