

[Time: Three Hours]

[ Marks:80]

N.B: 1. Question number one is compulsory  
2. Attempt any three out of remaining

- Q.1 Attempt any FOUR: (20)**
- a. Derive wave equation for electric fields.
  - b. Define the terms near field and far field for antenna
  - c. Derive continuity equation for electric fields
  - d. Explain ground wave propagation
  - e. Why Maxwells equations need to be modified for time varying fields
- Q.2**
- a. Define loop antenna. Mention the disadvantages of loop antenna (10)
  - b. Design rectangular micro strip antenna for 2.4 GHZ frequency using FR-4 Substrate of dielectric value 4.4 & thickness 1.6mm. (10)
- Q.3**
- a. Compare broadside and end fire array. (10)
  - b. Derive FRIIS Transmission Equation & Explain its Significance (10)
- Q.4**
- a. With neat sketch explain parabolic Reflector antenna. List feed mechanism used (10)
  - b. Derive wave equations for magnetic fields and explain what is TEM wave (10)
- Q.5**
- a. Explain H-plane sectoral horn a antenna and describe various configuration of horn (10)
  - b. antenna (10)
- What are the advantages of array antenna? Describe principle of pattern multiplication and sketch radiation pattern of a 3-element array separated at  $\lambda/2$
- Q.6** Write short notes on (any four questions, each carry five marks) (20)
- a) Sky wave propagation
  - b) Power in EM wave
  - c) Retarded potential
  - d) Equivalent noise temperature of antenna
  - e) Radiation pattern

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(3 Hours)

[Total Marks: 80]

- N.B. : (1) Question No. 1 is **compulsory**.  
 (2) Solve any **three** questions from the remaining **five**  
 (3) **Figures** to the **right** indicate **full** marks  
 (4) Assume suitable data if necessary and mention the same in answer sheet.

Q.1 Attempt **any 4** questions [20]

- a) Explain Program Status word Register of 8051 Microcontroller.
- b) List the features of ARM7.
- c) Differentiate between ARM and THUMB state.
- d) Explain any five Addressing modes of 8051 with one example in each.
- e) Differentiate between RISC and CISC design.

Q.2 a) Explain Internal RAM Organization of 8051 Microcontroller. [10]

b) Write a program for 8051 to transfer the message "ENGINE" serially at a [10]  
 baud rate of 9600 in mode 1. Assume suitable operating frequency.

Q.3 a) Draw and explain the interrupt structure of 8051. [10]

b) Write a program to rotate the stepper motor continuously using half step 8 [10]  
 sequences. Assume the look up table at location 1000H.

Q.4 a) Write an assembly language program to generate a square wave of 50% duty [10]  
 cycle and frequency 1KHz on the P2.5 bit. Use timer 1 to generate the time  
 delay.

b) Draw and explain the architecture of ARM processor. [10]

Q.5 a) Explain Addressing modes of ARM7 Processor with examples of each. [10]

b) Explain the following ARM7 instructions: [10]

1.	RSC R0
2.	CMP R0, R1, LSL #04
3.	LDR R0, [R1]
4.	SUB R0, R1, R2
5.	MOV R0

Q.6 a) Explain the implementation of stack in ARM using load-store instructions. [10]

b) Suppose a LED is interfaced with P0.0 of ARM. Write an embedded C [10]  
 language program to blink this LED with a certain delay. Software generated  
 delay may be used for LPC214X.

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Time: 3 Hours

Marks: 80

- N.B.:
- (1) Question No. 1 is compulsory.
  - (2) Solve any three questions from the remaining five
  - (3) Figures to the right indicate full marks
  - (4) Assume suitable data if necessary and mention the same in the answer sheet.

- Q1. Attempt **any 4** questions 20M
- A) Explain the need of layered protocol architecture in OSI reference model. [5]
  - B) Give comparison among coaxial, optical fiber and twisted pair cables. [5]
  - C) Explain the persistent strategies of CSMA. [5]
  - D) Draw and explain IPv6 Datagram format. [5]
  - E) Distinguish between TCP and UDP transport layer protocol. [5]
  - F) Analyze how SMTP protocol in application layer helps to deliver the electronic mail? [5]
- Q2.)
- A) Explain physical, logical, port addressing and socket addressing in networking. [5]
  - B) Explain in brief DSL, and HFC. [5]
  - C) Give classification of routing protocol. Explain in brief the link state and distance vector algorithm with example. [10]
- Q3)
- A) Compare Static Routing and Dynamic Routing. [5]
  - B) Explain the fields related to the fragmentation in the IP datagram header. [5]
  - C) Explain the classful addresses of IPv4 with net ID and host ID. [5]
  - D) Identify class, subnet mask, network address and broadcast address of the following IP addresses: [10]
    1. 214.25.6.3    2. 191.5.8.9    3. 5.6.45.4    4. 230.45.89.63
- Q4)
- A) Draw and explain User datagram Protocol (UDP) Header. [5]
  - B) Compare TELNET and SSH application layer protocol. [5]
  - C) Draw and explain User datagram Protocol (UDP) Header. [5]
  - D) Explain in brief working of DHCP. [5]
- Q.5)
- A) For the classless address 129.65.33.01/24 find [6]
    1. Number of addresses in the block N    2. First address    3. Last address
  - B) Explain congestion control techniques used in TCP. [4]
  - C) Explain in detail the Routing protocols OSPF. [5]
  - D) Give comparison between Star, Mesh and Bus Topology. [5]
- Q.6)
- A) Explain Go-Back –N ARQ and Selective Repeat ARQ. [5]
  - B) Compare Repeaters, Hubs, Bridges, Switches, Routers network hardware devices. [5]
  - C) Explain in brief working of HTTP application layer protocol [5]
  - D) Draw and explain different fields of TCP header. [5]

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Duration: 3hrs

[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 Specify formulas for computing Euclidian distance, City-block distance and Chess-board distance in digital images. Draw the locus of each them.
- b Justify/contradict: Salt-pepper noise in a digital image can be better removed by a median filter rather than an averaging filter.
- c State what is the cause of the 'Ringing effect' when a digital image is filtered in frequency domain. How can the effect be minimized?
- d Explain with a diagram what are support vectors in a SVM. Do they affect the classification process? If yes, how?
- e Illustrate with an example what is grey level co-occurrence matrix in texture analysis.

**2 a Given a grey scale image as follows:**

**[10]**

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

- i. Draw Histogram of the image.
  - ii. Perform histogram equalization on the image.
  - iii. Draw transformation function.
  - iv. Draw output image histogram.
- b Describe the Canny Edge Detection method step-by-step. Support your answer with appropriate diagrams.

**[10]**

- 3 a For the 2x2 transform matrix [10]

$A = \frac{1}{\sqrt{2}} \begin{bmatrix} \sqrt{3} & 1 \\ -1 & \sqrt{3} \end{bmatrix}$  and a sub-image  $U = \begin{bmatrix} 2 & 3 \\ 1 & 2 \end{bmatrix}$  compute the image transform and the basis images.

- b Write an expression for a two-dimensional DCT. Form a 4x4 DCT matrix and compute the DCT of the following sub-image. [10]

$$I = \begin{bmatrix} 1 & 2 & 2 & 1 \\ 2 & 1 & 2 & 1 \\ 1 & 2 & 2 & 1 \\ 2 & 1 & 2 & 1 \end{bmatrix}$$

- 4 a Explain the Hit-and-Miss transform in Morphology. Explain how morphology can be used for boundary detection. [10]

- b Differentiate between shape and region descriptors. State their examples. Explain signatures in detail. [10]

- 5 a For the given image, perform region based segmentation by split and merge technique. Illustrate the splitting technique with a quad tree graph. Use the Predicate  $P \geq 10$  for splitting and merging. [10]

13	12	13	12	11	12	11	12
13	13	63	63	61	11	12	11
11	12	63	62	61	62	12	12
13	13	62	63	62	61	13	13
12	11	62	63	62	11	12	11
62	62	63	61	61	62	13	13
62	61	61	62	13	12	13	11
61	62	63	11	12	11	12	12

- b Explain smoothing and sharpening filters in frequency domain. [10]

- 6 a Explain the need of good classifiers in object recognition. List different classifiers. Explain the Bayesian classifier in detail. [10]

- b Explain the K-means clustering algorithm with a suitable example. [10]

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(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

**Q1** Answer **any four** questions

- a.** Write any four properties of fuzzy sets. **05**  
**b.** With necessary equations, list the different types of activation functions used in Neural networks **05**  
**c.** What do you mean by K means algorithm? Where is it used? **05**  
**d.** If A and B are two fuzzy sets with membership functions:  $\mu_a(x) = \{1, 0.2, 0.2, 0.7\}$  and  $\mu_b(x) = \{0.2, 0.6, 0.4, 0.5\}$ , find the union and intersection between two fuzzy sets. **05**  
**e.** What is the use of pooling and padding in CNN architectures? **05**

**Q2.a.** Develop perceptron network to implement two input AND function. Consider inputs and the outputs as unipolar. Assume initial weights and bias value equal to zero. Consider learning rate equal to 1. **10**

**b.** Discuss linearly separable and linearly non-separable classification functions each with a graph. **10**

**Q3.a.** Construct a Kohonen Self Organizing map to cluster given vectors  $[0 \ 0 \ 1 \ 1]$ ,  $[1 \ 0 \ 0 \ 0]$ ,  $[0 \ 1 \ 1 \ 0]$  and  $[0 \ 0 \ 0 \ 1]$ . The number of clusters to be formed is 2. Consider the learning rate as 0.5. The weight matrix is given by **10**

$$w_{ij} = \begin{bmatrix} 0.2 & 0.9 \\ 0.4 & 0.7 \\ 0.6 & 0.5 \\ 0.8 & 0.3 \end{bmatrix}$$

**b.** Draw the architecture of simple Convolution neural network. Discuss the use of CNN in deep learning **10**

**Q4.a.** Construct a discrete Hopfield network to store the patterns  $[1 \ 1 \ 1 \ 1 \ 1]$ ,  $[1 \ -1 \ -1 \ 1 \ -1]$ ,  $[-1 \ 1 \ -1 \ -1 \ -1]$ . Calculate the energy of the stored patterns. **10**

**b.** What are the various types of neural network architectures? With neat diagram, briefly discuss the architectures. **10**

**Q5.a.** With neat flow chart, describe the various steps used in the training process of error back propagation algorithm. **10**

**b.** What is Support Vector Machine (SVM)? Analyze binary classifier using SVM. **10**

**Q6.a.** What is defuzzification? Explain any two methods of defuzzification. **10**

**b.** Design a fuzzy controller to decide the wash time of a washing machine. **10**

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3 Hours

Total marks: 80

- N.B.: (1) Question **no 1. is compulsory**  
(2) Attempt **any 3 questions** out of remaining questions  
(3) Make suitable assumption if needed

- Q.1. (a) List Five significant differences between file processing system and database management system. 5M  
(b) Explain ACID properties in details 5M  
(c) Explain View in SQL with Example 5M  
(d) Explain specialization and Generalization with Example 5M
- Q2. (a) Draw ER diagram of Hospital management system. Convert ER in to tables 10 M  
(b) What is deadlock? Discuss deadlock detection and prevention scheme 10 M
- Q3. (a) Explain any five relational algebra operations in details 10 M  
(b) What is Normalization? Explain 1 NF, 2 NF, 3NF, BCNF with example 10 M
- Q.4. (a) For the following given database , write SQL queries. 10 M  
Employee\_info (Emp\_id, Emp\_name, department, projects, address, DOB, gender)  
Employee\_position ( Empid, Emp\_position, Dateof joing, salary)
- i) Write a query to fetch the number of employees working in the department 'HR'.
  - ii) Write a SQL query to retrieve employee details from EmployeeInfo table who have a date of joining in the EmployeePosition table.
  - iii) Write q query to find all the employees whose salary is between 50000 to 100000.
  - iv) Write a query to retrieve EmpPosition along with total salaries paid for each of them.
- (b) Explain overall architecture of DBMS with suitable diagram? 10 M
- Q5. (a) Explain various types of constraints with examples? 10 M  
(b) Explain Time stamp protocol and log based recovery in details? 10 M
- Q6. (a) Explain Security and Authorization in dbms? 10 M  
(b) Explain serializability and concurrency control with example? 10 M

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