

TE/BXTC/SEM-VI/C-2019/DEC. 2023

[Time: 3 Hours]

[Marks: 80]

N.B: Q.1 is compulsory.
Attempt any Three out of remaining questions.
Assume suitable data.

- Q.1 a) Derive the integral form of continuity equation. 5
b) Explain concept of current density. How is magnetic field evaluated using current sheet. 5
c) Describe Maxwell's equation for time varying fields. 5
d) Prove that $\vec{E} = -\vec{\nabla}v$. where Symbols have usual meanings. 5
- Q.2 a) Derive an expression for away of two isotropic sources with same amplitude and in phase currents. 10
b) Explain different methods of feeding of parabolic antenna. 10
- Q.3 a) Derive radiation resistance of infinitesimal dipole. 10
b) Explain boundary conditions for electrostatic fields between two dielectric media. 10
- Q.4 a) State and explain principle of pattern multiplication. Explain concept of array factor. 10
b) Explain following concept of antennas with mathematical expressions. 10
i) Radiation pattern ii) Directivity
- Q.5 a) Describe various configurations of horn antenna and explain H plane sectoral horn antenna. 10
b) What is reactive near field. Discuss its importance in communication field and its applications. 10
- Q.6 a) Explain sky wave propagation with reference to D,E and F regions and multiple reflections. 10
b) Design a rectangular microstrip patch with dimension W and L ,over single substrate FR4 whose center frequency is 2.45 GHZ. The height of substrate is 1.6 mm. Find the dimensions W and L taking into account the fringing field. 10

TE / Sem-VI / ETC / C-2019 / Dec-2023

Time: 3 hours

Max. Marks: 80

- N.B. : (1) Question No.1 is compulsory
(2) Answer any three questions from Q. 2 to Q.6.
(3) Draw a neat diagram if necessary.

- Q1 Solve any four**
- a Draw OSI reference model. List the hardware devices, functions and protocols at each layer. 5
 - b Compare IPv4 and IPv6 5
 - c Explain Three-Way Handshaking for connection establishment in TCP 5
 - d Compare Star, Mesh, and Bus Topology 5
 - e An ISP grants a block of 195.2.6.0/24 addresses. It is required to have 14 subnets. 5
Determine the i) slash notation, ii) subnet mask, ii) first usable IP address and broadcast address belonging to first subnet.
- Q2**
- a Explain the principles of circuit switching and packet switching. Compare circuit switching and packet switching 10
 - b Compare twisted pair, coaxial and optical fibre cables. State at least one advantage and drawback of each cable. 10
- Q3**
- a Explain the HDLC frame format with a neat diagram. Explain HDLC bit stuffing and destuffing. 10
 - b Draw IPV4 Header and explain the meaning of various fields associated with it 10
- Q4**
- a Explain why IP uses ICMP? State ICMP message types and explain with neat diagrams. 10
 - b Differentiate between TCP and UDP. The following is the dump of the UDP header in hexadecimal format. 10
0045DF0000500000
a. What is the source port number?
b. What is the destination port number?
c. Is the packet directed from the client to the server or vice versa?
d. State which transport layer protocols would be necessary for each of the following applications
DNS, DHCP, File Transfer, Web Browsing, and remote login
- Q5**
- a Explain pure ALOHA and slotted ALOHA with neat diagrams. Also compare pure and slotted ALOHA. 10
 - b raw and explain TCP segment header. The following is a dump of a TCP header in hexadecimal format 10
053200016 00000000F 00000000 700207FF 00000000
1) What is the source port number?
2) What is the destination port number?
3) What is sequence number?
4) What is the acknowledgement number?
5) What is the length of the header?
- Q6 Write a short note on (Solve any 2)** 20
- a DHCP
 - b Unicast routing protocols
 - c DNS

G.P. code

38375

Duration: 3 hrs

[Max Marks: 80]

N.B. : (1) Question No 1 is Compulsory.

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

(3) All questions carry equal marks.

(4) Assume suitable data, if required, and state it clearly.

1 Attempt any **FOUR**.

[20]

a Explain Butterworth frequency domain filtering.

5

b List edge models and explain any one in short.

5

c For the following 2 images perform 1) $P1 = A * B$ and 2) $P2 = \max(A, B)$ while Result = $P1 - P2$ which is a 4-bit unsigned image.

5

$$A = \begin{bmatrix} 2 & 3 & 3 \\ 3 & 4 & 18 \\ 4 & 3 & 8 \end{bmatrix}$$

$$B = \begin{bmatrix} 2 & 5 & 8 \\ 3 & 2 & 3 \\ 5 & 2 & 1 \end{bmatrix}$$

d True or False: Second order filter is better than first order filter in edge detection. Justify.

5

e With example explain Distance measures.

2 a Explain Canny edge detection algorithm in detail steps with proper diagrams.

[10]

b Write brief notes on any two of the following

[10]

1. Thresholding

2. Fundamental steps in image processing.

3. High boost filtering

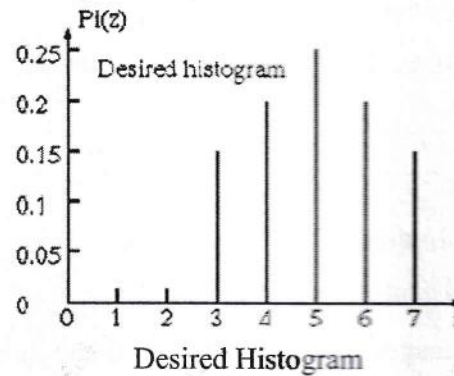
3 a Apply 3x3 averaging filter and median filter on following image. Use mirror padding.

[10]

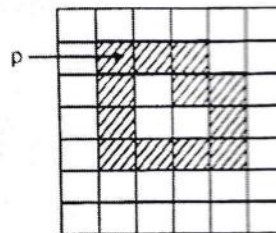
1	4	0	1	3	1
2	2	4	2	2	3
1	0	1	0	1	0
1	2	1	0	2	2
2	5	3	1	2	5
1	1	4	2	3	0

- b A 3-bit 64x64 image with 8 intensities is described in following table. Perform histogram equalization for it. The desired histogram is shown in figure below. [10]

Level	0	1	2	3	4	5	6	7
Intensity	790	1024	850	656	329	245	122	81



- 4 a Explain Hit and Miss transform with example. [10]
 b Elaborate on the following (5 marks each) [10]
 1. Log transformation
 2. Co-occurrence Matrix
- 5 a Find the Chain code, Shape no., and first difference for the following image using 4 connectivity. Arrow indicates starting point. [10]



- b Generate Haar Basis for $N=4$. [10]
- 6 a Describe the k-means algorithm with proper diagrams. Explain all the steps. [10]
 b Explain region growing algorithm with proper example. [10]

TE | sem-VI | EXTC | 2019 | Dec-2023

(3 Hours)

Total Marks: 80

- N.B. : (1) Questions No.1 is **compulsory**.
 (2) Solve any **three** questions out of **remaining**
 (3) Draw neat labeled diagram whenever necessary
 (4) Assume suitable data if necessary

Answer **any four** questions

- How do you define core, boundary and support of a fuzzy set 05
 - With neat diagram and necessary equations, List the different types activation functions. 05
 - What do you mean by K-Means algorithm? Where is it used? 05
 - If A and B are two fuzzy sets with membership functions: $\mu_a(x) = \{0.5, 0.2, 0.1, 0.7\}$
 $\mu_b(x) = \{0.8, 0.3, 0.4, 0.1\}$, prove De Morgan's theorem. 05
 - An image of size 32×32 is applied to CNN architecture. Using a kernel of size 5×5 and with a stride of 2, find out the size of output image after first CNN layer without padding. If this layer is followed with max pooling kernel of size 2×2 with stride 2, what is the resultant image size? 05
 - With neat flowchart, explain the training steps and testing steps for Perceptron. 10
 - Briefly discuss the architecture of CNN. 10
 - Construct a Kohonen Self Organizing map to cluster given vectors $[0 \ 0 \ 1 \ 1]$, $[1 \ 0 \ 0 \ 0]$ and $[1 \ 0 \ 1 \ 1]$. The number of clusters to be formed is 2. Consider the learning rate as 0.25. The weight matrix is given by 10
- $$w_{ij} = \begin{bmatrix} 0.1 & 0.3 \\ 0.6 & 0.9 \\ 0.8 & 0.7 \\ 0.2 & 0.5 \end{bmatrix}$$
- Implement OR gate using MP Neuron. 10
 - Construct a discrete Hopfield network to store the patterns $[1 \ 1 \ -1 \ 1]$, $[-1 \ -1 \ 1 \ -1]$ $[1 \ -1 \ -1 \ -1]$, $[1 \ 1 \ 1 \ 1]$. Calculate the energy of the stored patterns. 10
 - Draw the architecture of Biological Neuron. Compare Artificial Neuron with Biological Neuron. 10
 - What are the different types of membership functions? Discuss with diagram. Give their practical applications in fuzzy systems. 10
 - Discuss the Support Vector algorithm in detail 10
 - What is defuzzification? What are the various methods of defuzzification? 10
 - Design a fuzzy controller to decide the speed of a train approaching a station. 10

TE / Sem-VI / ETC / C-2019 / Dec-2023

Duration Three Hours

Total marks 80

N.B.

1. Question No 1 is compulsory and attempts any three out of remaining five questions.
2. Assume suitable data wherever required.
3. Figures to the right indicate full marks.

1. Solve any four-

- a) Explain Amdahl's law. 5
- b) Convert $(-63.25)_{10}$ in IEEE-754 single precision floating point representation. 5
- c) What's the difference between hardwired and microprogrammed control unit implementations 5
- d) What is a NUMA computer, and how is it used in a multiprocessor system? 5
- e) Explain Memory Hierarchy. 5

2. a) Illustrate with example how throughput can be scaled with the number of cores 10
- b) List and briefly define the possible states that define an instruction execution. 10

3. a) What types of transfers must a computer's interconnection structure support? 10
- b) Given $x = 0101$ and $y = 1010$ in two's complement notation (i.e., $x = 5$, $y = -6$), compute the product $p = x * y$ with Booth's algorithm. 10

4. a) Explain the various levels of RAID. 10
- b) Differentiate between Multiprocessor and Multicore systems. Also explain the structure/organization of each system. 10

5. a) Illustrate the concept of Virtual memory. How address translation is carried out? 10
- b) In the realm of computer organization what is significance of Arithmetic mean, Harmonic mean, Geometric mean, Rate metric and Speed metric. 10

6. a) Differentiate between the fetch cycle and the execute cycle in the instruction cycle. Illustrate the sequence of micro-operations involved in each, highlighting their roles in processing instructions 10
- b) List and explain the different microinstructions generated for the execution of an instruction $ADD R1, [R2]$. 10

G.P. Code

41728