B.E / ExTc / Sem VII / old

Elective : I : Radar Engineering 27-12-

VT-Oct-10-21

Con. 5693–10. **(OLD COURSE)** **GT–8094**

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

N.B. : (1) Question **No. 1** is **compulsory**.
(2) Attempt any **four** questions out of the remaining **six** questions.

1. (a) What do you understand by the term Radar resolutions cell ? **20**
   (b) What should be pulse repetition of Radar in order to achieve maximum unambigous range of 500 yards ?
   (c) If the radar has peak power of 800 kW,what is its average power and duty cycle ?
   (d) What are types of clutter ?

2. (a) Derive the Radar range equation as governed by minimum detectable signal to noise ratio. Enumerate the system losses that might occur in long range. **10**
   (b) Draw functional block diagram of MTI Radar system and explain it. Also define the terms blindspeed. **10**

3. (a) What do you mean by RCS ? Explain the RCS of following :– **10**
      (i) Sphere
      (ii) Rod
      (iii) Complex Target.
   (b) What do understand by RCS fluctuations ? Explain different Swertings model for RCS fluctuations. **10**

4. (a) Explain properties of sea and land clutter. **10**
   (b) Derive an expression for doppler frequency shift in terms of transmitted frequency and radial component of Target velocity vector. **10**

5. (a) With a suitable diagram,explain working of Conical scan tracking Radar. **10**
   (b) Explain the mechanism of range Tracking of moving target with example. **10**

6. (a) Explain the working of delay line canceler and derive an expression for the frequency response. **10**
   (b) Draw block diagram of CW radar and pulse doppler radar and explain equation echo signal. **10**

7. Write short notes on :– **20**
   (a) LORAN
   (b) DECCA
   (c) TACAN.

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BE / ExTc / Sem VII / old
Digital com

Con. 6367-10. (OLD COURSE) GT–9417

(3 Hours) [Total Marks : 100

N. B. : (1) Question No. **1** is **compulsory**.
(2) Solve any **four** of the remaining **six** questions.
(3) **Suitable** data may be assumed, if **needed**, justify.
(4) Figures to the **right** indicate **full** marks.

1. Write your answer in brief :— **20**
   (a) What is zero forcing equalizer ?
   (b) Interpretation of Eye pattern
   (c) Explain linearity and cyclic property of cyclic code
   (d) Deduce the bandwidth of Mary PSK system.

2. (a) The binary sequence 1011011110 is applied to DPSK transmitter : **12**
      (i) Draw the block diagram of DPSK transmitter and receiver, sketch the resulting waveform at output.
      (ii) Show that, in absence of noise the original binary sequence is constructed at receiver output. Calculate the bandwith of DPSK singnal.
   (b) Explain Binary ASK along the following lines :– **8**
      (i) Modulation
      (ii) Demodulation
      (iii) Power spectral density with relevant frequencies and hence BW.
      (iv) Signal space representation.

3. (a) An event has six possible outcomes with – **6**

   $P_1 = \frac{1}{2}$, $P_2 = \frac{1}{4}$, $P_3 = \frac{1}{8}$, $P_4 = \frac{1}{16}$, and $P_5 = \frac{1}{32}$.

   Find the entropy of system also find the rate of information if there are the outcomes per second.
   (b) For given bit sequence 110011010011 with the help of neat waveform, represent (a) NRZ (b) AMI (c) Manchester formats. **6**
   (c) Show that the minimum bandwith needed for transmission of N time division multiplexed base band signal by PAM is N–B Hz, where B is the bandwith of each of N-base band signal. **8**

4. (a) Derive the expression for error probability of matched filter and justify that P_e does not depend on shape of the input waveform. **10**
   (b) What is inter symbol interference ? Show, how transversal equalizer reduces ISI. **10**

5. Write short notes on :— **20**
   (a) QAM
   (b) Direct sequence SS
   (c) Optimum receiver
   (d) Duo-binary signaling.

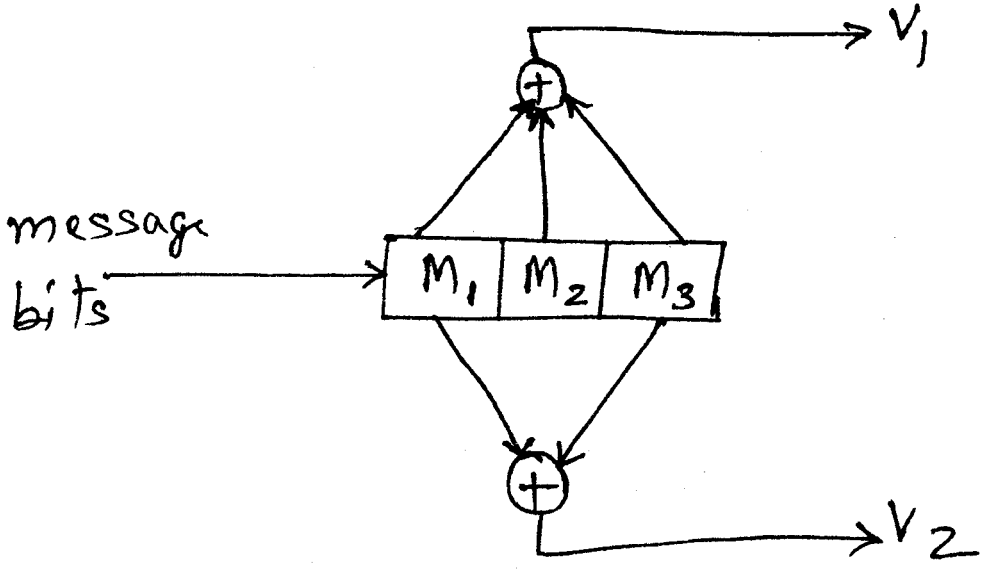
[TURN OVER

6. (a) The generator polynomial for a (7, 4) systematic cyclic code is x3 + x2 + 1. **10**
   (i) Find the code polynomial for message vector 1111 and hence coded word.
   (ii) Assume it suffers transmission error, find the syndrome at receiver.
   (b) The parity check matrix of (7, 4) linear block code is given by – **10**

$$H = \begin{vmatrix} 1 & 1 & 1 & 0 & 1 & 0 & 0 \\ 1 & 1 & 0 & 1 & 0 & 1 & 0 \\ 1 & 0 & 1 & 1 & 0 & 0 & 1 \end{vmatrix}$$

   (i) Find the greator matrix
   (ii) List all code words
   (iii) How many errors can be delected and corrected ?

7. (a) For a data bit sequence of 10110101 sketch the msk waveform. **8**
   (b) Given the following coder, obtain convolution code for the bit sequence 11011011 and 11000001. **12**



BE/EXTC/Sem VII/Old
Microwave Dev & Circuits

Con. 5563-10. **(OLD COURSE)** **GT-8100**

14/12/10

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

N.B.: (1) Question No. **1** is **compulsory**.
(2) Answer any **four** out of the remaining **six** questions.
(3) Assume any **suitable** data wherever **necessary** and justify the **same**.

1. (a) Explain the advantages of microwave frequency over low frequency. **20**

(b) For the following load conditions evaluate reflection coefficient (Γ_L), VSWR

(i) Matched Load
(ii) Open circuit
(iii) Short circuit.

Also draw the standing wave patterns for above loads for voltage and current waves.

(c) Describe the various cavity resonators.

(d) Explain IMPATT diode.

2. (a) A transmission line has the following parameters :— **10**

R = 6 Ω/ km
L = 2·2 mH/km
C = 0·005 μf/km
G = 0·05 μmho/km.

Determine : (i) Characteristic impedance Z_o
(ii) Attenuation constant α
(iii) Phase constant β
(iv) Phase velocity υ_P
(v) Wavelength λ

If the line is 100 km long and operated at 1 KHz.

(b) Explain the need of impedance matching for microwave circuits and explain the various methods of impedance matching. **10**

3. (a) A lossless line of $Z_o = 50\ \Omega$ is to be matched to a load $Z_L = \dfrac{50}{\left[2+j\left(2+\sqrt{3}\right)\right]}\ \Omega$ by **10**

means of a lossless short circuited stub. Characteristic impedance of the stub is 100 Ω. Find stub position and length of stub so that a match is obtained. (Use Smith chart)

(b) Explain microstrip line, strip line and co-planar waveguide. **10**

[TURN OVER

4. (a) An air-filled rectangular waveguide with following parameters : 10
a = 7 cm, b = 1·5 cm operates in the dominant mode. Calculate :
(i) Cut-off frequency f_c.
(ii) Phase velocity υ_p at 3 GHz
(iii) Guide wavelength λg at 3 GHz
(iv) Phase constant β_g.
(v) Wave impedance Z_g.

(b) Explain the working of directional coupler with neat diagram. 10

5. (a) Explain the working of reflex Klystron along with its modes and characteristics. 10

(b) A pulsed cylindrical magnetron is operated with the following parameters : 10
Anode voltage = V_o = 25 kV
Beam current = I_o = 25 Amp
Magnetic flux density = B_o 0·34 wb/ m^2
Radius of cathode cylinder = a = 5 cm
Radius of anode cylinder = b = 10 cm.
Calculate : (i) Angular freq. in radians and Hz
(ii) Hull cut-off voltage
(iii) Hull cut-off magnetic field flux density.

6. (a) Using two valley model explain the working of Gunn diode and various modes of Gunn diode. 10

(b) Explain the basic principle of parametric amplifier and also explain it as up-converter and down-converter. 10

7. (a) Explain the frequency measurement method with microwave bench set up. 10

(b) Using any method explain the impedance measurement technique. 10

Lab

BE/EXTC/sem VII/old

Discrete time signal processing.

P4-Con No-94

2-12-10

Con. 6107-10.

(OLD COURSE)

GT-8220

(3 Hours)

[Total Marks : 100

N.B. : (1) Question No. **1** is **compulsory**.
(2) Out of remaining questions, attempt any **four** questions.
(3) In **all five** questions to be attempted.
(4) Answer to **each** new question to be stared on a **fresh** page.
(5) Assume **suitable** data if **necessary**.

[20]

(a) For the following LTI system, draw pole zero diagram and identify the filter type.

i) $0.15\dfrac{1-z^{-2}}{1+0.7z^{-2}}$

ii) $\dfrac{1+z^{-2}}{1+0.81z^{-2}}$

(b) Explain how to determine IDFT using FFT algorithm.

(c) Draw the generalized linear phase FIR structure for odd value of M.

(d) Compare impulse invariant and bilinear transformation method.

(e) Derive the relationship between DFT and DCT.

2.(a) In FIR system, how to identify whether the system is minimum, maximum and mixed phase system. **[4]**

(b) One of the zero's of antisymmetric FIR filter is at $0.5\angle 60^0$. Show the locations of other zero's. What is minimum order of this filter? **[4]**

(c) Consider a causal LTI system **[12]**

$$\frac{1-\frac{1}{2}z^{-1}}{\left(1-z^{-1}+\frac{3}{16}z^{-2}\right)\left(1+\frac{1}{4}z^{-1}\right)}$$

Realize the system in each of the following forms
i) Direct form I
ii) Direct form II
iii) Cascade form
iv) Parallel form.

3.(a) Sample the given continuous time signal $x_{in}(t)=\sin[2\pi 1000t]+0.5\sin[2\pi 2000t]$ at 8000 sample/s and find out eight point DFT using DIT FFT algorithm **[10]**

(b) The desired frequency response of LPF is **[10]**

$H_d(e^{jw}) = e^{-3jw}$ for $-3\pi/4 \le w \le 3\pi/4$

0 for $3\pi/4 < |w| < \pi$

Determine $H(e^{jw})$ for M=7 using Hamming window

4.(a) An FIR digital filter has the unit sample response sequence h(n) = {2, 2, 1}. Determine the output sequence in response to the input sequence x(n) = {3, 0, -2, 0, 2, 1, 0, -2, -1, 0} using overlap add convolution method **[10]**

(b) What is DCT? Explain how DCT is classified in four types as DCT-I, DCT-II, DCT-III and DCT-IV. Which type is mostly used and why? **[10]**

5.(a) Design a digital Butterworth low pass filter satisfying the following specifications using BLT method (assume T= 1sec.) **[10]**

$0.9 \le |H(e^{jw})| \le 1 \quad ;0 \le w \le \pi/2$

$|H(e^{jw})| \le 0.2 \quad ;3\pi/4 \le w \le \pi$

(b) Develop DIF FFT algorithm for N=8 using radix 2 and draw the butterfly diagram **[10]**

6.(a) Design a digital band pass filter for the following specifications using analog frequency transformation. **[10]**

Pass band form 200 Hz to 300 Hz

Sampling frequency is 2000 Hz

(b) x(n)= {1, 2, 3, 1} find DFT X(K) using X(K) and not otherwise find the DFT of the following sequence **[10]**

i) $x_1(n) = \{1, 0, 2, 0, 3, 0, 1, 0\}$

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

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

7.(a) A two pole low pass filter has the system function $H(z) = \dfrac{b_0}{(1 - p.z^{-1})}$. Determine the values of bo and p such that the frequency response H(w) satisfies the conditions H(0) = 1 and $\left|H\left(\frac{\pi}{4}\right)\right|^2 = \frac{1}{2}$ **[10]**

7.(b) Write a short notes on **[10]**

i) Goertzel algorithm

ii) Compare the DSP processors and general purpose processors.

Lab BE / EXTC / Sem VII / Old

mobile - comm. System

9/12/10

ws Oct- 10 158

Con. 5553–10.

GT–8112

(OLD COURSE)

(3 Hours)

[Total Marks : 100

N.B. : (1) Question No. **1** is **compulsory**.
(2) Answer any **four** questions out of remaining **six** questions.
(3) **Clearly** state any assumptions **made**.

1. (a) How does cell dragging cause a potential interference problem ? **5**
   (b) What are the factors that effect small scale fading ? **5**
   (c) Purpose of SAT tone and ST tone in AMPS system. **5**
   (d) Function of RAKE receiver. **5**

2. (a) What are the various handoff strategies in cellular system ? **10**
   (b) Explain the ground reflection (two-ray) model. **10**

3. (a) What are the various steps in signal processing in GSM ? **10**
   (b) Give an account on DECT architecture. **10**

4. (a) Explain the reverse CDMA modulation process. **10**
   (b) What are the various steps in AMPS voice modulation process ? **10**

5. (a) Give a complete account on the Teledesic system. **10**
   (b) IMT–2000 Interfaces for specification by the ITV. **10**

6. (a) Explain the fading effects due to multipath time delay spread. **10**
   (b) Explain the control channels used in GSM. **10**

7. (a) Derive the relation between S/I and cluster size N for a cellular system. **10**
   (b) Purpose of power control subchannel in CDMA. **10**