

Digital Signal Processing

Q. P. Code : 622700

(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 Perform convolution operation between given function in time domain if 05
 $x_1(n) = (-3)^n$ for $n = 0, 1, 2, 3$
 0 otherwise and
 $x_2(n) = u(n) - u(n-4)$
- B Find whether the given signal is energy signal or not $x(n) = u(n) - u(n-6)$. 05
- C State the stability criteria of discrete time system and determine the given IIR 05
 system is stable or not $y(n) = 5x(n) + 12$.
- D Find IDFT of $X(k) = \{2, 1-j, 0, 1+j\}$. 05
- Q2 A Consider the following analog signal 10
 $x(t) = 2\sin(100 * \pi * t)$
 The signal $x(t)$ is sampled with a sampling rate $F_s = 50\text{Hz}$. Determine the discrete time signal. Plot the discrete time signal. And also calculate total number of samples.
- B If $x_1(n) = \{1, 2, 3, 6\}$ find $X_1(K)$ and $p(n) = \{1, 6, 3, 2\}$ Find $P(K)$ using $X_1(K)$. 10
 ↑ ↑
- Q3 A Check whether following systems are : 10
 i) Static or Dynamic ii) Linear or Non-linear
 iii) Shift invariant or variant iv) Causal or Non-causal.
 a) $y(n) = 2^n u(n)$ b) $y(n) = 4x(n) + x(n-2)$
- B For $x(n) = \{8, 5, 2, 4, 2, 1\}$, plot the following Discrete Time signals: 10
 1.) $x(n+2)$ 2.) $x(n)u(-n)$ 3.) $x(n-1)u(-n-2)$
 4.) $x(-n-1)u(n)$ 5.) $x(2n-1)$
- Q4 A State any five DFT properties. 10
- B Draw the radix 2 DIT FFT and find the DFT of the sequence 10
 $x(n) = \{2, 3, 4, 1, 0, 0, 0, 0\}$ using FFT flow graph.

[TURN OVER]

- Q5 A Compute Linear Convolution of causal sequence $x(n) = \{5, 6, 2, 4, 1, 4, 5, 2, 3\}$ 10
and $h(n) = \{2, 1, 3, 1\}$ using fast overlap add method.
- B For the FIR digital filter with impulse response given by 10
 $h(n) = \delta(n) + 2\delta(n-2) + 3\delta(n-3)$ sketch the magnitude response of the filter.
- Q6 A Write a detailed note on TMS 320. 10
- B Write a detailed note on Carls' Correlation Coefficient Algorithm. 10
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Sem -VII
Comp C (B&J)
C.S.S

11/12/2016

25

Q.P. Code : 811502

(3 Hours)

[Total Marks : 80

1. Question No 1 is compulsory.
2. Attempt any three out of the remaining five questions.

- Q1. (a) What are block ciphers? Explain with examples the CBC and ECB modes of block ciphers. 05
- (b) Encrypt the string "This is an easy task" using a playfair cipher with key "monarchy". 05
- (b) Define authentication and non-repudiation and show with examples how each one can be achieved. 05
- (d) Describe triple DES with two DES keys. Is man in the middle attack possible on triple DES? 05
- Q2. (a) A and B decide to use Diffie Hellman algorithm to share a key. They choose $p=23$ and $g=5$ as the public parameters. Their secret keys are 6 and 15 respectively. Compute the secret key that they share. 10
- (b) Compare DES and IDEA. Explain the round key generation scheme in both these algorithms. 10
- Q3. (a) What are the different types of viruses and worms? How do they propagate? 10
- Q3. (b) What are the various ways for memory and address protection in Operating systems? How is authentication achieved in O.S? 10
- Q4. (a) Explain briefly with examples, how the following attacks occur: i) Salami attack ii) Denial of Service attack iii) session hijacking attack iv) Cross-site scripting attack 10
- Q4. (b) How is security achieved in the transport and tunnel modes of IPSec? Describe the role of AH and ESP. 10
- Q5. (a) How is confidentiality achieved in emails using either S/MIME or PGP? 05
- Q5. (b) A and B wish to use RSA to communicate securely. A chooses public key (e,n) as $(7,247)$ and B chooses public key (e,n) as $(5,221)$. Calculate their private keys. What will be the cipher text sent by A to B if A wishes to send message $m=5$ securely to B? 10
- Q5. (c) What is a digital signature? Explain any digital signature algorithm. 05
- Q6. (a) Compare and contrast (any two): 10
- i) Block and stream ciphers
 - ii) MD-5 versus SHA
 - iii) KDC versus CA
- Q6. (b) What are firewalls. Explain the different types of firewalls and mention the layer in which they operate. 10

Q. P. Code : 811602

(3 Hours)

(Total Marks : 80)

- N.B. 1. Question No. 1 is compulsory
2. Attempt any three (3) out of remaining five (5)
3. Assume suitable data if necessary and justify the assumptions
4. Figures to the right indicate full marks

- Q1 Attempt an four (4)
- [A] What are PEAS descriptors? Give PEAS descriptors for a robot meant for cleaning the house. [05]
- [B] Define heuristic function. Give an example heuristics function for 8-puzzle problem. Find the heuristics value for a particular state of the Blocks World Problem. [05]
- [C] Compare and Contrast problem solving agent and planning agent. [05]
- [D] What are the problems/frustrations that occur in hill climbing technique? Illustrate with an example [05]
- [E] Represent the following statement into FOPL. [05]
- (i) Every tree in which any aquatic bird sleeps is beside some lake.
(ii) People try to assassinate rulers they are not loyal to.

- Q2 [A] Consider the given instance of 8-puzzle. [10]

1	2	3
4	5	6
7	8	

1	2	3
4	6	
7	5	8

Goal State

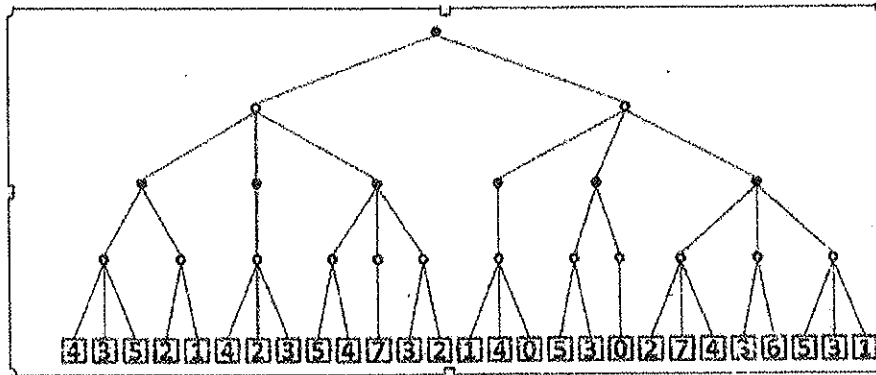
Initial state

Compare and contrast uninformed search strategies with respect to solving 8-puzzle problem.

- [B] Draw and describe the architecture of goal based agent. [06]
- [C] Convert the following propositional logic statement into CNF [04]
 $(A \leftrightarrow B) \rightarrow C$
- Q3 [A] The law says that it is a crime for an American to sell weapons to hostile nations. The country Nono, an enemy of America, has some missiles, and all of its missiles were sold to it by Colonel West, who is an American.
- (i) Represent the above sentences in first order predicate logic (FOPL). [04]
- (ii) Convert them to clause form [04]
- (iii) Prove that "West is Criminal" using resolution technique [04]
- [B] What are the basic building blocks of Learning Agent? Explain each of them with a neat block diagram. [08]

[TURN OVER]

- Q4 [A] Apply alpha-Beta pruning on following example considering first node as MAX [10]



- [B] Draw general architectural diagram of Expert system. Explain every component in detail of this block with an example. [10]

- Q5 [A] Give the initial state, goal test, successor function, and cost function for the travelling salesperson problem (TSP). There is a map involving N cities some of which are connected by roads. The aim is to find the shortest tour that starts from a city, visits all the cities exactly once and comes back to the starting city. [06]

- [B] Prove the admissibility of A* [06]

- [C] Explain a partial order planner with an example [08]

- Q6 [A] Given a full 4-gallon jug and an empty 3-gallon jug, the goal is to fill the 4-gallon jug with exactly 2-gallons of water. Give state space representation. [10]

- [B] The gauge reading at a nuclear power station shows high values if the temperature of the core goes very high. The gauge also shows high value if the gauge is faulty. A high reading in the gauge sets an alarm off. The alarm can also go off if it is faulty. The probability of faulty instruments is low in a nuclear power plant. [10]

- (i) Draw the Bayesian Belief Network for the above situation
 (ii) Associate a conditional probability table for each node

QP CODE : 811902

(3 Hours)

| Total Marks : 80

- N.B. (1) Question No. 1 is Compulsory.
 (2) Attempt any THREE questions out of remaining questions.
 (3) Assume any suitable data if required with justification.

- Q. 1 a) Explain any five zero memory operations. 10
 b) Perform histogram equalization and draw new equalized histogram of the following image data. 10

Gray level	0	1	2	3	4	5	6	7
Number of pixels	800	1000	850	650	300	250	100	150

- Q. 2 a) Find the DFT of the given image: 10

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

- b) What is segmentation? Explain (i) Region Growing (ii) Region Splitting (iii) Thresholding. 10

- Q. 3 a) Explain with an example that the first difference of a chain code normalizes it to rotation. 10
 b) Explain the following morphological operations: 10
 (i) Opening (ii) Closing

- Q. 4 a) Classify Image Compression methods in detail along with the different redundancies that can be present in digital images. 10
 b) What are various file formats? Explain each in brief. 10

- Q. 5 a) Given 10

$$F = \begin{bmatrix} 10 & 44 & 15 \\ 10 & 14 & 48 \\ 11 & 10 & 22 \end{bmatrix}$$

- i) Find 3-bit IGS coded image and calculate compression factor and BPP.
 ii) Find the decoded image and calculate MSE and PSNR.

- b) Write 8×8 HADAMARD transform matrix and its signal flow graph. Using Butterfly diagram, compute HADAMARD transform for $x(n) = \{1, 2, 1, 2, 1, 2, 3, 4\}$ 10

- Q. 6 Write short notes on 20
 a) Discrete Cosine Transform. (b) Hough transform.
 c) HSI color model. (d) 4, 8 and m-connectivity

Q.P. Code : 790702

(3 Hours)

[Total Marks : 80

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

1. (a) Define Support, Core, Crossover points, Normality and Convex Fuzzy sets. 5
(b) What are the types of neural processing? 5
(c) State differences between derivative based and derivative free optimization techniques? 5
(d) What are the features of hybrid system? Why is it required? 5
2. Design a fuzzy controller for a train approaching or leaving a station. The inputs are the distance from the station and speed of the train. The output is the amount of brake power used. Use four descriptors each for inputs and output and design using mamdani fuzzy model. Derive set of rules for control action and defuzzification. The design should be supported by figures. Prove that if the train is at a short distance with great speed the brake power required would be very high and vice versa. 20
3. (a) Four steps of Hebbian learning of a single neuron network is implemented starting with $w^1 = [1 \ -1]$ at the rate = 1, using the inputs given below :
 $X_1 = [1, -2]$ $X_2 = [0, 1]$ $X_3 = [2, 3]$ $X_4 = [1, -1]$
Find final weights for binary continuous activation function. 10
(b) Explain Error Back Propagation training algorithm with flow chart. 10
4. (a) How is LVQ working as a classifier? With a neat flow explain the working of LVQ ? 10
(b) What are the steps in Genetic Algorithm? Explain examples the uniform crossover, tournament selection and mutation. 10
5. (a) What are the types of Fuzzy Inference Systems? Explain each with appropriate diagrams. 10
(b) Explain ANFIS architecture with a neat diagram. 10

TURN OVER

6. Write short notes on **any four** :

- (a) Fuzzy extension principle
- (b) Flowchart of Single Discrete Perceptron Algorithm (SDPTA)
- (c) Kohonen Learning Algorithm
- (d) Newton's Method in derivative based optimization
- (e) CANFIS

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