

B.E / IT / Sem VII / Rev
Digital Signal & Image Processing.
 (REVISED COURSE)

GT-8952

P4-Con No-98

Con. 6602-10.

(3 Hours)

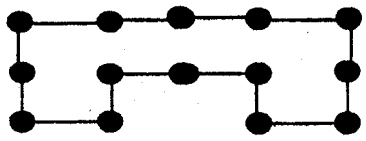
[Total Marks : 100

- Note: 1) Question No 1 is compulsory
 2) Attempt any four Questions out of remaining six questions.
 3) Assume suitable data wherever required and clearly specify it.

1. Attempt any four ;

[20]

- (a) Give any four classifications of Discrete Time Signals with examples.?
- (b) How to find Inverse one dimensional DFT using forward DITFFT flowgraph.? Derive the necessary formula.
- (c) Differentiate between Spatial Resolution and Tonal Resolution
- (d) Obtain the four directional Chain Code and Shape Number Representation of the following image.



(e) For the following given binary image first perform morphological opening operation and then successively apply morphological closing operation.

$$A = \begin{bmatrix} 1 & 0 & 1 & 0 & 1 & 0 & 1 \\ 1 & 1 & 0 & 1 & 1 & 0 & 1 \\ 1 & 1 & 1 & 1 & 1 & 1 & 1 \\ 1 & 1 & 1 & 1 & 1 & 0 & 0 \\ 1 & 1 & 0 & 1 & 1 & 1 & 1 \end{bmatrix} \quad B = [(i) \ 1]$$

(f) Consider the image given below. Calculate the direction of the edge at the center point of the image.

$$f = \begin{bmatrix} 50 & 60 & 70 \\ 5 & 50 & 80 \\ 7 & 9 & 50 \end{bmatrix}$$

(g) Prove that two dimensional DFT matrix is an unitary matrix.

2. (a) $x(t) = \sin(480 \pi t) + 3 \sin(720 \pi t)$ is sampled with $F_s = 600$ times per Sec. [4]

- (1) What are the Frequencies in radians in the resulting DT signal $x[n]$?
- (2) If $x[n]$ is passed through an ideal interpolator, what is the reconstructed signal.

(b) Given an image of size (3 X 3) $f(m,n) = \begin{bmatrix} 128 & 212 & 255 \\ 54 & 62 & 124 \\ 140 & 152 & 156 \end{bmatrix}$ [6]

Determine the output image $g(m,n)$ using logarithmic Transformation $g(m,n) = C \text{Log}_{10}[1 + f(m,n)]$ by choosing $C = \frac{L}{\log_{10}[1 + L]}$ where L is the maximum pixel value in the image.

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(c) Given $f(x,y) = \begin{bmatrix} 5 & 6 & 7 \\ 8 & 9 & 10 \end{bmatrix}$ $h(x,y) = \begin{bmatrix} 1 & 2 \\ 3 & 4 \end{bmatrix}$ Find Linear Convolution of [10]
 input image $f(x,y)$ with filter $h(x,y)$.

3. (a) Let $x[n] = 2 \delta[n] + 3 \delta[n-1] + 4 \delta[n-2] + 5 \delta[n-3]$. Find 4 point [4]
 DFT $X[k]$ using Fast Fourier Transform Flowgraph.

(b) Derive the contrast stretching Transformation function. [6]

[TURN OVER

- (c) For the following given Binary image R of size (256 X 256), apply split and merge technique and segment the image so that all the pixels in segmented image will have same intensity value. [10]

R =



4. (a) Explain separable property of DFT. [4]
- (b) Given an input image f of size (3 X 3), find the filtered image R using median filter with filter mask as given below. Assume virtual ROWs and COLUMNs with repeated border pixels. Show all calculations in nine steps. [6]

$$f = \begin{bmatrix} 3 & 2 & 1 \\ 5 & 2 & 6 \\ 7 & 9 & 1 \end{bmatrix} \quad \text{Output Image} \rightarrow R = \begin{bmatrix} R1 & R2 & R3 \\ R4 & R5 & R6 \\ R7 & R8 & R9 \end{bmatrix} \quad \text{Median filter mask} \rightarrow \begin{bmatrix} 0 & 1 & 0 \\ 1 & 1 & 1 \\ 0 & 1 & 0 \end{bmatrix}$$

- (c) Derive Fast Walsh Transform Flowgraph for N=4. [10]
5. (a) Let x[n] be 4 point sequence with X[k] = { 1, 2, 3, 4 }. Find the FFT of the following sequences using X[k] and not otherwise [4]
- (1) p[n] = (-1)ⁿ x[n] (2) q[n] = x[-n+1]
- (b) For a given source A = { a1, a2, a3, a4 } the following codes were developed. Check for each of them whether it is uniquely decodable or not. Justify your answer. Also state which is the most optimum compared to others? Why? [6]

SYMBOL	PROBABILITY	CODE-1	CODE-2	CODE-3	CODE-4
a1	0.5	00	0	0	11
a2	0.25	01	1	10	10
a3	0.125	10	00	110	010
a4	0.125	11	11	111	1001

- (c) A four bit Input Image F and DCT of Input Image is given below. [10]

$$F = \begin{bmatrix} 2 & 4 & 4 & 2 \\ 4 & 6 & 8 & 3 \\ 2 & 8 & 10 & 4 \\ 3 & 8 & 6 & 2 \end{bmatrix} \quad T = \begin{bmatrix} 19 & -0.27 & -8.0 & 0.65 \\ -2.69 & -0.25 & 2.30 & 0.89 \\ -3.50 & 1.46 & 1.50 & -1.69 \\ 0.03 & -1.60 & -0.95 & -0.24 \end{bmatrix}$$

Arrange the DCT coefficients in ZIG-ZAG order. Truncate 50 % high frequency AC coefficients. Then perform Inverse DCT. Compare the original image and decoded image. Calculate PSNR and MSE.

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6. (a) If $x[n] = \{ 1, 2, 3, 4 \}$ and $h[n] = \{ 1, -1 \}$ [4]
Find linear convolution using circular convolution.
- (b) Explain one level Decomposition and Reconstruction of Digital Image [6]
using Discrete Wavelet Transform.
- (c) Find the arithmetic codeword of the message : INDIA [10]
Calculate the percentage of compression and Bits Per Pixel (BPP) of the
compressed message.
7. Write Short Note on any **two** of the following [20]
- (a) Digital Watermarking in Transform Domain
 - (b) Hit-or-Miss transformation
 - (c) Content based Image Retrieval
 - (d) Biometric Authentication
-

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

(2) Attempt any **four** questions from the remaining.

(3) Assume suitable address and data if necessary.

(4) Figures to the right indicate **full** marks.

- Q1 A. Why CSMA/CD MAC protocol is not used in Satellite Systems ? Explain. (5)
- B. Explain the IMEI & IMSI structures of GSM network. (5)
- C. Explain why only seven slaves are supported inside a Piconet. (5)
- D. Explain the terms DIFS, PIFS, SIFS with respect to DCF operation. (5)
- Q2 A. With neat diagram explain cdmaOne protocol architecture. (10)
- B. Explain the protocol architecture and Security mechanism of DECT . (10)
- Q3 A. List & explain the Downlink (Forward Link) Physical Channels and Uplink (Reverse) Physical Channels of cdma2000. (10)
- B. Determine the number of mobile users that can be supported by a sector of three- sector Cell of CDMA system. The RF bandwidth is 1.25 MHz to transmit data at 9.6 kbps. $E_b/N_0 = 6$ dB, the interference from neighbouring cells $\rho = 50\%$, the power control accuracy factor $\alpha = 0.85$, the voice- activity factor $v = 0.6$, and the improvement from sectorisation $Y = 2.55$. (10)
- Q4 A. What is VSAT. Explain the VSAT-to-hub Channel Structure & Hub-to-VSAT channel structure with neat diagram. (10)
- B. What is WLL. Explain the MMDS & LMDS with the help of diagram. State its advantages & disadvantages. (10)
- Q5 A. With neat diagram explain the IEEE 802.11 System architecture. (10)
- B. How packet routing is done in Wireless Ad Hoc networks. Explain CGSR protocol. (10)

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Q6 A. Explain the Wired Equivalent Privacy Protocol (WEP). State the different fields present in the WEP frame. (10)

B. Consider an 802.11a WLAN system in which OFDM baseband modulation scheme is used. (10)

It has 52 subcarriers out of which 4 subcarriers are used as pilot & remaining as data. The guard interval for ISI mitigation is 4 micro second. If the system uses 1/3 FEC code rate & 64-QAM carrier modulation scheme. Find the achievable transmission data rate.

Q7 Write short notes on:- (20)

A. Concept of Spread spectrum.

B. Wireless Lan Topologies.

C. Difference between a MAC address & an LLC address.

D. Characteristics of the major 3G standards.

B. E. | IT | Sem III / Old (3 Hours)

N.B. Q1 is compulsory.

Elective - Advanced Database System

2) Answer any four out of remaining six questions.

3) Marks for each question are given in brackets at the right hand side.

- 1.A) Explain the concept of object identity and object structure. (5)
- B) Differentiate XML DTD and XML schema. (5)
- C) What do you understand by structured, unstructured and semi-structured data? (5)
- D) What are the advantages of distributed databases? (5)
- 2.A) Explain the architecture of parallel databases. (10)
- B) What are the software components of client server system? Explain 2 tier and 3 tier client server architecture? (10)
- 3.A) Describe with an example the need for relational object and object relational databases. (10)
- B) Consider an airline database that keeps track of reservations on two different flights. Design object oriented schema for the system. (10)
4. Design a database that manages information about publishers, authors and books with the following information about the system.

Publisher: name and address of the headquarters, set of branches, branch address and branch phone numbers (assume 2 phone numbers).

Author: name and address.

Book is published by a publisher and has a list of authors associated with it. An author can publish several books but a book is published by at most one publisher.

 - A) Draw a EER diagram for the above specification. (5)
 - B) Specify an object-relational database schema that represents the above properties. (10)
 - C) Describe the steps for mapping EER schema to an ODB schema. (5)
- 5.A) Explain with suitable example horizontal, vertical and derived fragmentation. (10)
- B) Describe the salient features of spatial databases. Show how GIS is developed from spatial databases. (10)
- 6.A) Explain with suitable examples object oriented concepts related to complex objects. (10)
- B) Design a web database for a case study of your choice. (10)
7. Write short notes on any two : (2 x 10)
 - A) Mobile database
 - B) Temporal database
 - C) XPath and XQuery.

Image Processing (OLD COURSE)

GT-8130

(3 Hours)

[Total Marks : 100

- N.B.** (1) Question No. 1 is **compulsory**.
 (2) Attempt any **four** questions from the remaining **six** questions.
 (3) Assume suitable **additional** data if **required**, **state** and **justify** the assumptions made.

1. State whether following statements are **True** or **False** and justify the same—
- (a) Shrinking of an image is a lossy compression. 5
 (b) Removing interpixel redundancy may or may not result in lossy compression. 5
 (c) Laplacian is better than gradient for detection of edges. 5
 (d) Walsh transform is nothing but sequency ordered Hadamard matrix. 5

2. (a) Perform Histogram Equation and also draw histogram for the input image and equalized image 10

Gray level r_k	0	1	2	3	4	5	6	7
No. of pixel n_k	123	78	281	417	639	1054	816	688

- (b) Consider the image : 10

$$A = \begin{bmatrix} 0 & 1 & 0 & 0 \\ 0 & 1 & 0 & 0 \\ 0 & 1 & 1 & 0 \\ 1 & 0 & 0 & 0 \end{bmatrix}$$

Let the structuring element $B = \begin{bmatrix} \textcircled{1} & 1 \end{bmatrix}$

Perform (i) Erosion (ii) Dilation (iii) Opening.

3. (a) Given below is the table of 8 symbols and their frequency of occurrence. 10

Symbol	a_0	a_1	a_2	a_3	a_4	a_5	a_6	a_7
Frequency	0.25	0.15	0.06	0.08	0.21	0.14	0.07	0.04

Find Huffmann Code for the same. Also find coding efficiency.

- (b) Explain the method of segmentation of images by Region splitting and merging with suitable example. 10

4. (a) Consider an 8 pixel line of gray scale data { 12, 10, 08, 13, 14, 32, 40, 11 } which has been uniformly quantized with 6 bit accuracy. Construct its 3 bit IGS code. Decode the received IGS code. 8

- (b) What are the different types of redundancies in digital images ? Explain in brief. Specify each of the following compression techniques whether it is a lossy or lossless and which type of redundancy it will minimize. 12

- (i) LZW algorithm (ii) Transform coding
 (iii) Run length coding (iv) Adaptive Delta Modulation.

[TURN OVER

Con. 6674-GT-8130-10.5. Write short notes on (any **four**) :—

20

- (a) Discrete Cosine Transform
- (b) Hit and Miss Transform
- (c) Fourier Descriptors
- (d) Image Compression Models
- (e) Enhancement of Image in Frequency domain.

6. (a) Explain Hough Transform and how it is used to link the edges. 10
- (b) Explain in detail any four methods of enhancement techniques in spatial domain used for images. 10

7. (a) State any five properties of 2D DFT. 10
- (b) Calculate the 2D Hadamard transform of the image segment shown below : 10

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

N.B. (i) Q.No. 1 is compulsory.

(ii) Attempt any four out of the remaining six questions.

(iii) Assume suitable data wherever required with justification.

(iv) Draw diagrams wherever necessary.

1. (A) What is an IS? Give the types of IS? Describe the components and resources of an IS? [10]
(B) What is System Maintenance? Discuss types of system maintenance? [10]
2. (A) Explain Data Warehouses and Data Mining using a neat labelled diagram? [10]
(B) Discuss the components of a Telecommunication Network and give types of networks? [10]
3. (A) Discuss the key tasks during Conceptual System Design? [10]
(B) Describe the step by step procedure for implementation of MIS? [10]
4. (A) Explain MIS application in service sector of Airlines OR Hospital? [10]
(B) Discuss in detail Documentation of an MIS? Give different methods of Documentation? [10]
5. (A) What is an ERP? What factors are important while ERP package selection? Explain in detail? [10]
(B) Discuss all the pitfalls of MIS development? [10]
6. (A) Explain MIS application in manufacturing sector for Production OR Personnel Management? [10]
(B) What is SCM? What is the need of SCM? Give its working, advantages and challenges? [10]
7. (A) What are characteristics of DSS? Explain DSS used for decision making phases? [10]
(B) What is CRM? Explain Phases of CRM, Benefits and challenges of CRM & Types of CRM? [10]

Lab
F-100.10-2
Con. 5555-10.

BE/IT/Sem VII/Old
mobile computing
(OLD COURSE)

(3 Hours)

9/12/10

GT-8152

[Total Marks : 100

- N.B. :** (1) Question No. 1 is **compulsory**.
(2) Attempt any **four** from remaining **six**.
(3) Support your answer with **diagrams**.
(4) **Figures** to the **right** indicate **full** marks.

1. Explain the following: 20
 - a) Hidden & Exposed terminal problem with solution
 - b) TDMA vs. FDMA
 - c) WAP protocol stack
 - d) Triangular Routing
2. Explain system Architecture of GSM in detail 20
3. (a) Explain IP packet delivery to/from mobile host. 10
(b) Explain WATM reference model with several access scenarios 10
4. (a) Explain Indirect TCP including its merits & demerits over S-TCP. 10
(b) Why routing in ad-hoc network is complicate? What are the challenges? 10
5. (a) Explain power management in IEEE 802.11 10
(b) Explain HIPERLAN 2 basic structure and handover scenario. 10
- 6.(a) Explain Digital Video Broadcasting and Audio broadcasting. 10
(b) Explain IP-in-IP encapsulation and minimal encapsulation along with differences. 10
7. Write short notes on any two of the following: 20
 - a) IPv4 Vs. IPv6
 - b) WML script.
 - c) GPRS

- N.B. :**
- 1) Question No. 1 is compulsory.
 - 2) Out of remaining questions, attempt any four questions.
 - 3) Assume suitable data wherever required but justify the same.
 - 4) All questions carry equal marks.
 - 5) Answer to each new question to be started on a fresh page.
 - 6) Figure to the right in brackets indicate full marks.
 - 7) Use of statistical table is allowed.

1. (a) Write down the Time Advance Algorithm. Explain it with suitable example. (05)
- (b) What are the advantages of simulation? (05)
- (c) Define the terms - System, System State, Event Notice, Event List in Discrete Event System Simulation. (04)
- (d) Design random variate generator for exponential and uniform distribution. (06)
2. (a) What are the trends in simulation software? Explain any three in detail. (10)
- (b) Consider a single server system. Let the arrival distribution be uniformly distributed between 1 and 8 minutes. Let the service distribution be as follows. (10)

Service Time (min)	1	2	3	4	5	6
Probability	0.17	0.15	0.32	0.20	0.06	0.10

Develop the simulation table and analyze the system by simulating the arrival and service of 10 customers. Assume that the first customer is arriving to system at 0th time. Random digits for intrarriaval time and service are given below.

Customer No.	1	2	3	4	5	6	7	8	9	10
R D. for Interarrival Time	---	751	303	106	94	606	747	339	877	454
R. D for. Service Time	74	52	16	82	94	61	87	35	29	99

3. (a) What do you understand by model verification and validation? How would you validate input-output transformation of a model? (10)
- (b) Explain counting process. What are the criteria for counting process to be a Poisson process? Explain the properties of Poisson process with suitable example. (10)
4. (a) State the effect of initialization bias in steady state simulation and how one can remove this effect. (08)
- (b) Consider the sequence of 40 digits:

0.81	0.62	0.27	0.88	0.72	0.43	0.56	0.97	0.75	0.49
0.06	0.39	0.89	0.23	0.02	0.66	0.40	0.19	0.73	0.52
0.53	0.30	0.92	0.96	0.58	0.47	0.60	0.11	0.29	0.78
0.87	0.28	0.69	0.37	0.64	0.39	0.51	0.54	0.01	0.05

Can the hypothesis that the numbers are independent be rejected on the basis of runs above and below the mean, where $\alpha = 0.05$? (08)

- (c) Explain the significance of correlation and covariance. (04)

5. (a) Discuss in detail the time series input models. (10)
(b) State - types of simulation with respect to output analysis with suitable example. (05)
(c) Define simulation. Draw the flowchart for steps involved in simulation study. (05)
6. (a) Explain quantile-quantile plot. (08)
(b) State the characteristics of queuing system. Explain it in detail. (12)
7. (a) Consider any scenario from manufacturing sector and draw the block diagram of various processes involved in it. Suggest the performance measures. (08)
(b) Explain p-values and best fits. (06)
(c) Identify the various activities in inventory system and reliability system. Suggest the statistical distribution to model these activities with appropriate justification. (06)
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