[3HRS] MAXIMUM MARKS 80

1. Question no.,1 is compulsory.
2. Write any three questions from remaining five questions.
3. Assume suitable data where ever necessary.
4.Draw diagrams wherever required.

1. a] Define and explain following terms
i) Coherence Bandwidth ii) Coherence time iii) Doppler spread 05

b] Why 120degree sectorization is preferred over 60degree sectorization in cellular technology.discuss in detail with reference to S/I calculations and handoffs 05

C] What is OVSF in WCDMA what is its advantage over fixed spreading IS95 05

d] What is timing advance in GSM explain in detail 05

2 a Discuss the various types of Handoffs from 2G to 4G with reference to technologies. 10
B How is the cell search and synchronization achieved in 3G? 10

3. a] Draw and explain 3G reference architecture 10

b] For a Rayleigh fading signal, compute the positive going level crossing rate for ρ=1. The maximum Doppler frequency (fm) is 20 Hz. What is the maximum velocity of the mobile for this Doppler frequency if the carrier frequency is 900 MHz? 10

4.a] Draw and explain protocol architecture of GPRS 10

b] Compare OFDMA and MC-CDMA techniques. 10

5. a] Explain RPE- LTP speech coder in GSM 10
b] What is the software-defined radio system? 10

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6. Write short note on (any two) 20

a] Cognitive Transceiver Architecture

b] Spreading codes used in CDMA

c] Adaptive multi antenna Techniques

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(Time: 3 hrs) (Max. Marks: 80)

N. B. Q.1 is compulsory.

1. Answer any **three** out of the remaining five questions.
2. Figures to the right indicate full marks.
3. Answer to the questions should be grouped and written together.

Q1 Solve **any four**

a Plot fuzzy membership function for the age 'A' in years of people. The linguistic variables are defined as follows: **05**

Very Young (VY): $A < 12$

Young (Y): $10 \leq A \leq 22$

Middle Age (M): $20 \leq A \leq 42$

Old (O): $40 \leq A \leq 72$

Very Old (VO): $70 < A$

b Draw XOR gate using Neural Network and explain its operation **05**

c Find λ cut set of $A=\{\frac{0.1}{20}+\frac{0.15}{30}+\frac{0.33}{40}+\frac{0.4}{50}\}$ for i) $\lambda = 0$ and ii) $\lambda = 0.3$ **05**

d Draw the flow chart for Error Back-Propagation training algorithm **05**

e Explain Perceptron Learning rule with flow chart. **05**

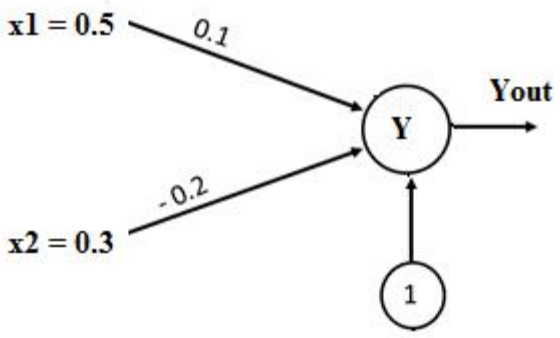
2a Describe application of neural network in numeric character recognition **10**

2b Define mathematically the following activation functions with the diagrams of their transfer functions: **10**

i) Linear activation function

ii) Logsigmoidal activation function

Use these in node Y to calculate output **Yout** of the network shown as follows:



3a Draw diagram of Hopefield neural network. Write the properties of Hopefield matrix and also explain its testing algorithm. **10**

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3b Two fuzzy sets are defined as follows: **10**

$$A=\{\frac{0.1}{3}+\frac{0.25}{6}+\frac{0.3}{9}+\frac{0.4}{12}\}$$

$$B=\{\frac{1}{3}+\frac{0.2}{6}+\frac{0.5}{9}+\frac{0.7}{12}\}$$

Find the following:
(i) A U B (ii) A ∩ B (iii) Complement of A
Also show that (iv) A U B = B U A (v) A ∩ B = B ∩ A

4a Define membership function and their types. Also, state their importance in fuzzy system. **10**

4b Explain with neat diagram the Radial Basis Function neural network for classification of data. **10**

5a Explain with diagram Supervised and Unsupervised learning methods. List two supervised learning rules and two unsupervised learning rules **10**

5b Using perceptron model of Neural Network design an OR gate. Consider inputs and output as unipolar. Assume initial weights and bias value equal to zero. Consider learning rate equal to one. **10**

6a What is Self-Organizing Map (SOM)? Describe Kohonan SOM with learning algorithm. **10**

6b With at least two input membership functions implement fuzzy wash cycle controller in washing machine. **10**

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Time: 3 Hours Marks: 80

N .B. (1) Q.1 is compulsory

(2) Solve any three questions from remaining 6 questions

(3) Assume suitable data if it is required.

Q.1 (a) Justify or contradict the following statements.(**Any two**) [10]

(i) DCT is efficient transform for highly correlated data.
(ii) Mixed adjusancy is uesd to avoid amiguity that often arrises when 8 adjaceny is uesd.
(iii) Continuous image histogram can be perfectly equalized but it may not be so for digital image.

(b) Perform opening and closing operation on the following image(A) using the structuring element (B)

A=

1	0	0	0	0
0	1	0	0	0
0	0	1	0	0
0	0	0	1	0
0	0	0	1	1

B=

[05]

(c) Find Covariance Matrix for the image A: [05]

$$A = \begin{bmatrix} 4 & -2 \\ -1 & 3 \end{bmatrix}$$

Q.2 (a) Write applications\advantages\effects of following techniques: [10]
(i) Hit or Miss transform (ii) Power Low transformation (iii) LoG(Laplacian of Guassian) Operator (iv)Image Restoration (v) Hiigh Boost filtering

(b) Explain different types of video frames. [05]

(c) Compare:Contrast straching and Histogram Equalizaltion [05]

Q.3 (a) State and prove translation property of DFT. Find DFT of the following image .

[10]

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

(b) What is motion vector? Explain optical flow equation. [10]

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Q.4 (a) Compare:Image enhancement and image restoration [04]

(b)Write different line detection masks in an image. Detect 45◦ inclined line in the following image :Z [10]

Z =

10	10	100
10	100	10
100	10	10

(b) Explain pixel-based motion estimation technique. [06]

Q.5 (a) What are the important features of wiener filter. Derive transfer function of wiener filter [10]

(b)Perform following operations on the image X :

X =

10	6	7	3
4	6	13	5
9	0	7	6

(i) Negative [02]

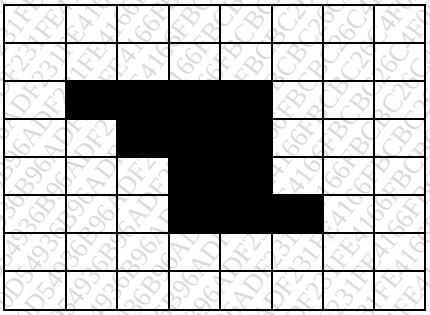
(ii) Bit plane slicing [03]

(iii) Histogram plot [03]

(iv) Compute the number of bits required to store the image [02]

Q.6(a) List the different properties of region which are used for region based image segmentation. Segment the following image (S) using region split and merge technique. Draw the corresponding quad tree. [10]

S=



(b) Explain in brief Homomorphic filtering. [05]

(c) Explain HSI color model. [05]

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(3 Hours) **Max Marks: 80**

N:B : 1. Question no. 1 is compulsory.
2. Out of remaining questions, attempt any three questions.
3. Assume suitable additional data if required.
4. Figures on the right hand side indicate full marks.

Q.1 (a) Explain Doppler shift and its role in pulsed and CW radar. **[5]**
(b) How does a slow–wave structure operate? **[5]**
(c) What are the advantages of more than two cavities in a Klystron? **[5]**
(d) Name four categories of transmission lines. What restricts the use of two-wire line in the microwave region? **[5]**

Q.2 (a) What are the relationships of the signal, pump and idler frequencies for a parametric amplifier with an idler circuit operated as a degenerate amplifier? **[10]**
(b) Derive equation for phase velocity, cutoff frequency, cutoff wavelength and field equations for rectangular waveguide. **[10]**

Q.3 (a) Explain the working of TWT. A helix travelling wave tube operates at 4GHz under a beam voltage 10KV and beam current of 500 mA. If the helix impedance is 25 ohms and the interaction length is 20 cm. Find the output power gain in decibels. **[10]**
(b) With the help of suitable diagram explain mechanism of operation of Magnetron. What is mode jumping in Magnetron? How are various modes separated? **[10]**

Q.4 (a) Explain how avalanche devices operate. Name three devices that use the avalanche mode for their operation. **[10]**
(b) Antenna with impedance 40+j30 ohms is to be matched to 100 ohms lossless line with a shorted stub. Determine: i) Required stub admittance **[10]**
ii) Distance between stub and antenna
iii) Stub length
iv) Standing wave ratio between stub and load, stub and source, along the stub. (use smith chart).

Q.5 (a) Derive the Radar range equation as governed by minimum detectable signal to noise ratio. **[10]**
(b) With a suitable block diagram explain the working of a conical scan tracking radar **[10]**

Q.6 Write short note on:
i) Modes in Gunn diode **[07]**
ii) High electron mobility transistors **[07]**
iii) Instrument landing system **[06]**

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[Time: 3 Hrs] **[Marks: 80]**

Please check whether you have got the right question paper.

N.B: 1. Question No 1 is compulsory.
2. Attempt any three questions from remaining five questions.
3. Assume suitable data where necessary.

Q. 1 Answer **any four:** **(20)**

a) What are different types of redundancies to be considered for text & image & video compression?
b) Solve using fermat's theorem 6^{10} mod 11
c) What is Denial of service (DOS) attack? Explain with suitable examples.
d) Consider a direct memoryless source with $p(x_1) = 0.2$, $p(x_2) = 0.4$, $p(x_3) = 0.1$ $p(x_4) = 0.2$, $p(x_5) = 0.1$. Find the code using minimum variance Huffman code.
e) Compare A law & μ Law companding.

Q. 2 a) Explain JPEG compression technique. **(10)**
b) Explain update procedure for Adaptive Huffman code. **(10)**

Q. 3 a) Apply Diffile-Hellman key exchange algorithm for g=7, n=17 select x=6 & y=4 find key k1 & k2 for diffie-Hellman Algorithm. **(10)**
b) Encode and decode using LZW algorithm-'RINKYPINKY'. **(10)**

Q. 4 a) Explain Arithmetic modes of Block Transfer. **(10)**
b) Explain Frequency & Temporal masking. **(10)**

Q. 5 a) Explain H-264 encoder & decoder. **(10)**
b) What are different types of fire wall explain them. **(10)**

Q. 6 Write short note on **any two:** **(10)**

1) Biometric Authentication
2) Hash & MAC functions
3) Security Principles

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(3 Hours) **TOTAL MARKS: 80**

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

(2) Attempt any three questions from remaining questions

(3) Figures to the right indicate full marks

1.	(a) Define Spontaneous Emission , Stimulated Emission and Quantum Efficiency	5
	(b) Define Cross talk and Solitons	5
	(c) What is OTDR. Draw its response graph with details.	5
	(d) Explain three operating windows in optical communication	5
2.	(a) What are the desirable requirements of a good fiber optic connector? What are the lensing schemes for coupling improvements?	10
	(b)List different types of fiber fabrication techniques and explain any one of them.	10
3.	(a) Explain different types of Front End Amplifier in Optical Receiver.	7
	(b) Differentiate PIN and APD. Derive an expression for Responsivity of PIN diode.	8
	(c) Explain Link Budget Analysis in Optical Communication	5
4.	(a) Differentiate Intermodal and Intramodal Dispersion. Derive an expression for Pulse Spreading in Intermodal Dispersion.	10
	(b) Consider a Graded Index Multimode Fiber for which the index profile α=2.0, the core index n_1 =1.480, the core cladding index difference Δ=0.01 and core radius a=25µm. If the radius of curvature of the fiber is R=1cm, What percentage of the modes remain in the fiber at a 1300nm wavelength?	10
5.	(a) What is Four Wave Mixing? Explain in brief WDM in optical communication	10
	(b) Explain in detail structure of SONET/SDH network.	10
6.	Write a short note on any two	20
	(a) OTDM	
	(b) Optical Access Network	
	(c) Fault Management	
	(d) Wavelength Stabilization	

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