(3 Hours)   **80 Marks**

N.B.   1. Question No.1 is Compulsory
2. Attempt any THREE questions out of remaining.
3.Assume suitable data wherever required

Q.1.   Answer the following   4*5=20M
a.   Explain Fidelity Criteria
b.   Explain Morphological operations Erosion and Dilation
c.   Explain Zero memory operations
d.   What is unitary Matrix

Q.2.a   What are the different types of redundancies in an image? Explain Run   10 M
Length Encoding with appropriate example. What are its drawbacks ?

Q.2.b.   Find the arithmetic codeword for the message: INDIA   10 M

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

Q.3 b.   Find the DFT of the following image   10 M

0	1	2	1
1	2	3	2
2	3	4	3
1	2	3	2

Q.4.a   Perform Histogram Equalization and Draw new equalized histogram of the   10 M
following image data

Grey levels	0	1	2	3	4	5	6	7
No of pixels	400	700	1350	2400	3000	1500	650	0

Q.4.b.   Explain segmentation? Explain the following methods of image   10 M
segmentation with suitable Example
1)   Region Growing
2)   Split and Merge

Q.5.a   Given   10 M

10	44	16
10	14	48
11	10	22

Find 3 bit IGS coded image and calculate compression Factor , BPP and MSE

Q.5. b   Explain Hough Transform with suitable example   10 M

Q.6   Write short notes on   5*4=20M

1) Holomorphic Filtering
2) Thinning with Example
3) Moments with Example
4) Color models

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

N.B   : (1) Question **No. 1** is **compulsory**
        (2) Attempt **any three** questions out of remaining **five.**

1. (a) The formation of algal solutions in surface water is strongly dependent on pH **(05)**
of water, temperature and oxygen content. T is a set of water temperatures
from a lake given by T = {50, 55, 60} and O is a set of oxygen content values
in water given by O = {1, 2, 6}. The fuzzy sets of T and O are
T = {0.7/50 + 0.8/55 + 0.9/60}
O = {0.1/1 + 0.6/2 + 0.8/6}.
Given I = {0.5/50 + 1/55 + 0.7/60} and R = T x O, find
     i.   A = I o R
     ii.   B = I ● R

   (b) What is competitive learning? Explain winner take all learning rule. **(05)**

   (c) What are hybrid systems? Explain any 2 types of hybrid systems. **(05)**

   (d) Explain with example any 5 operations performed in Genetic Algorithm. **(05)**

2. (a) Write Extension Principle and explain with an example. How do you perform **(10)**
fuzzy addition using extension principle?

   (b) With a neat diagram explain the architecture of ANFIS. **(10)**

3   Design a fuzzy logic controller to determine the amount of detergent required **(20)**
for a washing machine. Assume the input as dirt and grease on the clothes.
Use 4 descriptors for input as well as output. Derive a set of rules for control
action and appropriate defuzzification. The design should be supported by
figures. Prove that when the clothes are soiled to a larger extent the amount
of detergent required is also more.

4. (a) Compare Mamdani, Tsukamoto and Sugeno models w.r.t number and type of **(10)**
i/p and o/p, fuzzy rules created, defuzzification methods.

   (b) Explain with algorithm Kohonen's Self Organizing Feature Maps. **(10)**

5. (a) Explain the method of Steepest Descent of optimization. **(10)**

   (b) Explain McCulloch-Pitts model with an example of AND functionality. **(10)**

6. Write short notes on: (20)
   (a) LVQ algorithm
   (b) Multi Continuous Perceptron Training Algorithm
   (c) Defuzzification techniques
   (d) Characteristics of Soft Computing

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(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

Q.1. Attempt any four (4) questions from the following. [20]
   a) Define Intelligent Agent. What are the characteristics of Intelligent Agent?
   b) Give State space representation for 8 puzzle Problem. What are possible Heuristic functions for it?
   c) What is FOPL? Represent the following sentences using FOPL
      i) John has at least two friends
      ii) If two people are friends then they are not enemies.
   d) Differentiate between forward and backward chaining.
   e) Define Belief Network. Explain conditional Independence relation in Belief Network with example.

Q.2 a) Draw and Describe the Architecture of Utility based agent. How is it different from Model based agent? [10]
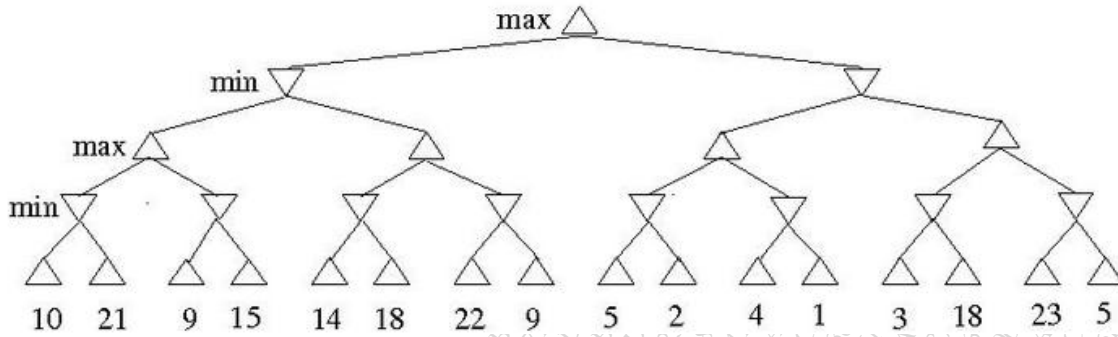
   b) Explain A* Algorithm with example. [10]

Q.3 a) Explain Resolution by Refutation with suitable example [10]

   b) Give the partial order plan for the following blocks-world-problem [10]

Start State   Goal State
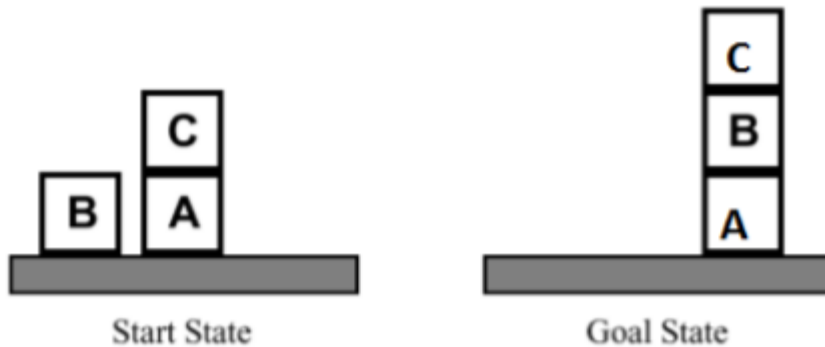
Q.4   a) Apply Alpha-Beta pruning on following example considering first node as MAX

[10]

b) Explain different Inference Rules for First Order Predicate Logic.   [10]

Q.5 a) Define the terms chromosome, fitness function, crossover and mutation as used in

Genetic algorithms. Explain how Genetic algorithms work.   [10]

b) What are steps involved in natural language processing (NLP) of an English sentence? Explain with an example sentence.   [10]

Q. 6 Write short note on any two of the following   [20]
   a) Expert System Architecture and Applications
   b) Local Search Algorithms
   c) Decision Tree learning

(3 Hours)   **[Total Marks:80]**

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

Q.1   **(a)**   What is the purpose of S-boxes in DES? Explain the avalanche effect?   **[05]**

          (b)   Give examples of replay attacks. List three general approaches for dealing   **[05]**
                    with replay attacks.

          (c)   Why is the segmentation and reassembly function in PGP(Pretty Good   **[05]**
                    Privacy) needed?

          (d)   List and explain various types of attacks on encrypted message.   **[05]**

Q.2   **(a)**   What is the need for message authentication? List various techniques used   **[10]**
                    for message authentication. Explain any one.

          (b)   Explain Kerberos protocol that supports authentication in distributed system. **[10]**

Q.3   **(a)**   What characteristics are needed in secure hash function? Explain the   **[10]**
                    operation of secure hash algorithm on 512 bit block.

          (b)   What is a nonce in key distribution scenario? Explain the key distribution   **[10]**
                    scenario if A wishes to establish logical connection with B. A and B both
                    have a master key which they share with itself and key distribution center.

Q.4   **(a)**   Why E-commerce transactions need security? Which tasks are performed by   **[10]**
                    payment gateway in E-commerce transaction? Explain the SET (Secure
                    Electronic Transaction) protocol.

          (b)   In RSA system the public key of a given user e=7 & n=187.   **[10]**

1) What is the private key of this user?

2) If the intercepted CT=11 and sent to a user whose public key e=7 & n=187. What is the PT?

3) Elaborate various kinds of attacks on RSA algorithm?

Q.5 **(a)** How can we achieve web security? Explain with example. **[10]**

(b) Use Hill cipher to encrypt the text "short". The key to be used is "hill". **[10]**

Q.6 **(a)** Explain IPSec protocol in detail. Also write applications and advantages of IPSec. **[10]**

(b) Differentiate between i) MD-5 and SHA ii) Firewall and IDS. **[10]**

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