

Q.P. Code: 27067

[Total Marks: 80]

(3 Hours)

- N.B. (1) Question No. 1 is **compulsory**.
(2) Attempt **any three** questions from remaining.
(3) All questions carry **equal marks**.
(4) Assume suitable data wherever necessary.

Q.1 Answer **any four** of the following:

- a) Justify Huffman coding is a lossless compression technique. (5)
b) Explain the role of illumination in segmentation. (5)
c) Explain Bit-plane slicing with the help of an example. (5)
d) Discuss various color models used in image processing. (5)
e) Explain any two properties of 2D DFT. (5)

Q.2 a) Perform Histogram Equalization on Gray level distribution shown in the table. Draw the histograms of the original and equalized images. Comment on the contrast of the image before histogram equalization and after histogram equalization. (10)

Gray Levels	0	1	2	3	4	5	6	7
No. of Pixels	0	100	400	50	200	50	200	0

Q.2 b) Explain Homomorphic filtering with the help of a neat block diagram. (10)

Q.3 a) Using Hough transform find the equation of the line that passes through maximum number of points using the following edge points. (10)

(1, 4), (2, 3), (3, 1), (4, 1) and (5, 0)

Q.3 b) Calculate the efficiency of Huffman code for the following symbol whose probability of occurrence is given below: (10)

Symbol	a1	a2	a3	a4
Probability	0.9	0.06	0.02	0.02

Explain Run-length coding with the help of an example.

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Q.4 a) Consider an 8x8 image, the grey level ranges from 0 to 7. Segment this image using region growing and region splitting technique. Comment on the results. (10)

5	6	6	6	7	7	6	6
6	7	6	7	5	5	4	7
6	6	4	4	3	2	5	6
5	4	5	4	2	3	4	6
0	3	2	3	3	2	4	7
0	0	0	0	2	2	5	6
1	1	0	1	0	3	4	4
1	0	1	0	2	3	5	4

Q.4 b) Explain the following morphological operations with the help of an example. (10)

- i) Opening
- ii) Closing

Q.5 a) Explain discrete wavelet transform in detail. Discuss its relevance in compression. (10)

Q.5 b) Explain any two spatial filtering techniques for image enhancement with the help of examples. (10)

Q.6 Write short notes on **any four** of the following: (20)

- a). Distance Transforms
- b). Chain Codes
- c). Data redundancies
- d). Eye Diagram
- e). Low pass averaging filter

Instructions to candidates

Marks

- 1) Q.No. 1 is compulsory.
- 2) Solve any 3 questions from the remaining 5 questions.
- 3) Figures on the right side indicate full marks.
- 4) Make suitable assumptions where required.

- Q.No 1** **Answer any four.**
- a) Explain the various categories of networks . 05
 - b) .Give any four functions of Data Link Layer. 05
 - c) What are GEO, MEO and LEO satellites ? 05
 - d) How does Token Ring work ? 05
 - e) Explain the concept of Pseudoheader used in UDP. 05

- .No 2**
- a) Explain the various physical media with the help of neat diagrams . 10
 - b) Compare Circuit Switching, Packet Switching and Message Switching. 10

- Q.No 3**
- a) What is Traffic shaping? Explain "Leaky bucket" technique of traffic shaping. 10
 - b) Explain the different Options used in IP Datagram. 10

- Q.No.4**
- a) Five equal-size datagrams belonging to the same message leave for the destination one after another. However, they travel through different paths as shown in Table 10

<i>Datagram</i>	<i>Path Length</i>	<i>Visited Switches</i>
1	3200Km	1,3,5
2	11.700 Km	1,2,5
3	12.200 Km	1,2,3,5
4	10.200 Km	1,4,5
5	10.700 Km	1,4,3,5

We assume that the delay for each switch (including waiting and processing) is 3, 10, 20, 7, and 20 ms respectively. Assuming that the propagation speed is 2×10^8 m/s , find the order the datagrams arrive at the destination and the delay for each. Ignore any other delays in transmission.

- b) Explain the various implementations of Standard Ethernet with neat diagrams. 10

- Q.No.5**
- a) Draw the TCP segment header format and explain each field in brief.. 10
 - b) Explain the recursive resolution and iterative resolution methods of resolving the Domain names. 10

- Q.No.6** **Write short notes on any 4 .**
- a) CSMA/CA. 05
 - b) PPP frame format. 05
 - c) Three Way Handshakes. 05
 - d) World Wide Web. 05
 - e) IPv6. 05

- Note:** (1) Question No.1 is compulsory.
 (2) Attempt any three out of remaining.
 (3) Assume suitable data wherever required.

- Q.1. Solve any four of the following
- (a) Enlist the steps for obtaining Silicon from Sand 5
 - (b) Explain the difference between Dry oxidation and Wet Oxidation 5
 - (c) Enlist important parameters for which measurement is required before device processing begin. 5
 - (d) Explain difference between FD SOI and PD SOI 5
 - (e) Compare evaporation and sputtering methods for metal deposition 5
- Q.2 (a) With a neat diagram, explain the Float Zone technique of crystal growth 10
- Q.2(b) What do you mean by Class of clean room? Give the steps in standard RCA cycle during wafer cleaning 10
- Q3.(a) Explain the difference Between Contact, Proximity and Projection Printing 10
- Q3 (b) Develop the equations to describe the oxidation process (Deal-Grove Model).. 10
- Q.4(a) Explain need of isolation in VLSI .Explain one method to accomplish it 10
- Q.4(b) Draw Layout of CMOS Inverter along with its circuit diagram. Mention Clearly all dimensions as per lambda rules. Explain buried and butting contact. 10
- Q.5(a) Describe with the help of a neat diagram Hayness-Schokly experiment for measurement of Drift Mobility of n-type semiconductor 10
- Q.5(b) Explain the fabrication Process steps along with vertical cross-sectional view for CMOS Inverter using N-well Process 10
- Q.6 Write short notes on any four of the following. 20
- (a) Fabrication of MESFET
 - (b) Silicon Crystal defects
 - (c) Electronics package reliability
 - (d) Multigate device structures
 - (e) Types of Thin Film Deposition

Duration 3 Hours

Maximum marks 80

- 1) Question 1 is compulsory
- 2) Solve any three from the remaining five questions
- 3) Assume suitable data if necessary.
- 4) Figures to the right indicate full marks

Q.1. Attempt any **four** from the following questions 20

- a) What is activation function? Explain any one activation function.
- b) Give the mathematical model of an artificial neuron.
- c) What are MLPs? Mention their applications.
- d) Explain in brief fuzzification process.
- e) What is Delta learning rule? Explain with examples.

Q.2.a With the help of a flow chart, explain back propagation algorithm. 10

b With a neat architecture, explain the training algorithm of Kohonen self-organizing feature maps. 10

Q.3.a Implement the discrete perceptron learning rule for the following set of input training vectors: 10
 $\mathbf{X}_1 = [1 \ 0 \ 1]^t$; $\mathbf{X}_2 = [1 \ 0 \ 0]^t$; $\mathbf{X}_3 = [1 \ 1 \ 0]^t$ belonging to group 1 with $d=1$ and
 $\mathbf{X}_1 = [0 \ 0 \ 1]^t$; $\mathbf{X}_2 = [0 \ 1 \ 1]^t$; $\mathbf{X}_3 = [0 \ 1 \ 0]^t$ belonging to group 2 with $d=-1$
 The learning constant, $c=0.1$ Assume the initial weight vector to be $\mathbf{W}_1 = [1 \ -1 \ 0]^t$ and obtain the updated weight vector after one epoch.

b. Explain with examples Hebbian learning rule. 10

Q.4.a Explain in detail factors that affect learning rate. 10

b. Construct an autoassociative network to store the vectors $X_1=[1 \ 1 \ 1 \ 1]$, $X_2=[1 \ -1 \ -1 \ 1 \ -1]$, $X_3=[-1 \ 1 \ -1 \ -1 \ -1]$. Find the weight matrix with no self connection and calculate the energy of the stored patterns. Using discrete Hopfield network test the pattern $S=[1 \ 1 \ 1 \ -1 \ 1]$. 10

Q.5 a Two fuzzy sets are defined as: 10

$$\tilde{A} = \left\{ \frac{0}{0} + \frac{0.2}{10} + \frac{0.35}{20} + \frac{0.65}{30} + \frac{0.85}{40} + \frac{1}{50} \right\}$$

$$\tilde{B} = \left\{ \frac{0}{0} + \frac{0.35}{10} + \frac{0.25}{20} + \frac{0.8}{30} + \frac{0.95}{40} + \frac{1}{50} \right\}$$

Perform union, intersection, difference and complement over these fuzzy sets.

b Explain any 2 defuzzification methods in detail. 10

Q.6 Write short notes on (any 4): 20

- a) Single layer Continuous Perceptron networks
- b) Minimum distance classifier
- c) Boltzmann Machine
- d) BAM
- e) ART

(3 Hours)

[Total Marks: 80]

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

(2) Attempt any **THREE** questions from the remaining five questions.

(3) Assume suitable data if necessary.

(4) Figures to the right indicate full marks.

1. Attempt **any four** questions:

20

- (a) Explain regenerative braking of DC motor.
- (b) What are the advantages and disadvantages of SMPS.
- (c) Explain the advantages of induction heating.
- (d) Compare SVM with the conventional sine wave PWM.
- (e) Give the significance of slip in AC motors.

2. (a) Explain in detail the principle and working of simple buck boost converter with the help of necessary derivation and waveforms. **10**

(b) Derive and explain the average state space model of buck converter. **10**
Use this state space model to derive equation for output voltage of buck converter at equilibrium condition ($dv/dt = 0$).

3. (a) Derive an expression for overlap angle (μ) and output voltage for a single-phase fully controlled bridge rectifier with source inductance. **10**

(b) Explain PWM as used for inverters. What are its advantages? **10**

4. (a) Explain the three regions in the torque-slip characteristics of an induction motor. Which is the most stable region of operation in the torque-slip characteristics? Justify your answer with suitable figure. **10**

(b) Explain various method of speed control for 3-phase induction motor. **10**

5. (a) Give different methods of controlling speed of separately excited DC motor. Explain constant torque and constant power operation. **10**

[TURN OVER]

5. (b) A 220V, 1300 rpm, 8A separately excited DC motor has armature resistance of 1 ohm. It is fed from a single-phase fully controlled bridge rectifier with an AC source voltage of 230 volts, 50Hz. Assuming continuous load, compute Motor speed at firing angle of 45 degrees and torque of 5 NM. **10**

6. Write short notes on (any three) **20**

- (a) Battery charging system.
- (b) Kramer's drive.
- (c) Classification of UPS.
- (d) Harmonic reduction in inverters.

- 1) Question no. 1 is compulsory
- 2) Solve any three from the remaining five questions.
- 3) Assume suitable additional data if necessary.

Q1) Answer the following questions. (20)

- (a) Compare CPLD/FPGA based embedded system with microcontroller based
- (b) What could be use of RTOS in an embedded system? Justify use.
- (c) Compare I2C and CAN communication protocol.
- (d) Explain blue-tooth communication protocol.

Q2)

- (a) What issues may arise due to sharing of data in an embedded system? Give an example with solution. (10)
- (b) What kind of C-programing strategies may help you lead to faster program ? (10)

Q3)

- (a) What features of Cortex-M3 are specifically useful for (i) Low power consumption (ii) Real time system (iii) RTOS support (iv) Debug support. (10)
- (b) Compare Cortex-M3, Cortex-R4 and Cortex-A8. (10)

Q4)

- (a) Interface (draw circuit diagram) of any input (error) and output interface with any microcontroller. Explain its functioning. (10)
- (b) Explain and compare any to scheduling method in RTOS. (10)

Q5) Deign a media player (audio only) for following features. (20)

- (i) Stored media
- (ii) FM player
- (iii) MP3 Encoding/Decoding processing support
- (iv) Output speaker
- (v) Display

Draw and explain using hardware and software building block required. Explain functioning using appropriate modelling method.

Q6) Write short notes on (ANY TWO) (20)

- (a) List different uCOS-II functions used for (rtos) management task.
- (b) What may be effect of longer interrupt response time on real time behaviour of system?
- (c) Present any case study which bring out advantage of ethical practice in any development.
