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06EC61

Sixth Semester BE Degree Examination, Dec.09-Jan.10
Digital Communication

Time: 3 hrs. Max. Marks:100

Note: *1. Answer any FIVE full questions, selecting at least TWO questions from each part.*
2. Missing data may be suitably assumed.

PART – A

1 a. Explain merits of digital communication system over analog communication system. **(04 Marks)**

b. Obtain the expression for Fourier transform of sampling function h(t) used for flat top sampling. Hence explain aperture effect with the help of spectral diagrams. Bring out the differences between aperture effect and aliasing effect. **(08 Marks)**

c. Four messages bandlimited to w, w, w and 3w are to be time division multiplexed, with w being 2000 Hz. Se up a TDM scheme for the same and find speed of the commutator in samples per second. **(08 Marks)**

2 a. A signal x(t) is uniformely distributed in the range $\pm x_{max}$. Calculate signal to noise ratio for pulse code modulation of this signal. **(08 Marks)**

b. Draw the output of midtread type uniform quantizer for one complete cycle of a sinusoidal modulating signal. **(06 Marks)**

c. A 10 KHz sinusoid with amplitude 1V peak is quantized to have SNR of about 45 dB. Find the number of bits required per sample, bit rate and bandwidth of the system if sampling frequency is twice the Nyquist rate. **(06 Marks)**

3 a. Explain DPCM with neat diagrams for transmitter and receiver and relevant mathematical equations. **(07 Marks)**

b. Derive the condition for no slope overload distortion in delta modulation system. Hence derive the expression for post filtered signal to noise ratio. **(09 Marks)**

c. Draw the output of a delta modulator for input m(t) = 0.01t when sampled with fs = 20 Hz. **(04 Marks)**

4 a. Define intersymbol interference and explain ideal solution for zero ISI. **(08 Marks)**

b. Explain modified duobinary coding with precoder. **(08 Marks)**

c. A binary PAM wave is required to be transmitted via a channel having bandwidth 75 kHz. The bit duration is 10 μsec. Find a raised cosine pulse spectrum that satisfies these requirements. **(04 Marks)**

PART – B

5 a. A binary signal transmitted using PSK has the bitrate of 100 kilobits per second. Sketch the PSK wave form for binary data 110 if carrier frequency used has frequency $f_c = 1/t_c$, where $3t_c = T_b$. **(04 Marks)**

b. Explain coherent PSK receiver. Obtain the expression for probability of error for PSK with coherent receiver. **(10 Marks)**

c. A binary data is transmitted using ASK over AWGN channel at a rate of 2.4 Mbps. The carrier amplitude at the receiver is 1mv. Noise power spectral density is $No/2 = 10^{-15}$ watts/Hz. Find the average probability of error if detector is coherent. Take erfc (5) $\cong 3 \times 10^{-6}$. **(06 Marks)**

6 a. Give the steps used for finding basis functions using orthogonalization procedure, for N = 2. **(06 Marks)**

b. Define MAP criteria in a receiver and explain how ML criterion is used in correlation receiver. **(14 Marks)**

7 a. Derive the expression for SNR for a matched filter. **(10 Marks)**

b. Explain fast frequency hop spread spectrum system. **(10 Marks)**

8 Write notes on:

a. Robust quantization **(07 Marks)**

b. TI system **(07 Marks)**

c. Notion of spread spectrum system. **(06 Marks)**

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06EC62

Sixth Semester B.E. Degree Examination, Dec.09/Jan.10
Microprocessors

Time: 3 hrs. Max. Marks:100

Note: ***Answer any FIVE full questions, selecting at least TWO questions from each part.***

PART – A

1 a. Discuss briefly, how microprocessor has evolved with relevance to its capability, bit size and applications. **(06 Marks)**

b. With reference to 8086 CPU, explain the role of the following:
   i) Instruction queue
   ii) Segment registers
   iii) General purpose registers. **(08 Marks)**

c. Write and explain with relevant timing diagram a memory read operation in 8086 under min mode. **(06 Marks)**

2 a. Explain the significance of the following pins of 8086 processor:
   i) ALE
   ii) MN / $\overline{MX}$
   iii) $\overline{LOCK}$
   iv) $\overline{TEST}$ **(06 Marks)**

b. Differentiate between the following instructions and explain them with suitable examples:
   i) Shift and rotate
   ii) HLT and INT-n
   iii) Jmp and call **(08 Marks)**

c. What are the assembler directives? Explain the action performed by the following directives:
   i) Price db (?)
   ii) PAI Equ 40h
   iii) ASSUME
   iv) EXTRN **(06 Marks)**

3 a. Write an assembly language program to arrange 'N' bytes of data in ascending order. Write relevant comments for each of the instruction used. **(10 Marks)**

b. Use string instructions to perform the following:
   i) Block move of 'N' bytes from 'SOURCE' to 'DESTN'
   ii) Concatenate two strings.
   Write the complete program with comments. **(10 Marks)**

4 a. Explain the software and hardware interrupt structure in 8086. **(08 Marks)**

b. Give the significance of BIOS & DOS interrupts. **(06 Marks)**

c. Differentiate between macros and procedures. **(06 Marks)**

PART – B

5 a. Show an interface of a matrix keyboard to a 8086 and explain its basic principle of operation. **(10 Marks)**

b. With necessary hardware and software, show an interface of 7 segment LED display to a 8086 processor. **(10 Marks)**

6 a. What is a co-processor? Why it is called so? Give the significance of 8087 NDP. (Numerical data processor). **(06 Marks)**

b. Explain the various data types that 8087 can handle. Give examples. **(06 Marks)**

c. Write a program to obtain the hypotenuse of a right angles triangle given its sides A & B using 8087 interfaced to 8086. **(08 Marks)**

7 a. Explain with relevant block diagram the maximum mode operation of 8086. **(06 Marks)**

b. What are the characteristics of the following?

i) Peripheral component interconnect (PCI)

ii) Universal serial bus (USB). **(06 Marks)**

c. Show an interface of a printer to a 8086 processor. Explain the signals of importance. **(08 Marks)**

8 a. Write a note on the various special registers in 80386 CPU. **(06 Marks)**

b. Discuss briefly the two modes of operation in 80386. **(08 Marks)**

c. Describe the basic features of a Pentium processor. **(06 Marks)**

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06EC63

Sixth Semester BE Degree Examination, Dec.09-Jan.10
Analog and Mixed Mode VLSI Design

Time: 3 hrs. Max. Marks:100

Note: *1. Answer any FIVE full questions, selecting at least TWO questions from each part.*
2. Standard notations are used.
3. Missing data be suitably assumed.

PART – A

1 a. Define Resolution, INL, DNL and V_{FS} for a DAC. **(06 Marks)**

b. Find the maximum DNL and INL in LSBs of a 3 bit DAC which has the following characteristics. Check if it is monotonic. **(10 Marks)**

Digital input	000	001	010	011	100	101	110	111
Analog output	0 V	0.625 V	1.5625 V	2.0 V	2.5 V	3.125 V	3.4375 V	4.375 V

c. Find the maximum resolution of an ADC which can use the S/H circuit with maximum sampling error of 0.628 mV while maintaining a sampling error less than 1/2 LSB Vref = 5V. **(04 Marks)**

2 a. Discuss the issues involved in mixed signal circuit layout. **(10 Marks)**

b. Describe the simple resistor string DAC, problem associated with it and how is it overcome by use of a binary switch array. **(10 Marks)**

3 a. Describe the pipelined ADC with a neat diagram. **(08 Marks)**

b. For an 8 bit pipelined ADC, all the amplifiers had a gain of 2.1 v/v instead of 2v/v. If V_{in} = 3V and V_{ref} = 5V, what would be the resulting digital output, assuming other components are ideal. **(06 Marks)**

c. For a 4 bit successive approximation ADC with V_{ref} = 5V, V_{in} = 1V, find the output digital code. Assume a dual slope successive approximation ADC. For each clock cycle, give the output of the SAR, V_{aut} and the final output. **(06 Marks)**

4 a. Discuss the advantages and disadvantages of using a dual slope over a single slope ADC. **(06 Marks)**

b. Draw the CMOS analog multiplier and explain its working. **(07 Marks)**

c. Discuss transient response, propagation delay and minimum slewrate of a comparator. **(07 Marks)**

PART – B

5 a. Develop an expression for effective number of bits in terms of the measured SNR if the input wave has a peak amplitude of 30% of V_{ref}. **(07 Marks)**

b. With a neat block diagram, describe the accumlate and dump circuit for decimation and averaging. **(07 Marks)**

c. Sketch the block level circuit diagram for an fs/4 digital resonator. **(06 Marks)**

6 a. With relevant diagrams, describe the CMOS process flow, for devices with L_{min} <0.35 μm. **(10 Marks)**

b. Describe with a neat diagram, the conceptual layout and actual layout of an R-2R resistor string with minimum area and also discuss the problem of laying out metal over the resistive material. **(10 Marks)**

7 a. Sketch the implementation of a synchronous up/down counter and discuss its operation. **(07 Marks)**

b. Draw the 4 bit pipelined adder and describe how it operates. **(08 Marks)**

c. Draw the positive edge triggered delay using clocked CMOS logic. **(05 Marks)**

8 a. Illustrate how a pushpull output stage is biased with a floating current source. **(07 Marks)**

b. Infer that, to minimize the input referred noise, the gain of the first stage of the amplifier should be large in a cascade of amplifiers. **(06 Marks)**

c. Discuss circuit noise in an opamp. **(07 Marks)**

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06EC64

Sixth Semester B.E. Degree Examination, Dec.09-Jan.10
Antennas and Propagation

Time: 3 hrs. Max. Marks:100

Note: *1. Answer any FIVE full questions, selecting at least TWO questions from each part.*
2. Assume any missing data suitably.

PART – A

1 a. Define the term antenna aperture. Derive the equation for directivity in terms of aperture. **(06 Marks)**

b. Explain the following terms with respect to antenna :
i) Field zones ii) Effective height. **(08 Marks)**

c. A lossless resonant $\lambda/2$ dipole antenna having an input impedance of 73 Ω is to be connected to a transmission line having characteristic impedance of 50 Ω. The pattern of the antenna is given by $u = u_o \sin^3\theta$. Find the overall gain of the antenna. **(06 Marks)**

2 a. For $\lambda/2$ dipole antenna derive an expression for effective aperture and obtain the value of directivity. **(08 Marks)**

b. State and explain power theorem and its application to point sources. **(04 Marks)**

c. For a source having radiation intensity $u = u_m \sin\theta \sin^2\phi$, find the directivity by
i) Exact method ; ii) Approximate method. **(08 Marks)**

3 a. Prove that the width of main lobe of uniform end-fire array is broader than that for a uniform broad side array. **(08 Marks)**

b. Explain the principle of pattern multiplication. **(04 Marks)**

c. Obtain the field pattern for a linear uniform array of 6 isotropic point sources spaced $\lambda/2$ distance apart. The power is applied with equal amplitude and in phase. Also find HPBW and FNBW. **(08 Marks)**

4 a. Derive far-field equations for a thin linear center fed antenna of length L. **(08 Marks)**

b. A thin linear dipole antenna is $\lambda/12$ long and its loss resistance is 1.2 Ω. Find the radiation resistance and efficiency. **(04 Marks)**

c. Write notes on i) Rhombic antenna ii) Folded dipole antenna. **(08 Marks)**

PART – B

5 a. Considering general case derive the far field equations for loop antenna. **(08 Marks)**

b. Explain Babinet's principle with illustration. **(04 Marks)**

c. Derive the equation for impedance of a slot antenna in terms of the impedance of the complementary dipole antenna. **(08 Marks)**

6 a. Explain the following design parameters of a helical antenna :
   i) Beam width
   ii) Axial ratio
   iii) Impedance. **(06 Marks)**

b. Explain in detail the log-periodic dipole array. **(06 Marks)**

c. Write notes on i) Antennas for ground penetrating radar ; ii) Ultra wide band antennas. **(08 Marks)**

7 a. A free space line of sight microwave link operating at 10 GHz consists of a transmit and a receive antenna each having a gain of 25 dB. The distance between the two antennas is 30 kmt and the power radiated by the transmit antenna is 10 W. Calculate the path loss of the link and the received power. **(06 Marks)**

b. An antenna located at the surface of the earth is used to receive the signals transmitted by another antenna located at a height of 80 mt from the spherical surface of the earth (mean radius = 6370 kmts). Calculate the optical and radio horizon if dN/dh = -39 / kmt. **(06 Marks)**

c. In troporpheric propagation, show that radius of curvature of path is a function of the rate of change of dielectric constant with height and explain the duct propagation of wave. **(08 Marks)**

8 a. For ionospheric layers, derive the expression for conductivity and relative permittivity as a function of electron density and angular frequency. **(08 Marks)**

b. Define the terms
   i) Critical frequency f_c
   ii) Skip distance D_{Skip}
   iii) Maximum usable frequency f_{MUF}.
   Obtain the relation for skip distance in terms of f_c and f_{MUF}. **(08 Marks)**

c. Ionospheric wave is reflected from E layer with virtual height 100 kmt and from F layer with virtual height 300 kmt. Determine the single loop distance for each layer. **(04 Marks)**

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06EC65

Sixth Semester BE Degree Examination, Dec.09-Jan.10
Information Theory and Coding

Time: 3 hrs. Max. Marks:100

Note: *1. Answer any FIVE full questions, selecting at least TWO questions from each part.*

PART – A

1 a. A source consists of six symbols with probabilities as given below:

$S = \{S_1, S_2, S_3, S_4, S_5, S_6\}$

$P = \left\{\frac{1}{3}, \frac{1}{4}, \frac{1}{8}, \frac{1}{8}, \frac{1}{12}, \frac{1}{12}\right\}$

Obtain Huffman i) Binary ; ii) Trinary and iii) Quaternary coding. Find the efficiency and redundancy in each case. **(12 Marks)**

b. Which of the following sets of word lengths are acceptable for the existence of an instantaneous code, given x = {0, 1, 2},Table Q1(b). **(08 Marks)**

Table 1(b).

Number of words of word length l_k			Word length l_k
Code A	Code B	Code C	
2	2	1	1
1	2	4	2
2	2	6	3
4	3	0	4
1	1	0	5

2 a. Explain the properties of entropy and obtain an expression for maximum entropy of a system. **(10 Marks)**

b. Design a system to report the heading of a collection of 400 cars. The heading levels are: heading straight (s), turning left (L) and turning right (R). This information is to be transmitted every second. Construct a model based on the test data given below.

i) On the average during a given reporting interval, 200 cars were heading straight, 100 were turning left and remaining were turning right.

ii) Out of 200 cars that reported heading straight, 100 of them reported going straight during the next reporting period. 50 of them turning left and remaining turning right during the next period.

iii) Out of 100 cars that reported as turning during a signalling period. 50 of them continued their turn and remaining headed straight during the next reporting period.

iv) The dynamics of the cars did not allow them to change their heading from left to right or right to left during subsequent reporting periods.

I) Find the entropy of each state ; II) Find the entropy of the system ; III) Find the rate of transmission. **(10 Marks)**

3 a. With suitable example explain the properties of code. **(06 Marks)**

b. State and explain kraft inequality. **(04 Marks)**

c. For the channel matrix shown in Table 3(c). Find H(A), H(B), H(AB), H(A/B), H(B/A) and I(AB). **(10 Marks)**

Table 3(c).

$$P[AB] = \begin{bmatrix} 0.1 & 0.05 & 0.06 & 0.04 \\ 0.02 & 0.1 & 0.05 & 0.1 \\ 0.1 & 0.05 & 0.02 & 0.01 \\ 0.1 & 0.1 & 0.05 & 0.05 \end{bmatrix}$$

4 a. What is binary erasure channel? Obtain an expression for the channel capacity of the binary erasure channel. **(06 Marks)**

b. State and explain Shannon – Hartley law and derive an expression for maximum capacity of a noisy channel. **(10 Marks)**

c. A Gaussian channel has a bandwidth of 4 kHz and a two sided noise power spectral density $\frac{n}{2} = 10^{-14}$ watts/Hz. Signal power at the receiver has to be maintained at a level less than or equal to 0.1 milli watt. Calculate the capacity of the channel. **(04 Marks)**

PART – B

5 a. Design a linear block code with a minimum distance of three and a message block size of eight bits. **(08 Marks)**

b. In a linear block code the syndrome is given by :

$S_1 = r_1 + r_2 + r_3 + r_5$

$S_2 = r_1 + r_2 + r_4 + r_6$

$S_3 = r_1 + r_3 + r_4 + r_7$

Find :

i) Generator matrix [G] ; ii) Parity check matrix [H]

iii) Write encoder and decoder circuit ; iv) Find the code word for all the messages

v) How many errors it can detect and correct ; vi) Write the standard array.

ii) Find the syndrome for the received data 1011 011 **(12 Marks)**

6 a. In a (15.5) cyclic code the generator polynomial is given by $g(x) = 1 + x + x^2 + x^4 + x^5 + x^8 + x^{10}$.

i) Write the block diagram of encoder and decoder.

ii) Find the codeword for the message 10101

iii) If the received data is 100010101000001 is it a valid code? **(10 Marks)**

b. In a (7.4) binary cyclic code the generator polynomial is given by $g(x) = 1 + x + x^3$. Find the codeword for messages (1001) and (1011). Show the contents of registers at each step. **(10 Marks)**

7 a. For the (3, 2, 1) convolution encoder shown in Fig.7(a). Find the codeword for the input sequence u = [110110], using

i) Time domain approach ; ii) Transfer domain approach ; iii) Using generator matrix. **(10 Marks)**

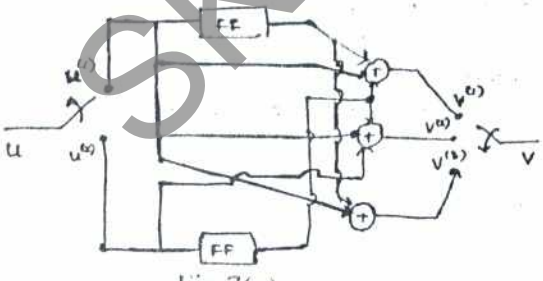

Fig.7(a)

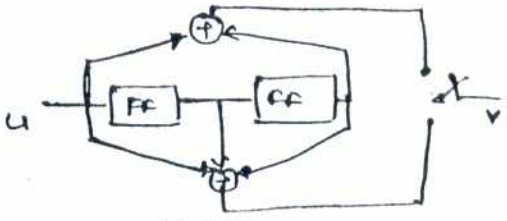

Fig.7(b)

b. For the convolution encoder shown in Fig.7(b)

i) Find the code rate and constraint length

ii) Write tree, state and trellis diagram. **(10 Marks)**

8 Write short notes on:

a. R.S codes b. Shortened cyclic code

c. Burst error correcting codes d. Golay codes. **(20 Marks)**

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