BE / ExTC / Sem VII / Rev

mobile com sys.

ws Oct- 10 162

Con. 5650–10. **(REVISED COURSE)** **GT–8895**

(3 Hours) **[Total Marks : 100**

N.B. : (1) Question No. **1** is **compulsory**.
(2) Attempt any **four** question out of remaining **six** questions.
(3) Assume made should be **clearly** stated.

1. (a) Relate doppler shift to the mobile velocity and the spatial angle between the direction of motion of the mobile and the direction of arrival of the wave. **5**
(b) Explain the nonlinear effects in FDMA. **5**
(c) How is FACCH used for carrying urgent messages ? **5**
(d) Derive relationship between capacity C of system and cluster size N. **5**

2. (a) Elaborate on forword W-CDMA channel. **10**
(b) How is mobility managed in CDPD ? **10**

3. (a) Relate S/I (signal-to-interference ratio) to the cluster size N. **10**
(b) A mobile is located 5 km away from a base station and uses a vertical $\lambda/4$ monopole antenna with a gain of 2·55 dB to receive cellulor radio signals. The E-field at 1 km from the transmitter is measured to be 10^{-3} V/m. The carrier frequency used for this system is 900 MHz. **10**
(i) Find the length and the effective aperture of the receiving antenna.
(ii) Find the received power at the mobile using the two-ray ground reflection model assuming the height of the transmitting antenna is 50 m and the receiving antenna is 1·5 m above ground.

4. (a) Give an account on SDMA. **10**
(b) Give a complete functional account on NSS. **10**

5. (a) How is power control applied in forward CDMA channel. **10**
(b) The channel data rate is 270·33 kbps in GSM standard that is 40% (say) of theoretical maximum data rate that can be supported in a 200 KHz channel bandwidth. Calculate the corresponding theoretical S/N required. **10**

5. (a) How is power control applied in forward CDMA channel. **10**

(b) The channel data rate is 270·33 kbps in GSM standard that is 40% (say) of theoretical maximum data rate that can be supported in a 200 KHz channel bandwidth. Calculate the corresponding theoretical S/N required. **10**

6. (a) Consider a transmitter which radiates a sinusoidal carrier frequency of 1850 MHz. For a vehicle moving 60 mph, compute the received carrier frequency if the mobile is moving (i) directly toward the transmitter (ii) directly away from the transmitter and (iii) in a direction which is perpendicular to the direction of arrival of the transmitted signal. **10**

(b) A hexagonal cell within a four-cell system has a radius of 1·387 km. A total of 60 channels are used within the entire system. If the load per user is 0·029 Erlongs, and λ = 1 call/hour, compute the following for an Erlong C system that has a 5% probability of a delayed call. **10**

(i) How many users per square kilometer will this system support ?

(ii) What is the probability that a delayed call will have to wait for more than 10 sec ?

(iii) What is the probability that a call will be delayed for more than 10 sec ?

From Erlong C chart, 5% probability of delay with C = 15 corresponds to traffic intensity = 9 Erlongs.

7. (a) How is variable data rate transmission done in reverse CDMA channel. **10**

(b) Give the 3G CDMA evolutionary path. **10**

BE / EXTC / Sem VII / Rev

Fundamentals of Micro-Engg. 14/12/10

44-p3-upq-Con No. File

Con. 5645–10. **(REVISED COURSE)** **GT–8907**

(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 of **smith chart** is **compulsory**.

Q 1 **20 Marks**

A) Enumerate and explain the advantages and applications of Microwaves.

B) A 50Ω transmission line is matched to a 10V source that feeds a load Z_L = 100Ω. If the line is 2.3λ long and has an attenuation constant α=0.5dB/λ, find the powers that are delivered by the source, lost in the line and delivered to the load.

C) With a neat diagram explain the working of a PIN diode.

D) With a neat block diagram explain the procedure for the measurement of an unknown impedance at microwave frequencies.

Q2 **20 Marks**

A) Using the multiple reflection viewpoint explain the principle of working of a quarter wave transformer.

B) With a neat diagram explain the working of a Magic Tee. Derive its scattering matrix.

Q3

20 Marks

A) A generator at 150MHZ drives a 10m long, 75Ω coaxial line terminated in a composite load consisting of the parallel connection of two 50Ω lines of lengths 0.5 m and 1.0 m, each terminated in a 50Ω resistance. All lines are lossless with ε_r=2.2. With reference to figure1, determine the length l_s and connection point d of a parallel-connected 75Ω stub that will produce minimum VSWR on the feed line. The stub should be as close as possible to the load. (Use Smith Chart)

B) A lossless air-dielectric waveguide for an S-band RADAR has inside dimensions a=7.214 cm and b=3.404 cm. For the TM_{11} mode propagating at an operating frequency that is 1.1 times the cutoff frequency of the mode , calculate (a)critical wave number, (b)cutoff frequency, (c)operating frequency, (d)propagation constant, (e) cutoff wavelength, (f) operating wavelength, (g) guide wavelength, (h) phase velocity, (i) wave impedance.

Q4

20 Marks

A) Explain the working and derive the S-Matrix for a two-hole directional coupler.

B) With neat diagrams explain the working of a Gunn Diode.

Q5 **20 Marks**

A) Design a composite low-pass filter by the image parameter method with the following specifications: R_o= 50Ω, f_c = 50MHz, f_∞= 52MHz.

B) With suitable diagrams, explain the working of a Reflex Klystron.

Q6 **20 Marks**

A) Design a low-pass fourth-order maximally flat filter using only shunt stubs. The cutoff frequency is 8GHz and the impedance is 50Ω. (Table for prototype is given below)

B) A travelling wave tube operates under the following parameters:

Beam Voltage: V_o = 3kV

Beam Current: I_o= 30mA

Characteristic impedance of helix: Z_o = 10Ω

Circuit Length: N = 50

Frequency: f = 10GHz. Determine: (a) the gain parameter C (b) the output power gain A_P in decibels and (c) all four propagation constants.

Q7 **20 Marks**

A) A plane wave travelling along the z-axis in a dielectric medium with $\varepsilon_r = 2.55$ has an electric field given by $E = E_o \cos(\omega t - kz)$. The frequency is 2.4GHz, and $E_o = 30V/m$. (a) Find the amplitude and direction of the magnetic field (b) Find the phase velocity and the wave length. Find the phase shift between the positions $z_1 = 0.5m$ and $z_2 = 1.7$ m.

B) Briefly explain the principle of operation of a gyrotron.

C) Briefly explain the concept of Dynamic range.

D) Explain the working of a Schottky Diode.

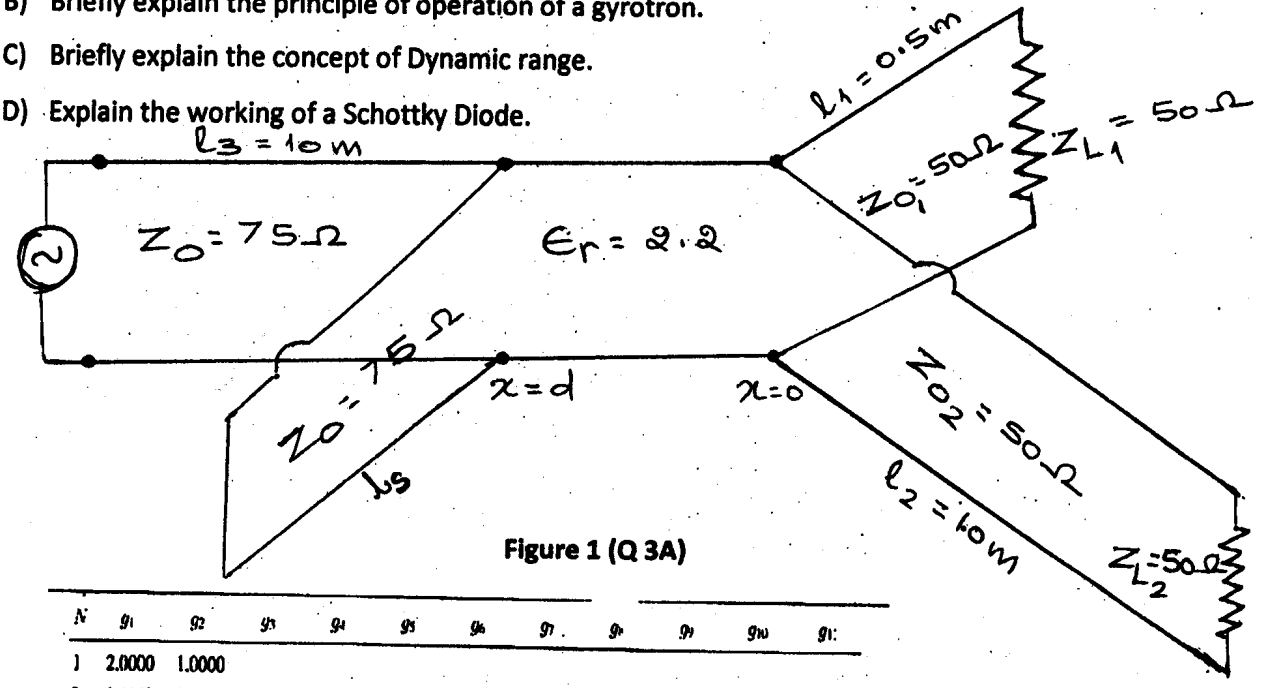

Figure 1 (Q 3A)

N	g_1	g_2	g_3	g_4	g_5	g_6	g_7	g_8	g_9	g_{10}	g_{11}
1	2.0000	1.0000									
2	1.4142	1.4142	1.0000								
3	1.0000	2.0000	1.0000	1.0000							
4	0.7654	1.8478	1.8478	0.7654	1.0000						
5	0.6180	1.6180	2.0000	1.6180	0.6180	1.0000					
6	0.5176	1.4142	1.9318	1.9318	1.4142	0.5176	1.0000				
7	0.4450	1.2470	1.8019	2.0000	1.8019	1.2470	0.4450	1.0000			
8	0.3902	1.1111	1.6629	1.9615	1.9615	1.6629	1.1111	0.3902	1.0000		
9	0.3473	1.0000	1.5321	1.8794	2.0000	1.8794	1.5321	1.0000	0.3473	1.0000	
10	0.3129	0.9080	1.4142	1.7820	1.9754	1.9754	1.7820	1.4142	0.9080	0.3129	1.0000

Table (Q 6A)

B.E. ExTc / Sem VII / Rev

Elective - I - Datacom & Encryption

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Con. 5656–10. **(REVISED COURSE)** **GT–8910**

(3 Hours) **[Total Marks : 100**

N.B. : (1) Question No. **1** is **compulsory**.
(2) Attempt any **four** question out of remaining **six** questions.
(3) Assume **suitable** data wherever **required**.
(4) **Figures** to the **right** indicate **full** marks.
(5) Answers to the question should be grouped and written **together**.

1. (a) What are the different measures of performance of data compression techniques ? **5**
   (b) Discuss the draw backs of statistical methods. **5**
   (c) What is motion compression w.r.t. Image Compression. **5**
   (d) Discuss secure electronic payment system. **5**

2. (a) Distinguish between Scalar and Vector Quantization. Discuss the MPEG Audio Encoder and Decoder systems. **10**
   (b) Describe the features of Video Compression as compared to Image compression. Explain MPEG Industry standard for Video Compression. **10**

3. (a) A source Emitts Letter's from alphabet A = {m, n, o, p, q} with probabilities p(m) = p(n) = 0·2, p(o) = 0·4, p(p) = p(q) = 0·1. **10**
      (i) Calculate the entropy of the source.
      (ii) Find Huffman Code using both the standard procedure and minimum variance method.
      (iii) Find the average length of code and redundancy for each of the code of part (II).
   (b) What are the different types of DES prevalent today ? How is the security aspect maintained in DES ? **10**

4. (a) In which situation LZ 77 does the perform 'best' ? 'Worst' ? Encode the string 'mnop mnopponm' using LZ 78. What are the limitations of this method ? **10**
   (b) What are the main features of Digital Signature Standards. Suggest a suitable scheme for secure communication between 'A' user and 'B' user covering issue of confidentiality and authentication. Justify your choice. **10**

5. (a) In High fidelity digital recording with a maximum frequency of 20 KHz. The sampling rate equals 44·1 KHz. How much memory is needed to store 1 hours of music if the number of quantization level is :– **10**
      (i) 2^8 (ii) 2^{16}.
   (b) Explain the JPEG compression method used for Image Compression. How JPEG-LS is different from JPEG ? **10**

5. (a) In High fidelity digital recording with a maximum frequency of 20 KHz. The sampling rate equals 44·1 KHz. How much memory is needed to store 1 hours of music if the number of quantization level is :– **10**

   (i) 2^8 (ii) 2^{16}.

   (b) Explain the JPEG compression method used for Image Compression. How JPEG-LS is different from JPEG ? **10**

6. (a) What are the "Active" and "Passive" attacks on security of a system ? How Chinese Remainder Theorem use in security ? **10**

   (b) Discuss the certificate based and Bio-metric authentication. How does message authentication is different from the above. **10**

7. Write short note on (any **two**) :– **20**

   (a) "Frequency Masking" and "Temporal Masking" w.r.t. Audio Compression.

   (b) "S" Box Design

   (c) Diffie-e-Hellman Key Exchange

   (d) Fire wall design.

BE/Sem-VII/Rev/EXTC/NOV-2010 Dt: 2-12-2010

Sub: - Discrete Time Signal Processing

10:30 to 1:30 pm

27 : 2nd half.10-p(d)

Con. 6394-10. **(REVISED COURSE)** **GT-8904**

(3 Hours) **[Total Marks : 100**

N.B. : (1) Question No. **1** is **compulsory.**
(2) Assume suitable data if **necessary.**
(3) Attempt **any four** questions out of remaining **six** questions.
(4) **Figures** to the **right** indicate **full** marks.

1. (a) A discrete time invariant and linear system is describe by the difference equation– **10**

$$y(n) = x(n) + 2\ x(n-1) + x(n-2)$$

Obtain (i) Impulse response
(ii) Frequency response
(iii) Sketch magnitude and phase response
(iv) System response to the input $(-)^n\, n\, u(n)$.

(b) Explain the concept of decimation by Integer (M) and interpolation by integer factor (L). **10**

2. (a) Find DFT of the sequence using DIT FFT – **10**

$x[n] = \{1, -2, 2, 2, 1, 3, -3, 4, 5\}$

(b) Convert the analog filter with system function– **10**

$$H(s) = \frac{s+0\cdot1}{(s+0\cdot1)^2 + 9}$$ .into a digital IIR filter using bilinear transformation. The digital filter should have a resonant frequency of $w_r = \frac{\pi}{4}$.

3. (a) A filter is to be designed with the following desired frequency response. **10**

$$H_d(e^{jw}) = \begin{cases} 0 & ; \ -\pi/4 \le w \le \frac{\pi}{4} \\ (e^{j2w}) & ; \ -\pi/4 < |w| < \frac{\pi}{4} \end{cases}$$

Determine the filter coefficients using Hamming window.

(b) Consider a causal LTI system which is defined by system function. **10**

$$H(z) = \frac{1 + \frac{1}{4}z^{-1}}{\left(1+\frac{1}{2}z^{-1}\right)\left(1+\frac{1}{2}z^{-1}+\frac{1}{4}z^{-2}\right)}$$

(c) Obtain DF-I, DF-II, cascade and parallel realization structures. **10**

4. (a) The frequency response of low pass filter is given by– **10**

$$H(e^{jw}) = \begin{cases} (e^{j3w}) & ; \ 0 \le w < \pi/2 \\ 0 & ; \ \pi/2 \le w \le \pi \end{cases}$$

Realize the above filter using frequency sampling realization technique.

(b) Develop DIT FFT algorithm for N = 6 = 2·3 using split-radix method. **10**

[TURN OVER

5. (a) The unit sample response of a system is h[n] = { 3, 2, 1} use overlap-add method of linear filtering to determine output sequence for the repeating input sequence x [n] = { 2, 0, –2, 0, 2, 1, 0, –2, –1, 0 } **10**

(b) Explain the subband coding of speech signal as an application of mutirate signal processing. **10**

6. (a) Design a digital Butterworth filter that satisfies the following constraint using bilinear transformation Assume T = 1 sec. **10**

$$0.9 \leq \left|H\left(e^{jw}\right)\right| \leq 1 \quad ; \quad 0 \leq w \leq \frac{\pi}{2}$$

$$\left|H\left(e^{jw}\right)\right| \leq 0.2 \quad ; \quad \frac{3\pi}{4} \leq w \leq \pi$$

(b) Draw pole-zero plot and sketch magnitude and phase response of finite impulse response fitter which is given by. **10**

$$h[n] = (0.5)^n \quad ; \quad 0 \leq n \leq 7$$

7. Write short note on (any **three**) :– **20**

(a) Multistage approach to sampling rate conversion.

(b) Adaptive television echo cancellation.

(c) Goertzel Algorithm

(d) Digital resonator.