



INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)

Dundigal, Hyderabad - 500 043

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

TUTORIAL QUESTION BANK

Course Name	:	Intelligent controllers
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Group – I QUESTION BANK ON SHORT ANSWER QUESTION

S.No	QUESTION	BLOOMS TAXONOMY LEVEL	COURSE OUTCOME
UNIT-I NEURAL NETWORKS			
1	What is meant by biological neuron ?	Evaluate	1
2	What are the advantages of NN over conventional computer system?	Remember	1
3	What are the functions performed by Axon, synapse, soma, dendrite?	Remember	1
4	Mention the parts of McCulloch –Pitts model?	Remember	1
5	Mention the parts of Perceptron?	Remember	1
6	What are the characteristics of Adaline?	Remember	1
7	Mention the difference between Auto and Hetero Association?	Understand	1
8	Explain Radial basis function network	Remember	2
9	What are supervised learning laws?	Remember	1
10	What are unsupervised learning laws?	Remember	1,2
11	What is meant by Reinforcement Learning	Remember	1,2
12	Explain Back propagation in simple terms	Understand	1
Group – II QUESTION BANK ON LONG ANSWER QUESTIONS			
1	Describe some attractive features of the biological neural network that make it superior to the most sophisticated Artificial Intelligence computer system for pattern recognition tasks.	Analyze	2

2	What are the main differences among the three models of Artificial Neuron ,namely, McCulloch-Pitts, perceptron, and Adaline with their Topology, give a few basic topological structures of artificial neural networks.	Understand	1
3	Identify supervised and unsupervised basic learning laws and compare Least mean square (LMS), perceptron and delta learning laws.	Analyze	2
4	Design networks using M_P neurons to realize the following logic functions Using + 1 or – 1 for weights. i) $s(a_1,a_2,a_3) = a_1a_3 + a_2a_3 + a_1(\bar{a}_3)$ ii) $s(a_1,a_2,a_3) = a_1a_2a_3$	Remember	1
5	Explain briefly the terms cell body,axon,synapse,dendrite,and neuron with reference to biological Neural Network.	Remember	1
6	Draw a block diagram each to describe i) supervised learning ii) unsupervised learning iii) Reinforcement learning iv) competitive learning	Understand	2
7	Enumerate all the sixteen steps with Equations for implementing a Back Propagation algorithm using a computational flow chart.	Evaluate	1
8	Prove that XOR function does not have a Linear separation Law.Draw an ANN for XOR problem.	understand	2
9	A fully connected feedforward network has 10 source nodes, 2 hidden layers, one with 4 neurons and the other with 3 neurons and a single output neuron. Construct an architectural graph of this network.	Evaluate	2
10	A neuron 'N' receives inputs from four other Neurons whose activity levels are 10,-20,4 and -2. The respective synaptic weights of neuron N are 0.8,0.2,-1.0,and -0.9. Compute the output of neuron N when a) the neuron is linear b) The neuron is represented by a Mccullah- Pitts model. Assume that the bias applied to the neuron is zero.	Remember	1
Group – I QUESTION BANK ON SHORT ANSWER QUESTION UNIT-II MODELS AND CONTROL SCHEMES IN ANN			
1	Explain activation and synaptic dynamics.?	Analyze	2
2	What is Auto Association and Hetero Association?	Understand	1
3	Show that Lyapunov function represents some form of Energy of an NN	Remember	2
4	What do you understand by Bi-directional Associative Memory	Analyze	1

5	What is Kohonen self organizing feature map	understand	2
6	What is recall and cross talk in Neural Networks ?	Understand	1
7	Give an example of Maxnet, Mexican hat and Hamming net	understand	2
8	What are the two general methods of recall of information in Neural Networks	Analyze	1
9	What are different types of Hebbian learning?	understand	2
10	What are different types of Competitive learning?	Analyze	1
	Group – II QUESTION BANK ON LONG ANSWER QUESTIONS		
1	Explain Three types of Activation functions in ANN with their mathematical properties involving Sigmoid functions	Analyze	1
2	Explain INSTAR (Winner-take-all) and outstar learning laws with mathematical model and diagrams	Analyze	1
3	What do you understand by 1) Cohen- Grossberg Theorem 2) Cohen –Grossberg –Kosko theorem 3) Adaptive bidirectional associative memory theorem	Understand	2
4	Consider a stochastic unit with bipolar [-1,1] output function. The probability distribution for the unit is given by $P(s=1/x) = 1/(1+\exp(-2tx))$. If the learning of the stochastic unit is based on gradient descent on the error between the desired and the average output, show that the resulting learning law is the same as the learning law obtained using delta learning for a deterministic unit with hyperbolic tangent as the output function	Understand	2
5	What do you understand by Travelling Salesman Problem? Enumerate a procedure to solve it using Hopfield network.	understand	2
6	Draw a block diagram each to describe i) supervised learning ii) unsupervised learning iii) Reinforcement learning iv) competitive learning	Analyze	1
7	i) Prove that XOR function does not have a linear separation law ii) Design NN using MP neurons to realize the following logic function using +, - 1 for the weights. $s(a_1, a_2, a_3) = a_1 a_2 a_3$	Analyse	2

8	Compare the performance of a computer and that of a biological network in terms of speed of processing, size and complexity, storage, format tolerance and control mechanism	understand	2
9	1) What are the merits and demerits of supervised and unsupervised learning? 2) List the features that distinguish Delta rule and Hebb's rule.	understand	2
10	Write short notes on a) XOR problem b) Associative memory c) Linear and nonlinear separation d) Self organizing feature map	Analyze	1
Group – I QUESTION BANK ON SHORT ANSWER QUESTIONS UNIT III FUZZY LOGIC AND ITS CONTROLLERS			
1	Define crisp and fuzzy sets	Understand	2
2	Define membership function and give some examples	understand	2
3	Explain Fuzzification done to solve a problem	Analyze	1
4	What is meant by defuzzification	Understand	2
5	Describe three main techniques of Defuzzification	Understand	2
6	Give a few classic fuzzy set operations	Analyze	1
7	What do you understand by Neuro fuzzy inference system	Analyze	1
8	Draw a block diagram of Fuzzy logic control system	Understand	2
9	What are the properties of crisp sets	Analyze	1
10	What are the properties of Fuzzy sets	Analyze	1
Group – II QUESTION BANK ON LONG ANSWER QUESTIONS			

1	i) Draw a generalized flow chart for the design of FLC ii) Illustrate the formation of rules and decision making logic with the help of a case study	Analyze	1
2	What is Fuzzification? Illustrate the procedure with the help of an Example	Understand	2
3	What are the common methods of defuzzification ? Illustrate the procedure with the help of an Example	Understand	2
4	Let $A=((x_1,0.5),(x_2,0.7),(x_3,0))$ and $B=(x_1,0.8),(x_2,0.2),(x_3,1)$ are fuzzysets with associated membership values. Find $A \cup B(x_1)$, $A \cup B(x_2)$, $A \cup B(x_3)$	Analyse	1
5	If $\mu_A(x)=1/(1+10x^2)$ is a membership function of a fuzzy set $A(x)$. Compute the complement of Fuzzyset $A(x)$	Analyse	1
6	Given Two universe of discourse $U_1=U_2=(1,2,\dots,10)$ and Two fuzzy sets(umbers) defined by “Approximately 2”$=0.5/1+1/2+0.5/3$ and “Approximately 4”$= 0.8/2+0.9/3+1/4$. It is desired to find “approximately8”	Understand	2
7	Consider Two fuzzy sets $A_1=0.2/x_1+0.9/x_2$ and $A_2=0.3/y_1+0.5/y_2+1/y_3$. Determine the fuzzy relation between these sets.	Analyse	1
8	Consider two fuzzy relations $R=[0.6 \ 0.8]$ and $[0.7 \ 0.9]$ $S=[0.3 \ 0.1]$ $[0.2 \ 0.8]$ it is desired to evaluate $R \circ S$ and $S \circ R$ where $X \circ Y$ is maxmin composition	Analyse	1
9	Describe two common methods of fuzzy logic Stability 1) Lyapunov Stability 2) Stability via Interval matrix Method.	Analyse	1

10	Consider the following Fuzzy system P1:IF $x(k)$ is A1 THEN $x_1(k+1)=0.85x(k)-0.25x(k-1)+0.35u(k)$ P2:IF $x(k)$ is A2 THEN $x_2(k+1)=0.56x(k)-0.25x(k-1)+2.22u(k)$ Assume two different fuzzy sets for A1 and A2 and bounded $u(k)$, check the stability of this system.	Analyse	1
	Group – I QUESTION BANK ON SHORT ANSWER QUESTION UNIT IV GENETIC ALGORITHMS		
1	What are the advantages of genetic algorithm over conventional approach	Analyse	1
2	In GA explain the operation of Encoding	understanding	2
3	How is fitness function defined in GA	Understanding	2
4	Explain Selection Operation in GA	Understanding	2
5	What is mutation in GA and how it helps?	Understanding	2
6	How crossover operation helps GA	Understanding	2
7	Give an example of combinatorial problem	Understanding	2
8	How will you perform genetic operations on a binary string ?	Analyse	1
9	Can you apply GA to travelling Salesmen Problem	Analyse	

10	Give an outline to solve TimeTable problem using GA	Analyse	1
	Group – II QUESTION BANK ON LONG ANSWER QUESTIONS		
1	Name and describe the main features of Genetic Algorithm(GA)	Understand	2
2	A budget airline company operates 3 planes and employs 5 cabin crews. Only one crew can operate on any plane on a single day and each crew cannot work for more than two days in a row. The company uses all planes everyday. A genetic algorithm is used to work out the best combination of crews on any particular day, Suggest i) Chromosome ii) Alphabet iii) fitness function for this problem	Analyse	1
3	Suppose a genetic algorithm uses chromosomes of the form $x = abcdefgh$ with a fixed length of eight genes. Each gene can be any digit between 0 and 9. Let the fitness of individual x be calculated as: $f(x) = (a + b) - (c + d) + (e + f) - (g + h),$ and let the initial population consist of four individuals with the following chromosomes: $x_1 = 6\ 5\ 4\ 1\ 3\ 5\ 3\ 2$ $x_2 = 8\ 7\ 1\ 2\ 6\ 6\ 0\ 1$ $x_3 = 2\ 3\ 9\ 2\ 1\ 2\ 8\ 5$ $x_4 = 4\ 1\ 8\ 5\ 2\ 0\ 9\ 4$ a) Evaluate the fitness of each individual, showing all your workings, and arrange them in order with the fittest first and the least fit last.	Understand	2

4	Consider the problem of finding the shortest route through several cities, such that each city is visited only once and in the end return to the starting city (the Travelling Salesman problem). Suppose that in order to solve this problem we use a genetic algorithm, in which genes represent links between pairs of cities. For example, a link between London and Paris is represented by a single gene 'LP'. Let also assume that the direction in which we travel is not important, so that $LP = PL$. a) How many genes will be used in a chromosome of each individual if the number of cities is 10?	Analyse	1
5	In the above problem b) How many genes will be in the alphabet of the algorithm?	Understand	2
6	In problem 3 perform Perform the following crossover operations: i) Cross the fittest two individuals using one-point crossover at the middle point ii) Cross the second and third fittest individuals using a two-point crossover (points b and f). iii) Cross the first and third fittest individuals (ranked 1st and 3rd) using a uniform crossover.	Analyse	1
7	Define_ the terms chromosome, fitness function, crossover and mutation as used in genetic algorithms. Explain how genetic algorithms work, in English or in pseudocode	Analyse	1
8	A genetic algorithm is to be used to evolve a binary string of length n containing only 1s. The initial population is a randomly generated set of binary strings of length n. i. Give a suitable fitness function for this problem.	Understand	2

9	Suppose the problem is to evolve a binary string of length n which is symmetric. If the string positions are numbered from 0, then a symmetric string will have a 1 in position i if and only if there is a 1 in position $(n-1-i)$. For example, 001100 is symmetric since it has a 1 at index 2 and a 1 at index $(6-1)-2 = 3$. Similarly, 110011 is symmetric, and 011011 is not. The initial population is a randomly generated set of binary strings of length n, where n is an even number. i. Give a suitable fitness function for this problem.	understand	2
10	In the above problem Will the off_spring of parents with a high fitness value generally also have a high_fitness value, given your_fitness function? Explain your answer If the population size in a genetic algorithm is restricted to 1, what search algorithm does it correspond to? Explain your answer	Analyze	1
	UNIT-V APPLICATIONS Group I and Group II put together		
1	How will you apply artificial Neural Networks in Pattern Classification i) Recognition of Olympic symbols ii) Recognition of printed Characters iii) Making an opening bid in Contract Bridge Game	Understand	2
2	How will you apply Associate memories i) Image pattern recall ii) Content addressable memory iii) Information retrieval	Analyze	1
3	How will you apply NN optimization to i) Graph bipartition Problem ii) Linear Programming Problem iii) Travelling salesman problem iv) Smoothing images with discontinuities	Understand	2

4	How will you apply NN to i) Vector quantization ii) Control Applications iii) Decision Making	Understand	2
5	How will you apply NN to following speech applications i) Net Talk ii) Phonic Typewriter iii) Vowel classification iv) Recognition of consonant (CV) segments v) Recognition of stop CV utterances in Indian Languages	Analyze	1
6	How will you apply NN to following Image Processing Applications i) Recognition of handwritten digits ii) Image segmentation iii) Texture classification and segmentation	Understand	2
7	How will you apply Fuzzy Logic to i) Predictive constrained control ii) PID control iii) Washing machines iv) Air conditioning control	Analyse	1
8	How will you apply Fuzzy Logic to Integrated Modern Control involving i) Supervision ii) Local Control iii) Optimization iv) Monitoring	Understand	2
9	Explain how Fuzzy logic works in i) Antilock braking system ii) Web based Fuzzy Neural Networks for Stock Prediction iii) Neuro Fuzzy system for Speech recognition.	Analyse	1
10	i) Give a flowchart program to solve Travelling salesmen Problem using GENETIC ALGORITHM	Understand	2