PG Odd Semester (CBCS) Exam., December—2016

COMPUTER SCIENCE

(9th Semester)

Course No. : MCS–903 (C)

(Neural Network)

Full Marks : 75
Pass Marks : 30

Time : 3 hours

The figures in the margin indicate full marks for the questions

Answer **five** questions, selecting **one** from each Unit

UNIT—I

1. *(a)* What is a perceptron? 2

(b) What is XOR problem? How was XOR problem solved? 1+3=4

(c) Write the significance of sigmoid and step function in McCulloch-Pitts neural network. 3

(d) A 4-input neuron has weights 1, 2, 3 and 4. The transfer function is linear with the constant proportionality being equal to 2. The inputs are 4, 10, 5, 20 respectively. Find out the output. 3

(e) Write the generalized delta rule and explain in brief. 3

2. *(a)* What is artificial neuron? What is the basic difference of artificial neuron and biological neuron? 1+2=3

(b) Draw a multi-layer perceptron and explain it. 2

(c) Explain AND-perceptron and OR-perceptron. 5

(d) Consider a Hopfield network with 5 nodes and initial pattern {0, 0, 0, 0, 0}. Recognise the patterns {0, 1, 1, 0, 1} and {1, 0, 1, 0, 1} and update the nodes and weight matrices. 5

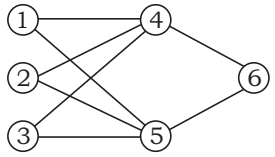
UNIT—II

3. *(a)* What is back propagation? Write its properties. 2

(b) Update weights of neural network given below using back propagation, if

x_1	x_2	x_3	w_{14}	w_{15}	w_{24}	w_{25}
1	0	1	0·2	–0·3	0·4	0·1

w_{34}	w_{35}	w_{46}	w_{56}	w_{04}	w_{05}	w_{06}	
–0·5	0·2	–0·3	–0·2	–0·4	0·2	0·1	0·9



10

(c) Compare RBF and MLP. 3

4. *(a)* Consider a first-order autocorrelator stores the patterns A_1 (1, 1, 1, 1), A_2 (1, 1, 1, 1) and A_3 (1, 1, 1, 1) and the connection matrix is

$$T = \begin{vmatrix} 3 & 1 & 3 & 3 \\ 1 & 3 & 1 & 1 \\ 3 & 1 & 3 & 3 \\ 3 & 1 & 3 & 3 \end{vmatrix}$$

Recognise a noisy pattern A (1, 1, 1, 1) which is very near to a stored pattern using HAM. 10

(b) Use Radial Basis Function (RBF) to convert the non-linear XOR problem to linear separable position. 5

UNIT—III

5. *(a)* Write short answers : 1×5=5

(i) What is counter-propagation?

(ii) Who introduced it?

(iii) Write two applications of counter-propagation.

(iv) What are the stages of counter-propagation?

(v) What are the types of counter-propagation?

(b) Consider the number of inputs n 4 and number of output nodes m 2 and four training samples

i_1 (1, 1, 0, 0)
i_2 (0, 0, 0, 1)
i_3 (1, 0, 0, 0)
i_4 (0, 0, 1, 1)

Use Kohonen's SOM to cluster the pattern. 10

6. *(a)* Draw the artificial neural networks training paradigm and its classification. 4

(b) Explain Boltzmann machine. 4

(c) Write the basic competitive learning algorithm. 3

(d) Put light on stability-plasticity dilemma. 2

(e) Define adaptive resonance. 2

UNIT—IV

7. *(a)* Given A $\{1, 2, 3, 4, 5, 6\}$, A_1 $\{1, 2\}$ and A_2 $\{3, 4\}$ and A_3 $\{5, 6\}$. Draw the partition diagram. 2

(b) Explain ANFIS. 3

(c) "Neural networks can be considered as an Associative Memory." Explain. 5

(d) Compare fuzzy system and neural network. 5

8. *(a)* Write the properties of fuzzy sets. 5

(b) If two fuzzy sets $\tilde{I}$ and $\tilde{F}$ represent identification of characters I and F from a set (F, E, X, Y, I, T) and

$\tilde{I}$ $\{(F, 0\ 4), (E, 0\ 3), (X, 0\ 1), (Y, 0\ 1)$
$(I, 0\ 9), (T, 0\ 8)\}$

$\tilde{F}$ $\{(F, 0\ 99), (E, 0\ 8), (X, 0\ 1), (Y, 0\ 2)$
$(I, 0\ 5), (T, 0\ 5)\}$

find out—

(i) $\tilde{I}$ $\tilde{F}$

(ii) $\tilde{I}$ $\tilde{F}$ 2½+2½=5

(c) Write fuzzy learning algorithm. 5

UNIT—V

9. *(a)* Explain pattern recognition cycle. 5

(b) What is feature extraction? What are the feature extraction types? 3

(c) Design a fuzzy neuro-controller. 7

10. *(a)* Draw the architecture of expert system and explain the use of neural network in the particular module of the architecture. 7

(b) Write a short note on the application software design using neural network. 8

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