Ref. no. PG/CSE/T/127C/2024

Master of Computer Science and Engineering Examination, 2024

1st Year 2nd Semester Examination

Pattern Recognition

Time: 3 hrs. **Total Marks: 100**

Answer any 5 Questions

All questions carry equal marks **[5x20=100]**

Q1 (a) Discuss the working principle of Linear as well as Non-Linear Support Vector Machine (SVM). What are the limitations of linear SVM and how can this be overcome?

(b) Derive the equation of the maximum margin for an SVM.

(c) With suitable examples define the kernel that is used in an SVM.

Q2 (a) What are Bayes and Naïve Bayes rules. Discuss how to design a Classifier based on Naïve Bayes rule.

(b) Briefly describe the KNN clustering algorithm. How to choose the value of 'K' for KNN Algorithm?

Q3 (a) Demonstrate how to use Genetic Algorithm (GA) for designing

(i) Single objective classifier.

(ii) multi-objective clustering technique.

(b) What is the difference between wrapper and filtering methods for feature selection.

Q4 (a) Describe the working principal of k-Mean and DBSCAN clustering Algorithms

(b) What is cluster validity index?

(c) Discuss the following two Hierarchical clustering algorithms:

(i) Single Linkage

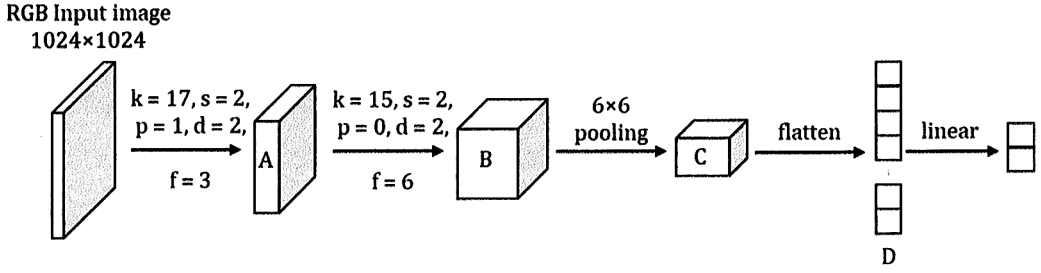
(ii) Complete Linkage

Q5 (a) With suitable example discuss how to compute the following

(i) Co-variance matrix? (ii) Eigen Vector and (iii) Eigen Value.

(b) Discuss Principal Component Analysis (PCA) and demonstrate how it works?

Q6 (a) Given the following convolutional neural network (CNN) for a binary image classification task, calculate the dimensions (number of channels, width, height) of the tensors marked A, B, C, and D in the diagram below, where k = kernel size, s = stride, p = padding, d = dilation rate.



(b) What are activation functions? Why are activation functions needed in CNN?

(c) Explain the concept of stride in convolutional operations.

Q7 (a) What is the role of the discriminator and generator in a Generative Adversarial Network (GAN)?

(b) What is mode dropping and mode collapse in the context of generative adversarial networks?

(c) Write a short note on the differences between a linear autoencoder and PCA.