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Roll No. ....

SIXTH SEMESTER

B. Tech.

MID SEMESTER EXAMINATION

March-2024

**CO-324 PATTERN RECOGNITION**

Time: 1:30 Hours

Max. Marks: 25

Note: All questions are compulsory. All questions carry equal marks.

- Q.1** Draw the design cycle of a PR system for action recognition system. Also, explain noisy and missing features.
- Q.2** Consider a 2-class PR problem with feature space  $\mathcal{X}$ . Let  $p_1$  and  $p_2$  be the prior probabilities. Let the class conditional density for Class-1 be exponential with parameter  $\lambda$ , and that for Class-2 be normal with mean  $\mu$  and variance  $\sigma^2$ . Derive the Bayes classifier for the 0-1 loss function. Specify any one special case when this Bayes classifier would be a linear discriminant function.
- Q.3** Explain Bayesian decision theory for minimum-error-rate classification. Also explain the conditional Risk.
- Q.4** Suppose we have  $n$  iid samples from a geometric distribution. Find the maximum likelihood estimator for the parameter  $p$ . (If  $X$  is geometrically distributed, its probability mass function is:  $f_X(x) = (1-p)^{x-1} p$ ,  $x = 1, 2, \dots$ ). For the same problem, suppose we want to use Bayesian estimation. What would be the conjugate prior? What is the MAP estimate for  $p$  in this case?
- Q.5** Let  $x$  have an exponential density

$$f(x, \sigma) = \begin{cases} \frac{x}{\sigma^2} e^{-\frac{x}{\sigma^2}} & x \geq 0 \\ 0 & \text{otherwise} \end{cases}$$

Suppose that  $m$  samples are drawn independently according to  $f$ . Derive the equation of maximum likelihood estimate.