MANIPAL INSTITUTE OF TECHNOLOGY
MANIPAL
(A constituent unit of MAHE, Manipal)

II SEMESTER M.TECH.(DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING) END SEMESTER EXAMINATIONS, JUNE 2022

SUBJECT: PATTERN CLASSIFICATION (CSE - 5006)

REVISED CREDIT SYSTEM

(29/06/2022)

Time: 2:00 to 5:00 pm MAX.MARKS: 50

INSTRUCTIONS TO CANDIDATES:-

- Answer **ALL** the questions.
- Missing data may be suitable assumed.

Q.no	Questions	Marks	CLO	AHEP4 LO	Blooms
1 A.	As you train your model, you realize that you have insufficient training data. What kind of model will be used where each pattern is generated. Analyze the scenario and provide with proper justification.	3M	1	M1, M3	3
1 B.	Sorting the incoming Fish on a conveyor belt, according to species using optical sensing. Illustrate with a neat diagam, the architecture involved in pattern classification for the scenario mentioned.	5M	1	M1, M3	2
1 C.	Describe with an example, evidence pooling and problem of invariances.	2M	1	M1, M3	2
2 A.	If we have an observation x for which $P(\omega1\|x)$ is greater than $P(\omega2\|x)$, we would naturally be inclined to decide that the true state of nature is $\omega1$. Similarly, if $P(\omega2\|x)$ is greater than $P(\omega1\|x)$, we would be inclined to choose $\omega2$. Justify this decision procedure, to calculate the probability of error whenever we make a decision.	3M	2	M2, M3	3
2 B.	Which density function is an appropriate model, where the feature vectors x for a given class ω_i are continuous valued, randomly corrupted versions of a single prototype vector μ_i. Derive mathematically, the given scenario.	4M	2	M2, M3	4,6

2 C.	Consider the two-category problem in which the components of the feature vector are binary-valued and conditionally independent. Illustrate with an example.	3M	2	M2, M3	2
3 A.	Using Bayesian estimation technique, calculate the posterior density function for the case $p(x\|\mu) \sim N(\mu,\sum)$.	5M	4	M2, M3	6
3 B.	How Bayesian method differs from Maximum Likelihood. Compare with valid case.	2M	4	M2, M3	5
3 C.	Describe the different sources of classification error, when designing a classifier by maximum likelihood estimation or Bayesian method.	3M	4	M2, M3	2
4 A.	Construct the sufficient statistics for the d - dimensional normal case with fixed co-variance but unknown mean, for the case $p(x\|\theta)\sim N(\theta,\sum)$ using the factorization theorem.	4M	2	M2, M3	6
4 B.	Evaluate the average probability of error for the nearest neighbour rule.	3M	3	M1, M3	5
4 C.	Discuss the different algorithmic techniques for reducing the computational complexity in nearest neighbour search.	3M	3	M1, M3	2
5 A.	Obtain the equation for class of polynomial discriminant functions. What kind of separating surfaces can arise in the general multivariate Gaussian case.	3M	5	M1, M3	6
5 B.	Write the process of classification in Boltzmann's Learning.	3M	5	M1, M3	2
5 C.	Describe with the neat diagram the architecture of a probabilistic neural network. Illustrate with an example.	4M	5	M1, M3	2