

QP Code : 2385

(3 Hours)

[Total Marks :100

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

(2) Answer any four out of remaining six.

(3) Illustrate answers with sketches.

(4) Use smith chart wherever necessary.

1. (a) State and explain Lorentz Reciprocity Theorem. 5
- (b) Explain microwave propagation in ferrites. 5
- (c) Differentiate between transferred electron devices and avalanche transit time devices. 5
- (d) Explain Amplification process in TWT. 5
2. (a) Using the multiple reflection viewpoint explain the principle of working of a quarter wave transformer 10
- (b) Describe the mechanism of velocity modulation in a two cavity klystron. 10
3. (a) Describe construction and working of two hole directional coupler along with its s-matrix. 10
- (b) Match a load impedance $Z_L = 60 - j80$ to a 50Ω line using a double - stub tuner. the stubs are open circuited are spaced $\frac{\lambda}{8}$ apart. The match frequency is 2 GHz. 10
4. (a) An air filled rectangular waveguide of inside dimensions 7×3.5 cm operates in TE_{10} mode. 10
 - (i) Find the cutoff frequency
 - (ii) Determine the guided wavelength at 3.5 GHz
 - (iii) Determine the phase velocity of the wave in the guide at the same frequency
- (b) What are the steps to solve a single - stub matching problem? 10
5. (a) With neat diagrams explain the working of a Gunn Diode. 10
- (b) Derive the electromagnetic equations for TE modes in rectangular waveguide. 10
6. (a) Explain the working of a negative resistance parametric amplifier. 10
- (b) Explain the working of Magic Tee. Design a circulator using Magic Tees. 10
7. Write short notes on the following:-
 - (a) Faraday Rotation 5
 - (b) Power dividers 5
 - (c) Hybrid junctions 5
 - (d) O-type and M - type devices 5

(3 Hours)

[Total Marks : 100]

Notes:

1. Question no. 1 is compulsory.
2. Solve any four out of remaining six questions.
3. Assume suitable data if required.

Q.1

- (a) How can system capacity can be increased in cellular system. (5)
- (b) Explain GSM services and features. (5)
- (c) Explain power control sub channel in IS-95 CDMA system. (5)
- (d) Effect of Doppler spread on fast fading and slow fading. (5)

Q.2

- (a) Discuss forward W-CDMA channels. (10)
- (b) Discuss hand-off procedure in CDPD with neat diagram. (10)

Q.3

- (a) Explain with neat diagram IS-95 forward traffic channel. (10)
- (b) Explain the Knife-edge diffraction model. (10)

Q.4

- (a) Explain handoff and power control in 3G system. (10)
- (b) Give the 3G CDMA evolutionary path. (5)
- (c) Compare W-CDMA & CDMA2000. (5)

Q.5

- (a) Explain factors affecting the small scale fading. Consider a transmitter which radiates signal of carrier frequency 1800 MHz. For a vehicle moving with 80 km/h, calculate the received carrier frequency : (10)
 - (1) If vehicle moving is moving directly towards the transmitter.
 - (2) If vehicle moving in a direction which is 70 degree to the direction of arrival of the transmitted signal.
- (b) Explain RAKE receive in detail. (5)
- (c) Explain umbrella cell approach. (5)

Q.6

- (a) Derive relation between system capacity and cluster size. (10)
- (b) Explain GPRS architecture with neat diagram (10)

Q.7 Short notes (Any two)

- (1) Compare FDMA, TDMA, CDMA, SDMA. (20)
- (2) Authentication in GSM.
- (3) Signal processing in GSM.

BE - SEM VII (R-2012) (CBGS)
EATC
Data Compression & Encryption

Dec-2015

Q.P. Code : 6193

(3 Hours)

[Total Marks :80

- N.B. : (1) Question No.1 is compulsory
(2) Solve any **three** questions from remaining **five** questions.
(3) Assume suitable data wherever necessary with proper justification.

1. (a) Distinguish between cryptography and steganography 20
(b) A source emits letters $A = \{a_1, a_2, a_3, a_4\}$ with probabilities $p(a_1) = 0.3$
 $p(a_2) = 0.15$ $p(a_3) = 0.25$ $p(a_4) = 0.10$ calculate the entropy of the source.
Also find the huffman code with minimum variance.
(c) Define the chinese remainder theorem find the solution to the simultaneous equations.
$$x = 2 \pmod{3}$$
$$x = 3 \pmod{5}$$
$$x = 2 \pmod{7}$$

(d) Define fermat's little theorem find the result of
(i) $3^{12} \pmod{11}$
(ii) $3^{10} \pmod{11}$
2. (a) Encode and decode the following sequence using Lz-77 and Lz-78 algorithm. 20
w a b b a b r a r b a r r a c b a c
Give drawbacks of Lz-77 and Lz-78 assume window size 9 for Lz-77.
(b) What is MDC and MAC ? Explain HMAC in detail.
3. (a) Write a short note on μ -law and A-law companding 20
(b) Explain diffie hellman key exchange algorithm with an example. Also explain attack on diffie hellman key exchange
4. (a) Explain attack on double DES with example write with neat block diagram 20
triple DES with two keys.
(b) Write short note on AES
5. (a) Write short note on H-264 encoder and decoder 20
(b) Explain Intrusion detection system in detail
6. Write short note (Any three) 20
(a) Ethical hacking
(b) Attacks on RSA
(c) JPEG - 2000
(d) Biometric Authentication.

BE-SEM VII (A-2012) (CBSS)

Dec-2015

ETC

N.N.F.L.

QP Code : 6199

(3 Hours)

[Total Marks :80

Instructions to the candidates, if any

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

- 2) Solve any three questions out of remaining five questions.
- 3) Draw neat labeled diagram wherever necessary.
- 4) Answers to each new question to be started on a fresh page.

Q1: Solve any four:

(5x4=20)

- a) Draw and explain neural networks based OR function.
- b) Draw and explain McCulloch Pitts neuron architecture.
- c) What do you mean iterations and epochs with reference to training of neural network
- d) For the two fuzzy sets:

Consider two fuzzy sets given by:

$$\tilde{A} = \left\{ \frac{1}{2} + \frac{0.2}{3} + \frac{0.5}{4} \right\}$$

$$\tilde{B} = \left\{ \frac{0.9}{2} + \frac{0.4}{3} + \frac{0.8}{4} \right\}$$

Find i) $A \cup B$ ii) $A \cap B$ iii) $\bar{A} \cap \bar{B}$ iv) $\bar{A} \cup \bar{B}$ of the fuzzy sets

e) Explain with block diagram the unsupervised neural networks with an example

Q.2 A) Describe delta learning rule with flow chart.

(10)

Q.2 B) Draw Hopfield Neural Network with four output nodes. Also explain training and testing algorithm of Hopfield neural network.

(10)

TURN OVER

MD-Con. 11742-15.

Q.3A)i) A Hopfield network made up of five neurons, which is required to store the following patterns:

$$P1 = [1 \ 1 \ 1 \ 1 \ 1]^T$$

$$P2 = [1 \ -1 \ -1 \ 1 \ -1]^T$$

$$P3 = [-1 \ 1 \ -1 \ 1 \ 1]^T$$

Evaluate the 5-by 5 weight matrix of the Hopfield Network

(6)

ii) Explain any four properties of fuzzy sets

(4)

Q.3B) Explain the following:

(10)

i) Radial Basis Function Neural Network structure for Classification

ii) Fuzzy Inference System with block diagram

Q.4A) Explain perceptron learning algorithm and develop perceptron network to implement two inputs OR gate to function. Consider inputs and output as bipolar. Assume initial weight and bias values equal to zero. Consider learning rate equal to one.

(10)

Q.4B) Explain any four methods for defuzzification in details.

(10)

Q.5. A) Describe the application of Neural Network for face recognition.

(10)

Q.5. B) Explain how Fuzzy logic can be used in image smoothing.

(10)

Q.6. A) What do you mean by membership function? Explain with diagram. Describe any three fuzzy membership functions with diagram and mathematical equations.

(10)

Q.6. B) Describe the following with suitable diagram:

(10)

i) Hand written character recognition using Neural Networks.

ii) Application of Fuzzy logic for image contrast enhancement.

DCE

QP Code : 2254

(3 Hours)

[Total Marks : 100

- N.B. : (1) Question no 1 is compulsory
 (2) Answer any four out of remaining
 (3) Assume suitable data if necessary and justify the same.

1. Answer in brief:

- (a) Give classifications Data Compression techniques Give an example of each type. 5
 (b) Explain different redundancies in text, digital images and digital videos. How are they important for data compression? 5
 (c) Differentiate between private key crypto systems and public key cryptosystems. Give an example of each. 5
 (d) Solve the following congruence using Chinese Remainder Theorem (and not by trial-and-error) 5

$$X \equiv 1 \pmod{3}$$

$$X \equiv 4 \pmod{5}$$

$$X \equiv 5 \pmod{7}$$

- 2 (a) For the following alphabet and probabilities, find a real valued tag for arithmetic coding, for the sequence $a_1 a_1 a_3 a_2 a_3 a_1$ 10

| Letter | Probability |
|--------|-------------|
| a_1 | 0.2 |
| a_2 | 0.3 |
| a_3 | 0.5 |

- (b) With a suitable example, explain LZ-77 dictionary compression technique. Also explain the worst case in LZ-77 and show how compression ratio is computed in LZ-77. 10

3. (a) An alphabet is given with following letters and probabilities. Perform minimum variance Huffman coding. Find the coding redundancy. Also find the compression ratio for the sequence $a_1 a_1 a_4 a_4 a_2 a_3$ 10

| | | | | |
|---------------|-------|-------|-------|-------|
| Letters | a_1 | a_2 | a_3 | a_4 |
| Probabilities | 0.1 | 0.3 | 0.25 | 0.35 |

- (b) With a neat block diagram, explain the JPEG lossy compression technique. 10
4. (a) Explain DPCM and ADPCM techniques with neat block diagrams. 10
 (b) What are I-, P - and B - frames in digital videos? Explain the principle of video compression used in MPEG standard 10
5. (a) The prime numbers used in RSA algorithm are $P=19$ and $g=23$. If the public key e is 3 find $\phi(n)$ and d ; the decryption key where $\phi(n)$ has usual meaning. Write encryption and decryption equations. 10
 (b) Explain "Man-in-the-middle" attack happening in Diffie-Hellman key exchange system. How can it be avoided? 10
6. (a) Give overall block diagram of the DES standard. Explain one round in detail. 10
 (b) What are MAC and Hash functions? Give one example of each. Also explain what are the requirements on MAC and Hash functions. 10
7. Write short notes on any two : 20
 (a) MP-III encoder and decoder
 (b) JPEG- 2000 standard
 (c) Viruses and worms

sem VIII
B.E (EXTC) OLD

1 = (12/20)

D T S P

QP Code : 2184

(3 Hours)

[Total Marks : 100

- N.B. : (1) Question No.1 is compulsory.
(2) Answer any four questions out of remaining six questions.
(3) Figure to the right indicates full marks.
(4) Illustrate the answers with sketches wherever required.

1. (a) Explain the frequency warping in Bilinear transformation. 5
(b) Justify DFT as a linear transformation. 5
(c) One of the zeros of ant symmetric FIR filter is at $0.5 \angle 60^\circ$, show locations of other zeros. What is minimum order of this filter? 5
(d) State and prove the DFT property for circular frequency shift. 5

2. (a) Draw a lattice filter implementation for the All pole filter, 10

$$H(z) = \frac{1}{1 - 0.2z^{-1} + 0.4z^{-2} + 0.6z^{-3}}$$

and determine the number of multiplications, additions and delays required to implement the filter.

- (b) Find $X(k)$ using DIF-FFT algorithm for $x[n] = n + 1$ and $N = 8$ 10

3. (a) By means of FFT-IFFT technique compute the circular convolution of the sequences 10

$$x_1(n) = \{1, 2, 3, 4\} \text{ and } x_2(n) = \{5, 6, 7, 8\}$$

- (b) Compare minimum phase, maximum phase and mixed phase system. Also identify whether the following system is minimum phase; maximum phase, mixed phase system. 10

$$H_1(z) = 1 - \frac{1}{2}z^{-1}$$

$$H_2(z) = 1 - \frac{1}{2}z^{-1} - \frac{1}{3}z^{-2}$$

4. (a) Design low pass filter for following specification 10

$$H_d(e^{j\omega}) = \begin{cases} e^{-j3\omega}, & -\frac{3\pi}{4} \leq \omega \leq \frac{3\pi}{4} \\ 0, & \frac{3\pi}{4} < \omega < \pi \end{cases}$$

Determine $H(e^{j\omega})$ for $M = 7$ using Hamming window.

TURN OVER

(b) Explain multirate sampling? What are the basic methods? List the advantages and disadvantages and its applications. Explain the different filter banks and also explain sub band coding. 10

5. (a) Design a digital Butterworth filter that satisfies the following constraint using bilinear Transformation, Assume $T = 1$ s 10

$$0.9 \leq H(e^{j\omega}) \leq 1, \quad 0 \leq \omega \leq \frac{\pi}{2}$$

$$H(e^{j\omega}) \leq 0.2, \quad \frac{3\pi}{4} \leq \omega \leq \pi$$

(b) Show that the zeroes of a linear phase FIR filter occur at reciprocal locations. Also show that 10

(i) FIR with symmetric impulse response and even length will compulsory have a zero at $z = -1$.

(ii) FIR with anti symmetric impulse response and odd length will compulsory have a zero at $z = +1$ and $z = -1$.

6. (a) The transfer function of discrete causal system is given as 10

$$H(z) = \frac{1}{1 - 0.2z^{-1} - 0.15z^{-2}}$$

(i) Find the difference equation

(ii) Draw cascade and parallel realization

(iii) Calculate the impulse response of the system

(iv) Find the impulse response of the system

(b) If $x(n) = \{1, 2, 3, 4\}$ find DFT $X[k]$. Using $X[k]$ obtained & not otherwise, find the DFT of the sequences:- 10

(i) $x_1(n) = \{4, 1, 2, 3\}$

(ii) $x_2(n) = \{2, 3, 4, 1\}$

(iii) $x_3(n) = \{3, 4, 1, 2\}$

(iv) $x_4(n) = \{4, 6, 4, 6\}$

7. Write short notes (any Four) : 20

(a) Application of DTSP for RADAR system

(b) Digital Resonator

(c) Goertzel algorithm

(d) Overlap add & overlap save method for long data sequence

(e) Frequency domain characteristics of the different types of window functions

B.E (EYTC) VIth OLD

Satellite Communication

Q.P. Code : 2712

(3 Hours)

[Total Marks :100

- N.B. : (1) Question No.1 is compulsory
 (2) Attempt any four questions from questions No. 2 To 7.
 (3) Assume suitable data wherever necessary and justify the same
 (4) Draw neat sketches/diagrams wherever necessary.

1. Answer the following. (any four)

- (a) State and explain Kepler's laws? And show that $a_{GSO} = 42,000$ km. 5
 (b) What is meant by polarization of satellite signals and why circular polarization is preferred in satellite applications? 5
 (c) Compare LEO, MEO, GEO satellites? 5
 (d) Briefly explain sun transit outage? 5
 (e) What are the differences between GEO Synchronous and GEO stationary orbits? 5
2. (a) Discuss design criteria and problems encountered by communication satellite and mention different sub systems of satellite? 10
 (b) Draw block diagram of transmit received earth station and explain each block? 10
3. (a) what is telemetry, tracking and command sub system? And explain it's working with necessary block diagrams? 10
 (b) Compare spin stabilization and 3-axis stabilization methods. Mention their advantages and disadvantages? 10
4. (a) Explain different types of double reflector antennas used in satellite communication? 10
 (b) Explain briefly importance of reliability, qualification and Bath tub curve? 10
5. (a) What are look angles? An earthstation is located at latitude $30^{\circ}S$ and longitude $130^{\circ}E$, calculate antenna look angles for satellite at $156^{\circ}E$? 10
 (b) Discuss different launching mechanism of satellite in GEO stationary orbit with necessary diagrams? 10

[TURN OVER

6. (a) A satellite circuit has the following parameters:

10

| | Uplink, decibels | Downlink, decibels |
|--------|------------------|--------------------|
| [EIRP] | 54 | 34 |
| [G/T] | 0 | 17 |
| [FSL] | 200 | 198 |
| [RFL] | 2 | 2 |
| [AA] | 0.5 | 0.5 |
| [AML] | 0.5 | 0.5 |

Calculate the overall $[C/N_0]$ values.

- (b) Why TWT is preferred for satellite communication and multiple carriers operations? Explain 1 dB compression point? And what is significant of this point in relation to operating point of TWT?

10

7. Write short notes on any two: -

20

- Orbital perturbations with equations
- Double conversion transformers
- SPADE system
- VSAT