(3 HOURS) Total Marks: 80

N.B. (1) Question No 1 is compulsory

(2) Attempt any **three** Questions out of the remaining five questions

Q1	(a)	What are the differences between Hard computing and Soft Computing	5
	(b)	How do you distinguish linearly separable for linearly non-separable patterns?	5
	(c)	Define Extension principle with an example	5
	(d)	What are the various Selection types used in Genetic Algorithms. Explain Roulette Wheel with an appropriate example	5
Q2	(a)	Compare the learning rules used for supervised and unsupervised and specify how the weight adjustments are done in each case	10
	(b)	Use perceptron learning rule for computing weights after **one** iteration for the data given bellow $X_1=[1\ -2\ 0\ -1]^T$; $X_2=[0\ 1.5\ -0.5\ -1]^T$;$X_3=[-1\ 1\ 0.5\ -1]^T$. Initial weight $W^1=[1\ -1\ 0\ 0.5]$. The learning constant is given by c=0.1. The teacher's desired responses for X_1,X_2,X_3 are [-1,-1,1] respectively.	10
Q3	(a)	Design a fuzzy controller for controlling the amount of detergent required in a washing machine. The inputs are dirt and grease on clothes and the output is amount of detergent required. Use 3 descriptors for inputs and outputs respectively. Prove that clothes which have less dirt and grease requires less detergent and vice versa. Draw figures wherever required.	20
Q4	(a)	An engineer is testing the properties, strength and weight of steel. Suppose he has two fuzzy sets, A defined on universe of discourse $\{s_1,s_2,s_3\}$ and B defined on a universe of discourse $\{w_1,w_2,w_3\}$. The membership of A and B are given by $\mu_A=\{(s_1,1),(s_2,0.5),(s_3,0.2)\}$and $\mu_B=\{(w_1,1),(w_2,0.5),(w_3,0.3)\}$ a. Find the Cartesian product of A and B i.e R=A X B b. Suppose $C=\{(s_1,0.1),(s_2,0.6),(s_3,1)\}$. Find S=C X B c. Find C o R using Max-min composition d. Find C • R using max-product composition	10
	(b)	How Learning Vector Quantization helps in classifying data samples? Write the algorithm of LVQ?	10
Q5	(a)	With a neat diagram explain the architecture of ANFIS?	8
	(b)	Explain Steepest Descent Algorithm with a suitable example	8
	(c)	State the differences between derivative based and derivative free optimization	4
Q6		Write short notes on any **two**:-	
	(a)	Block Diagram of Error Back Propagation Training Algorithm(EBPTA)	10
	(b)	Different membership functions of fuzzy logic	10
	(c)	Major components of Genetic Algorithm	10

(3 hours) **Total Marks: 80**

N.B. 1. Question **No. 1** is compulsory
2. Attempt any **three** out of remaining
3. Assume suitable data if **necessary** and justify the assumptions
4. Figures to the **right** indicate full marks

Q1 A Determine the energy of signal given by $x(n) = (1/4)^n u(n)$. 05

B Compare microprocessor with digital signal processor. 05

C Define BIBO Stable system. 05

D Find the Linear Convolution of the following causal signals 05
$x_1(n)$= { 3, 2, 4, 1} and $x_2(n)$={ 2, 1, 3 }.

Q2 A Given a[n]={1, 2, 3, 4} using DFT properties 10
(a) Find A[k] which is DFT of a[n]
(b) Let b[n] = {1, 4, 3, 2} Find B[k] which is DFT of b[n] using A[k].
(c) Let c[n]= {2, 6, 6, 6} Find C[k] which is DFT of c[n] using A[k].
(d) Let d[n] = {2, 1, 4, 3} Find D[k] which is DFT of d[n] using A[k].

B Draw DIT FFT flow graph for 8-point sequence and compute DFT for causal sequence x(n) = {1, 2, 2, 1, 1, 2, 2, 1}. 10

Q3 A Perform Cross correlation of the causal sequences 10
x(n)= {3, 3, 1, 1 }, y(n) = { 3, 2, 1, 2}

B Consider the following analog signal 10
x(t) = 5 cos 2∏ (2000 t) + 6 cos 2∏(4000t) to be sampled.
I) Evaluate the Nyquist rate for this signal.
II) If the signal is sampled at 6 kHz, will the signal be recovered from its samples?

Q4 A Compute linear convolution of the causal sequences 10
x[n] = {1, 2, 3, -1, 2, -2, 0, -1} and h[n]={-1, 2, 1} using overlap save method.

B For x(n) = {-2, 1, 2, -1, 6, 4, 5}, plot the following Discrete Time signals: 10

1.) x(n+2) 2.) x(-n)u(-n+1) 3.) x(-n-2)

4.) x(n-1)u(n) 5.) x(n+1)

58025

Q5 A For the causal LTI digital filter with impulse response given by 10

$h(n) = 2\delta(n) + 2\delta(n-1) + 2\delta(n-2) + 2\delta(n-3)$ sketch the magnitude response of the filter.

B Check whether the system $y[n] = nx[n] + 2x[n-1]$ is: 10

i) Static or Dynamic
ii) Linear or Non-linear
iii) Causal or Non-Casual
iv) Shift variant or Shift Invariant

Q6 A Explain with the example significance of Carl's Correlation Coefficient Algorithm in digital signal processing. 10

B Write a detailed note on DSP Processor. 10

(3 hours) **Total Marks: 80**

N.B. 1. Question **No. 1** is compulsory
2. Attempt any **three** out of remaining
3. Assume suitable data if **necessary** and justify the assumptions
4. Figures to the **right** indicate full marks

Q.1. Answer the following 20 M

a. What is Shape Number?

b. Run length coding is lossless compression technique Explain

c. Explain City Block Distance, Chess board distance , Dm Distance

d. What would be the effect on the histogram if we set to zero, the higher order bit planes

Q.2.a What are the different types of redundancies in an image? Explain 10 M
i) Phychovisual redundancies
ii) Interpixel redundancy
iii) Coding redundancy

b. Explain Chain code with example and show that how first difference makes chain code rotation invariant. 10 M

Q.3.a Using the Butterfly diagram, compute Hadamard transform for X(n)={ 1,2,3,4,1,2,1,2} 10 M

b. Generate the DFT Transform of the given Image 10 M

2	1	2	1
1	2	3	2
2	3	4	3
1	2	3	2

Q.4.a Given a histogram, what happens when we equalize it twice, comment 10 M

Grey levels	0	1	2	3
No of pixels	70	20	7	3

b. Explain Region based segmentation with an example. 10 M

58030

Q.5.a Find Huffman code for the following stream of data 10 M
{a, a, a, b, b, c, c, c, c, c, d, d, d, d, d, d, d, d, e, e, e, e, f, f }

b Explain Hough Transform with suitable example 10 M

Q.6 Write short notes on **(Any two)** 20 M

a) Holomorphic Filtering
b) Hit and miss transform
c) Moments with Example
d) Color models

(3 hours) **Marks:[80]**

N.B

1. Question No. 1 is compulsory.
2. Attempt any 3 out of remaining 5.

Q.1	a) Explain the different software flaws with example.	**05**
	b) Define goals of security and mechanism to achieve them.	**05**
	c) Define the properties and applications of Hash function.	**05**
	d) Explain handshake protocol in SSL.	**05**
Q.2	a) How is security achieved in Transport and Tunnel modes of IPSEC? Explain the role of AH and ESP.	**10**
	b) How does PGP achieve confidentiality and authentication in emails?	**10**
Q.3	a) Why are digital certificates and signatures required? What is role of digital signature in digital certificates? Explain any one digital signature algorithm.	**10**
	b) What are the different components of Intrusion Detection System? Compare signature based IDS to anomaly based IDS.	**10**
Q.4	a) Discuss DES with reference to following points • Block size and key size • need of expansion permutation • role of S-box • weak keys and semi weak keys • possible attacks on DES	**10**
	b) Explain Diffie Hellman key exchange algorithm. What types of attacks are possible on it explain with example.	**10**
Q.5	a) Explain briefly the following attacks with example (I) Session hijacking (II) Salami Attack (III) SQL injection (IV) Buffer overflow	**10**
	b) What is Denial of Service attack? What are the different ways in which an attacker can mount a DOS attack on a system?	**10**
Q.6	a) Explain the working of Kerberos.	**10**
	b) Elaborate the steps of key generation using RSA algorithm. In RSA system the public key (E, N) of user A is defined as (7,187). Calculate Φ(N) and private key 'D'. What is the cipher text for M=10 using the public key.	**10**

Time: 3 Hours **Total Marks = 80**

Note:

(i) Each question carries 20 marks
(ii) **Question 1** is compulsory
(iii) Attempt any **three (3)** from the remaining questions
(iv) Assume suitable data wherever required

Q1. Attempt any **four (4)** questions from the following: **[20]**

(a) Compare Model based agent with Goal based agent.
(b) Given a full 5-gallon jug and an empty 3- gallon jug, the goal is to fill the 3-gallon jug with exactly one gallon of water. Give state space representation
(c) Explain conditional independence relation in belief network with example
(d) Describe the environmental characteristics of WUMPUS world Puzzle.
(e) What is Supervised and Unsupervised learning? Give example of each.

Q2 **(a)** Draw and illustrate the Architecture of Learning agent. Describe each of its component w.r.t. Medical diagnosis system **[6+4]**

(b) Distinguish between Propositional logic (PL) and first order predicate logic (FOPL) knowledge representation mechanisms. Take suitable example for each point of differentiation. **[10]**

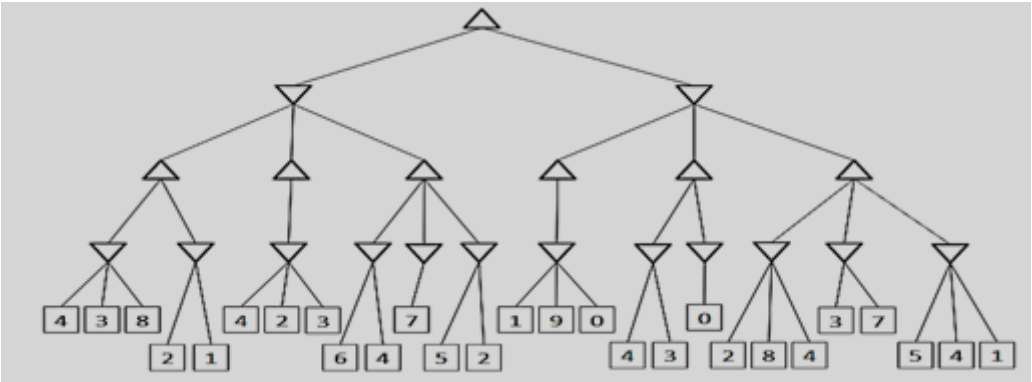
Q3 **(a)** Consider the following set of sentences **[10]**

a) Whoever can read is literate
b) Birds are not literate
c) Some birds are intelligent

Prove the following using forward reasoning "**Some who are intelligent cannot read"**

(b) Evaluate **IDA* search** algorithms based on performance measures such as Complete, Optimal, Time and Space complexity with justification. Illustrate its working with a suitable example. **[6+4]**

Q4 **(a)** Apply Alpha-Beta Pruning on following example **[10]**



(b) Define Belief Network. Describe the steps of constructing belief network with an example. What types of inferences can be drawn from that? **[2+6+2]]**

Q5 **(a)** Explain Partial order planning with example. **[10]**

(b) Describe each component in the architecture of Expert System? What are the limitations of Expert System? **[10]**

Q6 Answer any **two (2)** of the following **[20]**

(a) Construct the decision tree from the following set of training data. Classify the new record: outlook=rain, temp =70, humidity=65, windy=true.

Tid	Refund	Marital Status	Taxable Income	Cheat
1	Yes	Single	>100	No
2	No	Married	80-100	No
3	No	Single	<80	No
4	Yes	Married	>100	No
5	No	Divorced	80-100	Yes
6	No	Married	<80	No
7	Yes	Divorced	>100	No
8	No	Single	80-100	Yes
9	No	Married	<80	No
10	No	Single	80-100	Yes

(b) What are steps involved in natural language processing (NLP) of an English sentence? Explain with an example sentence.

(c) Write a short note on local search algorithms.

****