Reg.No. _____

Karunya UNIVERSITY

(Karunya Institute of Technology & Sciences)
(Declared as Deemed-to-be University under Sec.3 of the UGC Act, 1956)

End Semester Examination – Nov/Dec – 2016

Code : 14EI3007 | **Semester : 2016-17 ODD**
Sub. Name : Intelligent Controllers | **Duration : 3hrs** | **Max. marks : 100**

ANSWER ALL QUESTIONS (5 x 20 = 100 Marks)

Q. No.	Sub Div.	Questions	Course Outcome	Marks
1.	a.	Describe the architecture of Artificial Neural Network using biological neurons.	CO1	**10**
	b.	Explain the learning and training procedure of Hopfield network.	CO1	**10**
		(OR)		
2.	a.	Draw and explain the architecture and algorithm of back propagation network. Also derive the weight updation equation of hidden layer and output layer weights.	CO2	**14**
	b.	Implement the perceptron training rule for a neural network using f(net)=sgn(net). Given Ƞ=1. [Signum = Assume Bipolar Binary Activation Function] $w_1 = [0 \;\; 1 \;\; 0]^t$; For Inputs $x_1 = [2 \;\; 1 \;\; -1]^t$; $d_1 = -1$; and $x_2 = [0 \;\; -1 \;\; -1]^t$; $d_2 = 1$	CO1	**6**
3.	a.	Explain how neural network could be applied for Cerebellar Model Articulation Controller.	CO2	**10**
	b.	Implement Neural Controller for balancing an Inverted Pendulum using Visual Imaging Technique.	CO3	**10**
		(OR)		
4.	a.	Write brief notes on Indirect Learning and Online Learning of Neural Network.	CO2	**10**
	b.	Explain the scheme of neural network based system identification for control application.	CO2	**10**
5.	a.	For the given two fuzzy sets $\underset{\sim}{A} = \left\{\frac{0.1}{0} + \frac{0.2}{1} + \frac{0.4}{2} + \frac{0.6}{3} + \frac{1}{4}\right\}$ and $\underset{\sim}{B} = \left\{\frac{1}{0} + \frac{0.5}{1} + \frac{0.7}{2} + \frac{0.3}{3} + \frac{0}{4}\right\}$ Perform the following fuzzy operations $(i) A \cup B \quad (ii) A \cap B \quad (iii) A \cup \overline{B} \quad (iv) B \cap \overline{A} \quad (v) \overline{A \cup B} \quad (vi) \overline{A} \cap \overline{B}$	CO3	**6**
	b.	Write brief notes on the Fuzzy sets, Fuzzy arithmetic, Fuzzy Propositions and Fuzzy Quantifiers.	CO2	**14**
		(OR)		
6.		Two key variables in the production of a photographic plate are "exposure time" denoted by the universe X={0,1,2,3} and development time denoted on the universe Y={0,1,2,3,4,5,6,7}. Suppose we represent each of these variables as specific fuzzy sets.	CO3	**20**

		$A = \text{less exposure time} = \left\{\frac{0}{0}+\frac{1}{1}+\frac{0.7}{2}+\frac{0.1}{3}\right\};$ $B = \text{more development time} = \left\{\frac{0}{0}+\frac{0.2}{1}+\frac{0.3}{2}+\frac{0.5}{3}+\frac{0.7}{4}+\frac{1}{5}+\frac{0.9}{6}+\frac{0.6}{7}\right\}$ a. Construct a relation for the compound proposition IF A THEN B b. Let a new exposure time be represented by $\left\{\frac{0}{0}+\frac{1}{1}+\frac{0.4}{2}+\frac{0}{3}\right\}$. Using max-min composition, find the fuzzy development time associated with the new exposure time.		
7.		Design a Fuzzy Logic Controller for a water heating system.	CO3	**20**
		(OR)		
8.	a.	Explain the structure of Fuzzy Logic Controller with necessary diagram.	CO2	**10**
	b.	Fuzzy sets A,B and C are defined in the universe of discourse X = { 0, 1, 2, 3}, Y= { 0, 1, 2, 3, 4, 5, 6, 7 } and Z= { 0, 1, 2, 3, 4} respectively. Find the relationship R= A X B and S=B X C. Using this relation find out max-product composition of RoS $A = \left\{\frac{0}{0}+\frac{1}{1}+\frac{0.7}{2}+\frac{0.1}{3}\right\};\ B = \left\{\frac{0}{0}+\frac{0.2}{1}+\frac{0.3}{2}+\frac{0.5}{3}+\frac{0.7}{4}+\frac{1}{5}+\frac{0.9}{6}+\frac{0.6}{7}\right\};$ $C = \left\{\frac{0}{0}+\frac{0.5}{1}+\frac{0.2}{2}+\frac{1}{3}+\frac{0.2}{4}\right\}$	CO2	**6**
	c.	Write short notes on Fuzzy Membership Functions.	CO2	**4**
		Compulsory:		
9.	a.	Explain the basic operators of Genetic Algorithm.	CO3	**15**
	b.	Write short notes on search space and fitness function.	CO3	**5**

ALL THE BEST