

DSP

QP Code : 31256

(3 hours)

Total Marks: 80

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

- Q1 A For the given causal sequences $x(n) = \{8, 9, 2, 3\}$ and $h(n) = \{4, 3, 6\}$ find the cross correlation. 05
- B State the condition for stability of LTI system and determine for the given discrete time system $h(n) = (0.3)^n u(n) + 5\delta(n)$, is stable or not. 05
- C Differentiate IIR and FIR systems. 05
- D For the causal signal $x(n) = \{2, 2, 4, 4\}$ compute four point DFT using DIT-FFT. 05
- Q2 A Check whether following system $y(n) = 2x(n-1) + x(2n)$ is: 10
1. Linear or non Linear
 2. Causal or non-causal
 3. Time variant or Time invariant
 4. Static or Dynamic
- B Draw the radix 2 DIT flow graph and find the DFT of the sequence $x(n) = \{10, 11, 8, 5\}$ using FFT flow graph. 10
- Q3 A For $x(n) = \{2 \ 3 \ 4 \ 5 \ 1 \ 3\}$, plot the following Discrete Time signals: 10
- 1.) $x(n-1)$
 - 2.) $x(n)u(-n)$
 - 3.) $x(n-1)u(-n-1)$
 - 4.) $x(n)u(n)$
 - 5.) $x(2n)$
- B Determine whether or not the following signals are periodic. 10
- If periodic specify its fundamental period.
1. $x(n) = \sin(0.25\pi n + 0.4)$
 2. $x(n) = \cos(0.5n\pi) + \sin(0.25n\pi)$
- Q4 A For the FIR digital filter with impulse response given by 10
- $$h(n) = 2\delta(n) + 3\delta(n-1) + 4\delta(n-3) + \delta(n-4)$$
- sketch the magnitude response of the filter.
- B State any five DFT properties. 10

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- Q5 A Find circular convolution of $x_1(n) = \{5, 6, 2, 1\}$ and $x_2(n) = \{3, 2, 1, 4\}$ by computing DFT of $x_1(n)$ and $x_2(n)$. 10
- B Compute Linear Convolution of causal sequence $x(n) = \{7, 6, 4, 5, 2, 4, 5, 2, 3\}$ and $h(n) = \{1, 2, 3, 1\}$ using fast overlap save method. 10
- Q6 A Write a detailed note on Carls' Correlation Coefficient Algorithm. 10
- B Write a detailed note on DSP Processor and Architecture. 10

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QP Code : **31386**

(3 hours)

[80 Marks]

N.B.:

1. Question No.1 is **compulsory**.
2. Attempt any **Three** questions out of remaining **Five** questions.
3. Figures to the right indicate full marks.
4. Assume any suitable data wherever required but justify the same.

Q.1

- a) What is Unitary transform matrix? Explain with example. 5
- b) Explain in short sampling and quantization method for digital image. 5
- c) Explain in short morphological operations Dilation and Erosion. 5
- d) Justify /contradict: All Image compression techniques are invertible. 5

Q.2

- a) Explain in detail any two types of Image File Formats. 8
- b) For the 3 bit 4x4 size image perform following operations. 12
 - i) Thresholding $T = 3$
 - ii) Intensity level slicing with background, $r_1 = 3$ and $r_2 = 5$
 - iii) Bit plane slicing for MSB and LSB planes

3	3	1	2
1	4	0	7
3	4	2	6
2	4	6	4

- Q.3 a) Perform histogram equalization and draw new equalized histogram of the following image data 10

Gray Level	0	1	2	3	4	5	6	7
No. of pixels	400	700	1350	2400	3000	1500	650	0

- b) Find Huffman code for the symbols given below. Which kind of redundancy is removed by Huffman code? Explain the term Compression Ratio. 10

Symbols	Probability
a ₁	0.1
a ₂	0.3
a ₃	0.2
a ₄	0.25
a ₅	0.07
a ₆	0.08

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Q.4 a) Using matrix multiplication method calculate 2-D DFT of 10

$$f(x, y) = \begin{bmatrix} 1 & 0 & 3 & 1 \\ 1 & 1 & 2 & 2 \\ 2 & 0 & 1 & 3 \\ 1 & 2 & 2 & 4 \end{bmatrix}$$

b) Using the Butterfly diagram, compute Hadamard transform for $x(n) = \{1, 2, 3, 4, 1, 2, 1, 2\}$ 10

Q.5 a) What are the different types of redundancies in digital image? Explain in detail giving example of each. 10

b) What is image segmentation? Explain the following methods of image segmentation. 10

- i) Region growing
- ii) Split and Merge

Q.6 Write detail notes on (any two) 20

- i) Hough Transform
- ii) Homomorphic filter
- iii) Hit or Miss Transform
- iv) Chain code

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(3 Hours)

[Total Marks : 80]

- N. B. :** (1) Each question carry 20 marks.
(2) Question 1 is compulsory.
(3) Attempt any three (3) from the remaining questions.
(4) Assume suitable data wherever required.

1. Attempt any four (4) questions from the following: 20
- (a) Draw and explain architecture of Expert System.
 - (b) Explain Hill-climbing algorithm with an example.
 - (c) Give PEAS description for a Robot Soccer player. Characterize its environment.
 - (d) Explain Turing test designed for satisfactory operational definition of intelligence.
 - (e) Prove that A^* is admissible if it uses a monotone heuristic.
 - (f) Compare and Contrast problem solving agent and planning agent.
2. (a) Explain decision tree learning with an example. What are decision rules? How to use it for classifying new samples? 10
- (b) Write first order logic statements for following statements: 10
- (i) If a perfect square is divisible by a prime p then it is also divisible by square of p .
 - (ii) Every perfect square is divisible by some prime.
 - (iii) Alice does not like Chemistry and History.
 - (iv) If it is Saturday and warm, then Sam is in the park.
 - (v) Anything anyone eats and is not killed by is food.
3. (a) Design a planning agent for a Blocks World problem. Assume suitable initial state and final state for the problem. 10
- (b) Find the probabilistic inference by enumeration of entries in a full joint distribution table shown in figure 1. 10
- (i) No cavity when toothache is there
 - (ii) $p(\text{Cavity} | \text{toothache or catch})$

	toothache		¬toothache	
	catch	¬catch	catch	¬catch
cavity	.108	.012	.072	.008
¬cavity	.016	.064	.144	.576

Figure 1.

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4. (a) Compare following informed searching algorithms based on performance measure with justification: Complete, Optimal, Time complexity and space complexity. 10
- a) Greedy best first
 - b) A*
 - c) Recursive best-first (RBFS)

- (b) Apply alpha-Beta pruning on example given in Figure 2 considering first node as max. 10

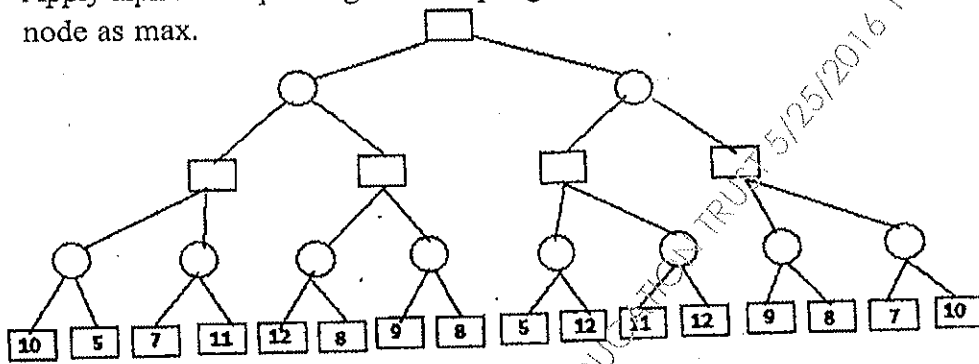


Figure 2.

5. (a) Explain how genetic algorithm can be used to solve a problem by taking a suitable example. 10
- (b) Consider the graph given in Figure 3 below. Assume that the initial state is A and the goal state is G. Find a path from the initial state to the goal state using DFS. Also report the solution cost 10

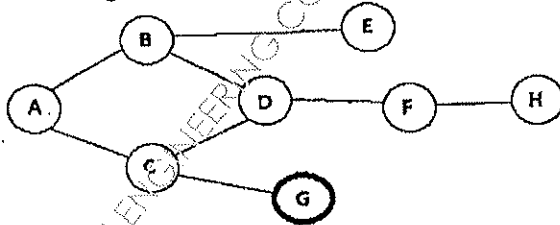


Figure 3.

6. (a) Explain the steps involved in converting the propositional logic statement into CNF with a suitable example 10
- (b) What are the basic building blocks of Learning Agent? Explain each of them with a neat block diagram. 10

QP Code : 31296

(Time: 3hrs)

(Marks 80)

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

- Q1. (a) Explain software flaws with examples 05
(b) List with examples the different mechanisms to achieve security 05
(b) Explain with examples, keyed and keyless transposition ciphers 05
(c) Elaborate the steps of key generation using RSA algorithm 05
- Q2. (a) A and B decide to use Diffie Hellman algorithm to share a key. They chose 10
 $p=23$ and $g=5$ as the public parameters. Their secret keys are 6 and 15 10
respectively. Compute the secret key that they share.
(b) Explain working of DES.
- Q3. (a) What is access control? How does the Bell La Padula model achieve access 10
control.
Q3. (b) What is a digital signature. Explain any digital signature algorithm in detail. 10
- Q4. (a) Compare packet sniffing and packet spoofing. Explain session hijacking 10
attack.
Q4. (b) Explain working of Kerberos. 10
- Q5. (a) What is a firewall? What are the firewall design principles? 05
Q5. (b) What are the various ways for memory and address protection 05
Q5. (c) Explain the significance of an Intrusion Detection System for securing a 10
network. Compare signature based and anomaly based IDS.
- Q6. Write in brief about (any four): 20
i) Email Security.
ii) SSL handshake protocol
iii) IP Sec protocols for security
iv) Denial of service attacks
v) IDEA

