Question Paper

Exam Date & Time: 10-Jan-2024 (02:30 PM - 05:30 PM)

MANIPAL ACADEMY OF HIGHER EDUCATION

SEVENTH SEMESTER B.TECH MAKEUP EXAMINATIONS, JAN 2024

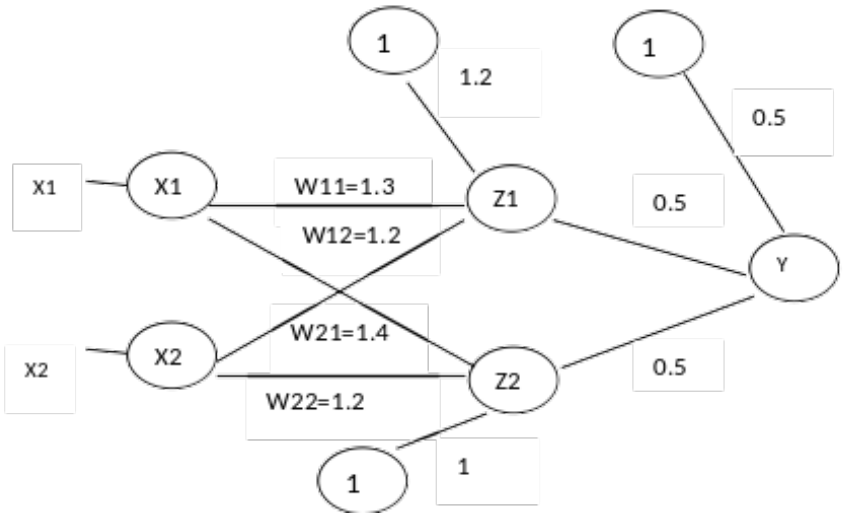
Pattern Recognition [BME 4068]

Marks: 50 **Duration: 180 mins.**

Answer all the questions.

Instructions to Candidates: Answer ALL questions Missing data may be suitably assumed

1)		How Bayes' theorem for a given feature vector "X", utilises likelihood ratio for analysing classification problems? Explain.	(3)
	A)		
	B)	Apply the Complete linkage algorithm to find two clusters from the given three clusters: {(1,1),(2,2)}, {(10,10), (11,12)}, { (15,25) } , {15,27)}. Use city block distance.	(4)
	C)	Construct the workflow diagram for a pattern recognition system and highlight the challenges of each stages.	(3)
2)		Find a decision boundary between the following classes. The values of feature-x for the given subjects of a Group1 are: 65,61,60,58,51,54,58,63,71,74. Similarly the subjects of Group2 had x values: 91,84,79,72,86,77,79,82. Draw the nature of the given classes using histogram plot.	(3)
	A)		
	B)	Apply Forgy's algorithm to generate two groups of patients having their weight (in KGS) and height (in feet) for analysing their BMI. The (weight, height) of samples are:(52,5), (59, 5.5), (72, 6), (88,6). (92,6.2)	(4)
	C)	Design and test an artificial neuron to implement a AND gate function using a McCulloch-Pitts model.	(3)
3)		What are different types of learning methods. Explain the one which uses target along with the input during the training.	(3)
	A)		
	B)	Identify the rules that are important for the training of a perceptron neuron for classification. Explain the training procedure with an appropriate example.	(4)
	C)	Explain how the ECG can be classified based on heart rate details. Draw suitable block diagram indicating various stages of the system.	(3)
4)		Find the optimal decision boundary for the following two classes where the class-A has the feature-x is normally distributed with μA=2, and σA=2. For class-B also "x" is normally distributed with μB=7, and σB=3. The prior probabilities are P(A)=0. 7 and P(B)=0.3. Draw the class conditional densities and define an optimal decision boundary?	(3)
	A)		
	B)	Find the output response of the following backpropagation net. The network is presented with the input pattern [0,1] and the target output is 1.Use a learning rate α=0.25 and binary sigmoidal activation function.	(4)



C) What are the significance of True Positive, and True Negative samples for a ML model. Calculate the value Sensitivity and Specificity of a model developed for screening anaemia, from the following details: True positive=5250, True negative=4750, False positive=1000 and False negative =750. (3)

5) Illustrate biometric pattern usage for authenticating patient report with an example. Discuss the benefits of the system over traditional. (3)

A)

B) Compare artificial neuron and biological neuron. List two advantages of artificial neural network. (3)

C) Calculate the value of posterior probability P(Dengue=YES/Rash) using Naive Bayesian theorem using the given table 5 (c). Interpret the answer. (4)

Rash	Nausea	Headache	Fever	Joint Pain	Tested For Dengue
Yes	Yes	Yes	Yes	Yes	**YES**
Yes	No	Yes	No	No	**NO**
Yes	Yes	No	Yes	Yes	**YES**
No	No	Yes	Yes	Yes	**NO**
Yes	No	No	No	No	**NO**
Yes	Yes	No	Yes	No	**YES**
No	Yes	Yes	No	No	**NO**
Yes	Yes	Yes	Yes	Yes	**YES**

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