Instructions:
(1) Question No 1 is Compulsory
(2) Answer any 3 questions from the remaining questions

Q1 Answer any 4   20

   a. Explain RGB and HSI colour models.
   b. Quality of picture depends on the number of pixels and grey level that represent the picture. Justify or contradict.
   c. What are the different types of order statistics filters? Discuss their advantages.
   d. Discuss the classifications of video frames.
   e. Explain opening and closing of a digital image.

Q2 a. Write an expression for a two dimensional DCT. Also, find the DCT of the given image.   10

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

   b. Why Fourier transform and the frequency domain tools are so useful for image enhancement? With the help of neat block diagram explain the basic of filtering in the frequency domain. Give the reasons of shifting the origin.   10

Q3 a. Perform histogram Equalization for the following image. Plot the original and the Equalized Histograms   10

Intensity	0	1	2	3	4	5	6	7
No. of pixels	70	100	40	60	10	70	10	40

   b. Discuss region based segmentation.   10

Q4 a. What are the required sampling rates for video signals? Explain video sampling in three dimensions.   10
   b. Explain HIT or MISS transform using an example.   10

Q5 a. Explain the working of Weiner filter in image restoration.   10
   b. Discuss the concept of optical flow for motion estimation.   10

Q6 Write short notes on any two   20
   a. KL Transform.
   b. Exhaustive block matching algorithms.
   c. Hough transform.
   d. Point Processing.

MD-Con. 7991 -15.

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.

Q1.

a] Compare 2G, 3G and 4G with respect to speed, applications and bandwidth   05

b] If 36 Mhz total spectrum is allocated for a duplex wireless cellular System and simplex channel has 25Mhz RF bandwidth find Total number of duplex channels, Number of channels per cell if N=4 cell reuse is used.   05

c] Explain concept and importance of power control in CDMA   05

d] Explain fading effects due to Doppler spread   05

Q2.

a] If a signal to interference ratio of 15 dB is required for satisfactory Forward channel performance of a cellular system, what is frequency Reuse factor and cluster size that should be used for maximum capacity if path loss exponent is 1) n=3 and 2) n=4. Assume six first tier co channel cells & mobile unit is at the center of cell.   10

b] Explain principle of Rake receiver in detail.   10

Q3.

a] An urban area has a population of two million residents. Three competing trunked mobile networks (systems A, B and C) provide cellular service in this area. System A has 394 cells with 19 channels each. System B has 98 cells with 57 channels each; and system C has 49 cells each with 100 channels. Find the number of users that can be supported at 2% blocking if each user averages two calls per hour at an average call duration of 3 minutes. Assuming that all three trunked systems are operating at maximum capacity, compute the percentage market penetration of each cellular service provider. Data: GOS = 0.02;

[TURN OVER

MD-Con. 8767 -15.

b] Explain W-CDMA Forward channel structure in detail.   10

10

Q4.
    a) Compare IS-95, WCDMA and CDMA2000 with respect to Channel bandwidth, chip rate, modulation schemes, data rate and frame size.

    b) Draw LTE network architecture and discuss it in detail

Q5
    a) What is the concept of software defined radio? Elaborate in detail.   10

b) Explain Hand off in UMTS.
10

Q6. Write a short note on any two of the following: 20
    1. Multiantenna Techniques
    2. Cellular capacity and coverage improvement Techniques
    3. Indoor propagation Models

———— X ————

VII (CBCS) (EXTC) OC & N. Nov. Dec 15

BE Sem.

4/12/2015

Sub- OC & N

QP Code : 5954

(3 Hours) [Total Marks : 80]

N.B. : (1) Question No. 1 is compulsory
(2) Attempt any three questions out of the remaining five questions.
(3) Figures to the right indicate full marks.

1. (a) Differentiate DWDM, WDM and SONET. 5
(b) What is optical safety? 5
(c) Differentiate LED and LASER sources. 5
(d) Compare different types of splicing techniques. 5

2. (a) Draw the block diagram of optical communication and state its advantages and disadvantages. 10
(b) Explain different types of fibers with their refractive index profile and mention its dimensions. 5
(c) A multimode GIF exhibits total pulse broadening of ms over a distance of 15 km. Estimate (i) The maximum possible Bandwidth on the link assuming no |S| 5
(ii) The pulse dispersion per unit length.
(iii) The Bandwidth length product.

3. (a) What is macrobending loss. Explain with neat diagram. Explain how to minimize microbending losses. 10
(b) Explain OTDR with neats sketch and mention its advantages and applications. 5
(c) Derive an Expression for responsivity of PIN photodiode. 5

4. (a) What are optical amplifiers. Explain different types of front end amplifiers. 7
(b) Explain in detail working principle of RAPD. Why it is called reach through APD and compare its working with PIN diode. 8
(c) Explain SONET architecture in detail. 5

5. (a) Explain working principle of isolator with neat sketch. Also compare isolator and circulator. 10
(b) Write a short note on link power budget. 10

6. (a) Explain OTDM in detail. 10
(b) Explain optical access networks. 10

MD-Con. 9983-15.

Sub:- DTSP

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 $0.5 < 60°$, show locations of   5
       other zeros. What is minimum order of this filter?
   (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
       $x_1(n) = \{1, 2, 3, 4\}$ and $x_2(n) = \{5, 6, 7, 8\}$
   (b) Compare minimum phase, maximum phase and mixed phase system. Also identify   10
       whether the following system is minimum phase, maximum phase, mixed phase
       system.

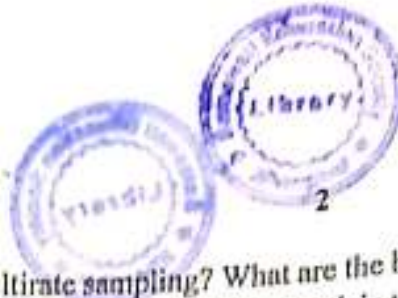$$H_1(z) = 1 - \frac{1}{2}z^{-1} - \frac{3}{2}z^{-2}$$
$$H_2(z) = 1 - \frac{5}{2}z^{-1} - \frac{3}{2}z^{-2}$$

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

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

   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 10 disadvantages and its applications. Explain the different filter banks and also explain sub band coding.

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

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

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

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

(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 10 the DFT of the sequences:-

(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

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

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

Q.P. Code : **6015**

(3 Hours) [Total Marks : 80

N.B. : (1) Question No.1 is compulsory.
(2) Solve any three questions from the remaining.
(3) Assume suitable data if necessary.

1. (a) Design circulator using magic tees. 5
   (b) Explain Travelling wave tube as an amplifier. 5
   (c) Explain the operation of 2-hole Directional coupler with s-matrix. 5
   (d) Explain Doppler shift and its role in pulsed and CW radar. 5

2. (a) The terminating impedance Z_L is $100+j100\Omega$ and the characteristics impedance Z_0 of the line and stub is 50Ω. The first stub is placed at 0.40λ away from the load. The spacing between the two stubs is $3\lambda/8$. Determine the length of the short circuited stubs when the match is achieved. 10
   (b) Explain instrument landing system for aircraft navigation. 10

3. (a) Derive the wave equation for a TE wave and obtain all the field components in a circular waveguide. 10
   (b) What is the importance of beam coupling coefficient? Derive the equation of velocity modulation in klystron. 10

4. (a) Explain the significane of RWH model and two valley model in Gunn diode. 10
   (b) With a suitable diagram, explain the working on conical scan tracking radar. Explain the various factors that need to be considered in determining the optimum squint angle. 10

5. (a) Draw and explain with block diagram of MTI radar system. What are its limitations. 10
   (b) Discuss the power frequency, current frequency and power gain frequency limitations with refrence to a microwave transistor. 10

6. (a) Design two lumped element L section matching network at 500 MHz to transform $Z_L = 200 - j100\Omega$ to a $100\ \Omega$ transmission line. Use Smith Chart. 10
   (b) Write a short note une backward wave oscilator. 5
   (c) A radar operating at 1.5 GHz uses a peak pulse power of 2.5 MW and have a range of 100 nmi for objects whose radar cross section is $1m^2$. If the minimum receivable power of the receiver is 2×10^{-12} Watt. What is the smallest diameter of the antenna reflector could have, assuming it to be a full paraboloid with $\eta = 0.65$. 5

MD-Con. 11083-15.

(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   5
   type.
   (b) Explain different redundancies in text, digital images and digital videos. How   5
   are they important for data compression?
   (c) Differentiate between private key crypto systems and public key cryptosystems.   5
   Give an example of each.
   (d) Solve the following congruence using Chinese Remainder Theorem (and not   5
   by trial-and-error)
   $X \equiv 1 \bmod 3$
   $X \equiv 4 \bmod 5$
   $X \equiv 5 \bmod 7$

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

Letter	Probability
a_1	0.2
a_3	0.3
a_2	0.5

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

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

Letters	a_1	a_3	a_2	a_4
Probabilities	0.1	0.3	0.25	0.35

[TURN OVER]

QP-Con. 11333-15.

(b) With a neat block diagram, explain the JPEG lossy compression technique.

10

4. (a) Explain DPCM and ADPCM techniques with neat block diagrams.

(b) What are I-, P - and B - frames in digital videos? Explain the principle of video compression used in MPEG standard

10

10

5. (a) The prime numbers used in RSA algorithm are P=19 and g=23. If the public key e is 3 find ϕ (n) and d; the decryption key where ϕ (n) has usual meaning. Write encryption and decryption equations.

10

(b) Explain "Man-in-the-middle" attack happening in Define- 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 :

(a) MP-III encoder and decoder

(b) JPEG- 2000 standard

(c) Viruses and worms

20

QP Code : 5743

(3 Hours)   [Total Marks : 80

N.B: (1) Question No. 1 is compulsory
     (2) Solve any 3 from remaining 5 questions.
     (3) Figures to the right indicate full marks.
     (4) Assume suitable data if necessary and mention the same in the answer sheet.

1. Solve any five :   20
   (i)   Differentiate between synchronous counters and ripple counters.
   (ii) Differentiate between inverting and non-inverting amplifier.
   (iii) Design first order non-inverting low pass filter to provide cutoff frequency of 10KHz.
   (iv) Explain 7490 decade counter.
   (v)   Design voltage regulator to provide output voltage equal to 5V and load current 1 Amp using IC 7805.
   (vi) With the help of neat circuit diagram explain any one application of PLL565.

2. (a) What is a precision rectifier ? Draw the diagram for a full wave precision   10
       rectifier. With the help of waveforms at different points in the circuit explain its working.
   (b) With the help of a neat circuit diagram explain working of RC phase shift   10
       Oscillator.

3. (a) Draw functional block diagram of IC723 and explain its working as low   10
       voltage regulator and high voltage regulator.
   (b) With the help of neat circuit diagrams explain how analog multiplier AD   10
       534 can be utilised for :
       (i) analog division and
       (ii) Square root extraction.

4. (a) Draw and explain the functional diagram of IC555 and explain its operation   10
       in astable mode.
   (b) Explain working of :   10
       (i) logarithmic amplifier and
       (ii) Anti logarithmic amplifier with the help of circuit diagram.

MD-Con.-11117 -15   TURN OVER

5. (a) With the help of a neat circuit diagram explain the working of Universal shift   10
register IC74194 as a 4bit, 4-state Ring counter with a single circulating 'T'.

(b) With the help of a neat circuit diagram explain the working of 74163   10
synchronous 4 bit binary coutner. Also illustrate the cascading connections for
74163 based coutners.

6. Write short notes on any **four** :   20

    (i)   74181 Arithmetic Logic Unit

    (ii)   Instrumentation Amplifier

    (iii) Switching Regulator

    (iv) Voltage to frequency converter

    (v)   Triangular wave generator.

(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)   (20)

  (1) Compare FDMA, TDMA, CDMA, SDMA.

  (2) Authentication in GSM.

  (3) Signal processing in GSM.

Sub:- DC&E

(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.

20

1. (a) Distinguish between cryptography and steganography
   (b) A source emits latters 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.

   $x = 2 \mod 3$

   $x = 3 \mod 5$

   $x = 2 \mod 7$

   (d) Define fermat's little theorem find the result of
   (i) $3^{12} \mod 11$
   (ii) $3^{10} \mod 11$

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.

20

3. (a) Write a short note on μ-law and A-law companding
   (b) Explain diffie hellman key exchange algorithm with an example. Also explain
   attack on diffie hellman key exchange

20

4. (a) Explain attack on double DES with example write with neat black diagram
   triple DES with two keys.
   (b) Write short note on AES

20

5. (a) Write short note on H-264 encoder and decoder
   (b) Explain Intrusion detection system in detail

20

6. Write short note (Any three)
   (a) Ethical hacking
   (b) Attacks on RSA
   (c) JPEG - 2000
   (d) Biometric Authentication.

_____

Sub:- FME

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 x 3.5cm 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

QP-Con. 12051-15.

QP Code : 2562

Duration : 3 Hrs

Maximum Marks: 100

Note: i) Question no 1 is compulsory

ii) Solve any four out of remaining questions

iii) Figure to the right indicate full marks

Q.1		Attempt any TWO questions.	[20]
	A	What is data transparency? Explain bit stuffing and de-stuffing.	[5]
	B	What are various networking components? Give functioning.	[5]
	C	What is the use of application layer? Explain	[5]
	D	What are category cables? What are its type and applications?	[5]

Q.2	A	What is flow control? Explain GO-Back-N protocol.	[10]
	B	What are HDLC frame format? Explain	[10]

Q.3	A	What are various station types, configurations and modes of communication supported by HDLC protocol? Explain in brief.	[10]
	B		[10]

Q.4	A	Brief various fields in the TCP header format.	[10]
	B	Explain various scheduling mechanism: reservation, token passing and polling.	[10]

Q.5	A	What is IP address? What is Classful and classless addressing? Explain Classful addressing.	[10]
	B	Explain the difference between Dijkstra and Bellman-Ford algorithm with example.	[10]

Q.6	A	What is VLAN? What is the basis of membership in a VLAN? Explain the advantages.	[10]
	B	What is transmission impairment? Explain the causes and remedy	[10]

Q.7		Write a notes on any two.	[20]
	A	IEEE802 project	
	B	SONET	
	C	CSMA/CA	

QP-Con. 12340-15.