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06EC61

Sixth Semester B.E. Degree Examination, December 2012
Digital Communication

Time: 3 hrs. Max. Marks:100

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

PART – A

1 a. A low pass signal g(t) and its spectrum is given by

$$G(f) = \begin{cases} 1 - \dfrac{|f|}{200} & |f| < 200\,\text{Hz} \\ 0 & \text{Elsewhere} \end{cases}$$

i) Assume that g(t) is ideally sampled at f_s = 300 Hz. Sketch the spectrum of the sampled signal.

ii) Repeat part (i) for f_s = 400 Hz. **(06 Marks)**

b. State and prove sampling theorem for band pass signals. **(10 Marks)**

c. Highlight the advantages and disadvantages of digital communication over analog communication. **(04 Marks)**

2 a. Twenty-four voice signals are sampled uniformly and then time-division multiplexed. The sampling operation uses flat-top samples with 1 microseconds duration. The multiplexing operation includes provision for synchronization by adding an extra pulse of sufficient amplitude and also 1 microsecond duration. The highest frequency component of each voice signal is 3.4 kHz.

i) Assuming a sampling rate of 8 kHz, calculate the spacing between successive pulse of the multiplexed signal.

ii) Repeat your calculation assuming the use of Nyquist rate sampling. **(06 Marks)**

b. Determine the probability of symbols error for binary encoded PCM wave and is given by

$$P_e = \frac{1}{2}\text{erfc}\left(\frac{A}{2\sqrt{2}\,\sigma}\right)$$ **(10 Marks)**

c. Write a note on robust quantization. **(04 Marks)**

3 a. For the sinusoidal modulating signal $x(t) = A_0 \cos 2\pi f_0 t$. Show that the output signal-to-noise ratio in a delta modulated system under the assumption of no slope overload is given by

$$(SNR)_0 = \frac{3f_s^3}{8\pi^2 f_0^2 f_M}$$

where f_s = sampling frequency and f_M = cut-off frequency of the low pass filter in the receiver. **(08 Marks)**

b. Give the binary sequence 011010110, construct the polar octal format of the NRZ type using i) natural code ii) Gray code **(06 Marks)**

c. Explain the inter symbol interference with the help of spectral analysis. How it will be eliminated? **(06 Marks)**

4 a. Explain duobinary signalling scheme. **(10 Marks)**

b. A binary wave using polar signalling is generated by representing symbol 1 by a pulse of amplitude +1 volt and symbol 0 by a pulse of amplitude –1 volt; in both cases the pulse duration equals the bit duration. This signal is applied to a low-pass RC filter with transfer function

$$H(f) = \frac{1}{1 + j^{f/f_0}}$$

Construct the eye pattern for the filter output for the following sequences:
i) Alternating 1s and 0s.
ii) A long sequence of 1s followed by a long sequence of 0s. **(06 Marks)**

c. Highlight the significance of raised cosine technique. **(04 Marks)**

PART – B

5 a. Explain the generation and detection of binary phase shift keying. **(10 Marks)**

b. Find the average probability of symbol error for a coherent QPSK system. **(10 Marks)**

6 a. For the signals $s_1(t)$, $s_2(t)$, $s_3(t)$ and $s_4(t)$ shown in the Fig.Q6(a), find the orthonormal basis functions using Gram-Schmidt orthogonalisation procedure. **(10 Marks)**

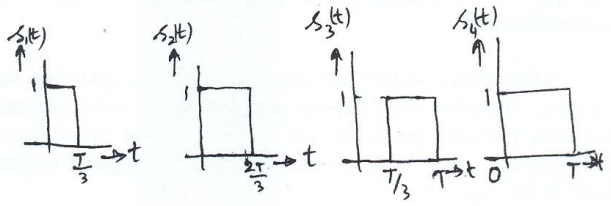

Fig.Q6(a)

b. In an FSK system the following data are observed;
Transmitted binary data rate = 2.5×10^6 bits/sec
PSd of zero mean AWGN = 10^{-20} Watts/Hz.
Amplitude of received signal in the absence of noise = 1 μVolt.
Find the probability of error assuming coherent detection. Given erfc($\sqrt{5}$) =1.7. **(05 Marks)**

c. Explain correlative receiver. **(05 Marks)**

7 a. State and prove properties of matched filter receiver. **(10 Marks)**

b. Explain adaptive equalizer with respect to a suitable block diagram. **(10 Marks)**

8 a. Explain the properties of maximum length sequence generated from 3 stage shift register with linear feedback. Verify these properties and determine the period of the given PN sequence 01011100101110. **(08 Marks)**

b. Explain with a block diagram the model of direct sequence spread binary PSK system. **(08 Marks)**

c. Highlight the applications of spread spectrum techniques. **(04 Marks)**

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06EC62

Sixth Semester B.E. Degree Examination, December 2012
Micro Processors

Time: 3 hrs. Max. Marks:100

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

PART – A

1 a. With neat block diagram, explain how 8086 CPU supports pipelined architecture. **(10 Marks)**

b. Explain significance of special bit indicators available in 8086. **(05 Marks)**

c. If the opcode of MOV instruction is 100010 then find machine code for MOV[BX + 24h], AL. **(05 Marks)**

2 a. With respect to 8086 CPU explain the following:
i) LDS BX, [LOC]
ii) DAS
iii) LOOP
iv) DB
v) Length. **(10 Marks)**

b. Bring out the difference between
MOV AX, BX and MOV AX, [BX]. **(02 Marks)**

c. WALP to pack the two unpacked BCD numbers stored in the locations LOC and LOC + 1. **(05 Marks)**

d. Replace the following program segment by its single equivalent instruction:
NEG BL
ADD AL, BL
CMC. **(03 Marks)**

3 a. Using table translation method WALP to find equivalent seven segment code for given BCD digit. **(08 Marks)**

b. WALP to read a string from key board and check whether it is a palindrome or not. If palindrome display PAL else NPAL on monitor. **(12 Marks)**

4 a. What is an interrupt? Discuss the interrupt classification in 8086. **(07 Marks)**

b. What do you mean by an IVT? Explain IVT of 8086 microprocessor. **(07 Marks)**

c. Explain microprocessor's response for an INTR interrupt. **(06 Marks)**

PART – B

5 a. Differentiate between memory mapped I/O and I/O mapped I/O schemes. **(04 Marks)**

b. With neat diagram write an 8086 program for 4 × 4 matrix keyboard interface and display key value on monitor. **(10 Marks)**

c. WALP to rotate the stepper motor for 270° in anticlock wise direction. **(06 Marks)**

6 a. Explain data types for 8087 NDP. **(10 Marks)**

b. Represent 20.59375_{10} into short real form. **(04 Marks)**

c. Explain the following with respect ot 8087 coprocessor:

i) FLD src

ii) FADD

iii) FLDPI. **(06 Marks)**

7 Write a note on:

a. Minimum mode configuration of 8086. **(10 Marks)**

b. PCI bus. **(05 Marks)**

c. Flow chart to generate USB data. **(05 Marks)**

8 a. With neat block diagram, explain memory organization in 80386 processor. **(08 Marks)**

b. Explain the following terms for 80486 process or

i) AHOLD

ii) BREQ

iii) $\overline{\text{FLUSH}}$. **(06 Marks)**

c. Explain branch prediction logic and cache structure of Pentium processor. **(06 Marks)**

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06EC63

Sixth Semester B.E. Degree Examination, December 2012
Analog and Mixed Mode VLSI Design

Time: 3 hrs. Max. Marks:100

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

PART – A

1 a. With a neat diagram, explain the mixed signal layout strategy. **(07 Marks)**

b. Explain the different specifications of DAC. **(07 Marks)**

c. With a neat sketch, explain the typical errors associated with sample and hold circuit. **(06 Marks)**

2 a. With a neat diagram, explain the working of 3 bit pipeline DAC. **(07 Marks)**

b. With a neat circuit diagram, explain the working of R-2R ladder type DAC architecture. **(07 Marks)**

c. Determine the effective number of bits for a resistor string DAC which is assumed to be limited by the INL. The resistors are passive poly resistors with a known relative matching of 1% and $V_{ref} = 5V$. **(06 Marks)**

3 a. With the help of block diagram, explain the flash type ADC. **(07 Marks)**

b. With a neat block diagram, explain the working of successive approximation ADC. **(07 Marks)**

c. For an 8 bit single slope ADC with $V_{ref} = 5V$ and clock frequency of 2 MHz, calculate the conversion time for an input of 2V. Also calculate the sampling frequency. **(06 Marks)**

4 a. With a neat block diagram, explain the working of voltage comparator. Also draw the schematic of pre-amplification stage of comparator. **(10 Marks)**

b. With a neat circuit diagram, explain the working of CMOS analog multiplier. Also explain the biasing of the multiplying quad. **(10 Marks)**

PART – B

5 a. With the help of block diagram explain the operation of an accumulate and dump circuit used for decimation and averaging. **(08 Marks)**

b. Explain the principle of interpolation and decimation. **(08 Marks)**

c. Determine the effective number of bits required for an ADC with a SNR of 50db. **(04 Marks)**

6 a. With neat sketches described the CMOS process. **(10 Marks)**

b. With neat CV curves explain natural MOSFET capacitor and floating MOS capacitor. **(10 Marks)**

7 a. With a neat circuit schematic, explain the working of a fulladder implemented using dynamic logic. **(07 Marks)**

b. Explain the simple delay element using clocked CMOS logic. **(07 Marks)**

c. Explain the design steps involved in analog circuit design. **(06 Marks)**

8 a. With a neat circuit schematic, explain the design of mixed signal op-amp. **(14 Marks)**

b. Explain fully differential op-amp. **(06 Marks)**

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06TE63

Sixth Semester B.E. Degree Examination, December 2012
Satellite Communication

Time: 3 hrs. Max. Marks:100

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

PART – A

1 a. What are the factors that affect the propagation of radio waves? **(06 Marks)**

b. Derive an expression for the received power, taking into account the effect of ground reflection. **(10 Marks)**

c. Write short note on diffraction. **(04 Marks)**

2 a. Explain the following terms: i) Virtual height ; ii) Skip distance. **(10 Marks)**

b. Describe in tropospheric scattering with the help of neat diagram and expressions. **(10 Marks)**

3 a. State and explain Kepler's three laws of planetary motion. **(09 Marks)**

b. What is the difference between a geosynchronous and geostationary satellites? **(04 Marks)**

c. Define the following with respect to a satellite and explain:
   i) Perigee
   ii) Line of apsides
   iii) Retrograde orbit
   iv) Right ascension of the ascending node. **(07 Marks)**

4 a. Calculate the time in days, hours, minutes, and seconds for the epoch day 324.95616765. **(04 Marks)**

b. An earth station is located at a longitude of 76° east and latitude of 13° north, while the satellite is at 83° east. Calculate the elevation and azimuth requirement of a transmitting antenna. **(08 Marks)**

c. Explain:
   i) limits of visibility
   ii) launching orbits. **(08 Marks)**

PART – B

5 a. Write short notes on atmospheric losses. **(04 Marks)**

b. A satellite orbiting at 38000 km transmits signal at 11.7 GHz. The output power of the satellite transmitter is 250 mW fed to an antenna of directive gain 18.9 dB. The earth station antenna being 4m dish with efficiency 60%. Find the G/T ratio of the earth station of bandwidth 36 MHz if C/N = 40dB. **(08 Marks)**

c. Explain what is meant by
   i) Antenna noise temperature.
   ii) System noise temperature referred to input.
   iii) Input back off.
   iv) Saturation flux density. **(08 Marks)**

6 a. Define and explain the terms roll, pitch and yaw. **(06 Marks)**

b. Describe the tracking, telemetry, and command facilities of a satellite communication system. **(10 Marks)**

c. Write a short note on antenna subsystem. **(04 Marks)**

7 a. Explain with neat block diagram, direct broadcast satellite service. **(06 Marks)**

b. An FM/TV carrier is specified as having a modulation index of 2.571 and top modulating frequency of 4.2 MHz. Calculate the protection ratio required to give a quality impairment factor of 4.2. **(04 Marks)**

c. Discuss the following in detail: i) Spade system; ii) TDMA. **(10 Marks)**

8 a. Show that :

$$\left[\frac{C}{N}\right]_{REQ} \leq [EIRP] - [BO]_o + \left[\frac{G}{T}\right]_D - [LOSSES] - [K] - [BTR] - [\alpha].$$ **(10 Marks)**

b. Explain the on-board signal processing for FDMA/TDM operation. **(10 Marks)**

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06EC64

Sixth Semester B.E. Degree Examination, December 2012
Antennas and Propagation

Time: 3 hrs. Max. Marks:100

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

PART – A

1 a. Explain the following terms with respect to antenna:
i) Antenna Beamwidth ii) Directivity iii) Beam Efficiency **(09 Marks)**

b. Explain the different types of aperture and their relationships. **(06 Marks)**

c. Distinguish the parameters of antenna field zones. **(05 Marks)**

2 a. The radiation intensity of an antenna is given by $u(\theta, \phi) = \cos^4\theta \sin^2\phi$, for $0 \le \theta \le \pi/2$ and $0 \le \phi \le 2\pi$. This zero in the lower half space. Find,
i) Exact directivity in dB ii) HPBW (Half power beam width) **(06 Marks)**

b. Derive an expression and draw the field pattern for an array of two isotropic point sources of same amplitude and opposite phase. Also determine its maxima, minima and HPBW. **(08 Marks)**

c. Calculate the maximum effective aperture of a short dipole. **(06 Marks)**

3 a. Calculate the diversity for the power pattern given as $U = U_m \sin^2\theta \sin^3\phi$, for $0 \le \theta \le \pi$ and $0 \le \phi \le \pi$ and zero elsewhere. **(06 Marks)**

b. Show that effective height of an antenna is given by, $h_e = \sqrt{\frac{A_{em} R_v}{30\pi}}$. **(05 Marks)**

c. Illustrate the principle of pattern multiplication with suitable example. **(05 Marks)**

d. State and explain power theorem to point sources. **(04 Marks)**

4 a. Derive the expression for radiation resistance of short dipole. **(07 Marks)**

b. Derive the far field components of short dipole. **(07 Marks)**

c. Four isotropic sources are placed $\frac{\lambda}{6}$ mt apart. They have a phase difference of $\pi/3$ between the adjacent elements. Find the beam width between first nulls. **(06 Marks)**

PART – B

5 a. Show that the radiation resistance of loop antenna is given by

$$31200\left(\frac{nA}{\lambda^2}\right)^2$$ **(08 Marks)**

b. Explain the concept of Babinet's principle with neat figure. **(06 Marks)**

c. Write a note on pyramidal horn antenna with design equation. **(06 Marks)**

6 a. Explain the practical design operation for the monopilar axial mode helical antenna. **(06 Marks)**

b. With neat diagram, explain the operation of log-periodic antenna. **(06 Marks)**

c. Write short notes on : i) Embedded antennas and ii) Ultra-wide band antennas. **(08 Marks)**

7 a. Derive an expression for space wave field intensity. **(08 Marks)**

b. Show that radius of curvature of path is a function of the rate of change of dielectric constant with height in tropospheric propagation. **(08 Marks)**

c. Explain the three factors which affect the propagation of radio waves in an actual environment. **(04 Marks)**

8 a. Explain the structure of the ionosphere and derive an expression for refractive index of ionosphere assuming the value of ϵ_r. **(08 Marks)**

b. Define and derive the expression for the following:
i) Critical frequency ii) Virtual height iii) Skip distance. **(09 Marks)**

c. A radio link is established for a range of 300 km. If the reflection region of ionosphere is at a height of 200 km with critical frequency of 8 MHz, calculate MUF. **(03 Marks)**

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06TE64

Sixth Semester B.E. Degree Examination, December 2012
Transmission Lines and Antenna's

Time: 3 hrs. Max. Marks:100

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

PART – A

1 a. Derive an expression for α, β, wavelength and velocity of propagation. **(10 Marks)**

b. Show that characteristic impedance of a distortionless line is purely real. **(05 Marks)**

c. Compute the elements of constant – K low pass network having cut off frequency $f_c = 2000$ cycles/sec and load 5000 Ω. **(05 Marks)**

2 a. Define standing wave ration. Derive an expression for S interms of 'K'. **(07 Marks)**

b. A lossless line is operated at a frequency of 250 MHz. The characteristic resistance of the line is 500Ω and is 50cm long. Find the input impedance of the line, if the line is terminated by a reactance of j200Ω. **(06 Marks)**

c. Derive an expression for input impedance of open and short circuited lines. **(07 Marks)**

3 a. Explain applications and properties of Smith chart. **(10 Marks)**

b. Explain the steps involved in design of single stub matching using Smith chart. **(05 Marks)**

c. A R.F line with $z_o = 70\Omega$ is terminated by $Z_L = 115 - j80$ at $\lambda = 2.5$ metres. Find VSWR and the maximum and minimum input resistance. **(05 Marks)**

4 a. Explain the following terms with respect to antenna:
i) Power gain
ii) Beam efficiency
iii) Aperture efficiency. **(06 Marks)**

b. An antenna has a field pattern given by $E(\theta) = \cos\theta.\cos2\theta$ for $O^o \le \theta \le 90^o$.
Find : i) HPBW; ii) BWFN. **(08 Marks)**

c. Two space crafts are separated by 100 μm. Each has an antenna with D = 1000 operating at 2.5 GHz. If the craft A's receiver requires 20dB over 1PW, what transmitter power is required on craft 'B' to achieve this signal level. **(06 Marks)**

PART – B

5 a. Derive an expression for field pattern of an array of two point sources of equal amplitude and out of phase by 180° ($\delta = 180^o$). Draw the pattern for $d = \frac{3\lambda}{2}$. **(12 Marks)**

b. Four isotropic point sources are placed along a straight line separated by a distance $\frac{\lambda}{2}$. The power is applied with equal magnitudes. The peak should be in a direction 60° from the axis of array. Find the phase difference between adjacent elements. Complete the pattern and find the BWFN and HPBW. **(08 Marks)**

6 a. Derive an expression for electric fields of a short dipole starting from retarded potentials. **(12 Marks)**

b. Show that effective aperture of a short dipole $A_e = 0.119\lambda^2$ and hence find its directivity. **(08 Marks)**

7 a. Derive an expression for field components of a loop antenna (general case). **(12 Marks)**

b. Describe with diagrams the slot antennas. **(08 Marks)**

8 a. Explain the construction and basic characteristics of yagi uda antenna. **(10 Marks)**

b. Explain turn stile antenna with diagram along with patterns. **(10 Marks)**

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06EC65

Sixth Semester B.E. Degree Examination, December 2012
Information Theory and Coding

Time: 3 hrs. Max. Marks:100

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

PART – A

1 a. An analog signal is band limited to 500Hz and is sampled at "Nyquist rate". The samples are quantized into 4 levels and each level represent one message. The quantization levels are assumed to be independent. The probabilities of occurrence of 4 levels are $P_1 = P_4 = 1/8$ and $P_2 = P_3 = 3/8$. Find the information rate of the source. **(04 Marks)**

b. Design a system to report the heading of a collection of 400 cars. The heading is to be quantized into three levels: heading straight (s), turning left (L), and turning right ®. This information is to be transmitted every second. Based on the data given below, construct a model for the source and calculate: i) the entropy of each state; ii) entropy of the source; iii) the rate of transmission.

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

II. Out of 200 cars that reported heading straight during a reporting period, 100 of them (on the average) going straight during the next reporting period, 50 of them reported turning left during the next period, and 50 of them reported turning right during the next period.

III. On the average, out of 100 cars that reported as turning during a signaling period, 50 of them continued their turn during the next period and the remaining headed straight during next reporting period.

IV. The dynamic of the cars did not allow them to change their heading from left to right or right to left during subsequent reporting periods. **(10 Marks)**

c. Define the following:

i) Entropy
ii) Self information
iii) Information rate. **(06 Marks)**

2 a. Using Shannon's encoding algorithm find the binary code for the symbol of length two (ie. N = 2) generated by the information source given in Fig.Q.2(a). Also compute the average number of bits/symbols and efficiency of the codes. **(12 Marks)**

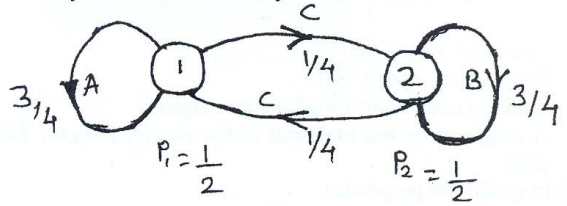

Fig.Q.2(a)

b. A Gaussian channel has a 10 MHz bandwidth and S/N = 100. Calculate the capacity of a channel and the maximum information rate. **(04 Marks)**

c. Determine the capacity of the channel shown in Fig.Q.2(c). **(04 Marks)**

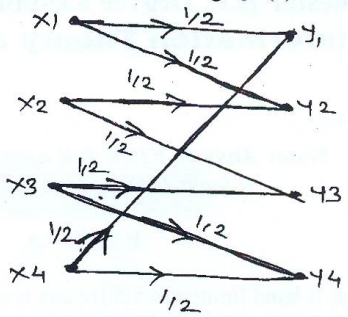

Fig.Q.2(c)

3 a. A source emits an independent sequence of symbols from an alphabet consisting of a 6 symbols A, B, C , D, E and F with probabilities $P = \left\{\frac{1}{3}, \frac{1}{4}, \frac{1}{8}, \frac{1}{8}, \frac{1}{12}, \frac{1}{12}\right\}$. Determine the Huffman code by shifting the combined symbols as high as possible. Also find the coding efficiency of the code. **(08 Marks)**

b. Explain the properties of mutual information and prove that the mutual information of the channel is symmetric. **(12 Marks)**

4 a. Prove that the maximum value of the differential entropy of white Gaussian noise with variance σ^2 is given by $h(x) = 1/2 \log_2 (2 \pi e \sigma^2)$. **(10 Marks)**

b. A channel has the following characteristics :

$$P\left(\frac{Y}{X}\right) = \begin{array}{c} \\ X_1 \\ X_2 \end{array} \begin{array}{c} \begin{array}{cccc} Y_1 & Y_2 & Y_3 & Y_4 \end{array} \\ \begin{bmatrix} 1/3 & 1/3 & 1/6 & 1/6 \\ 1/6 & 1/6 & 1/3 & 1/3 \end{bmatrix} \end{array}$$

Find H(X), H(Y), H(X, Y) and channel capacity if r = 1000 symbols/sec. Assume $P(X_1) = P(X_2) = 1/2$. **(10 Marks)**

PART – B

5 a. 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) Find the code word for all the messages

iv) A single error has occurred in the received vector 1011011. Detect and correct this error. **(10 Marks)**

b. Explain syndrome properties. **(10 Marks)**

6 a. The generator polynomial for (15, 5) cyclic code is $g(x) = 1 + x^4 + x^6 + x^7 + x^8$. Find the code-vector in systematic form for the message vector $D(x) = x^2 + x^3 + x^4$. **(06 Marks)**

b. The generator polynomial of a (15, 7) cyclic code is $g(x) = 1 + x + x^4$. Illustrate the encoding procedure by listing the state of the register with the message vector 10010110111. **(08 Marks)**

c. Explain the error correction procedure for cyclic codes. **(06 Marks)**

7 a. Explain the interlacing technique for the correction of burst and random errors. Consider a (15, 7) BCH code generated by $g(x) = x^8 + x^4 + x^2 x + 1$; construct a interleaved code with $\lambda = 5$, with a burst error correcting ability of 10. **(08 Marks)**

b. Write short notes on any three:
   i) RS codes
   ii) Shortened cyclic codes
   iii) BCH codes
   iv) Golay codes. **(12 Marks)**

8 a. Consider a (2, 1, 2) convolution code with the impulse response $g^{(1)} = (1, 1, 1)$ and $g^{(2)} = (1, 0, 1)$ and the incoming message sequence is 10011.
   i) Draw the encoder block diagram.
   ii) Find the generator matrix.
   iii) Find the code vector if the encoder generates.
   The two output sequences by convoluing the message sequence with the impulse response of the path using time domain approach. **(10 Marks)**

b. For the (3, 2, 1) convolution encoder shown in Fig.Q.8(b), find the codeword for the input sequence 110110 using i) Time domain approach (using generator matrix); ii) Transfer domain approach by constructing transfer function matrix. **(10 Marks)**

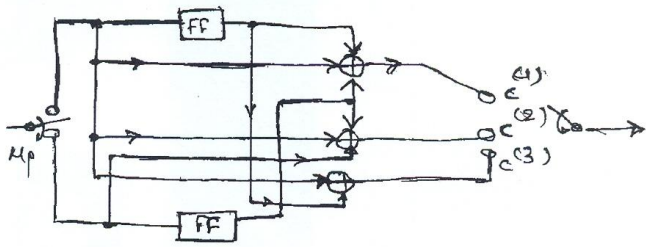

Fig.Q.8(b)

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06EC661

Sixth Semester B.E. Degree Examination, December 2012

Programming in C++

Time: 3 hrs. Max. Marks:100

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

PART – A

1 a. Explain the difference between the four objects defined below:
i) int ival = 1024; ii) int *pi = &ival;
iii) int *pi2 = new int (1024); iv) int *pi3 = new int [1024]; **(08 Marks)**

b. What is information hiding? What are its benefits? **(06 Marks)**

c. What is an exception? What are the primary components of exception handling? Explain with an example. **(06 Marks)**

2 a. List and brief the integral types in C++. **(06 Marks)**

b. What is a variable? What are the generally accepted conventions for naming a variable? **(04 Marks)**

c. What are the operations you expect from a string class? How the string class of C++ library supports these operations? Explain. **(06 Marks)**

d. What are the difference between a reference and a pointer? Explain with examples. **(04 Marks)**

3 a. Explain the bitset operations with suitable examples. **(08 Marks)**

b. What do you understand by the "dangling-else" problem? How do you overcome that? Explain. **(04 Marks)**

c. Write a recursive function to find n^{th} Fibonacci number. Also, write the supporting main ( ) function that uses this function to generate m Fibonacci numbers. **(08 Marks)**

4 a. What is the benefit of inline function over normal function? Explain with an example. **(06 Marks)**

b. Write the prototypes for each of the following:
i) A function named compare with two (02) parameters that are references to a class named matrix and with a return value of type bool.
ii) A function named extract with an integer array as parameter and with a return value of type int. **(04 Marks)**

c. Explain with suitable examples, the following parameter passing mechanisms:
i) Call-by-value ii) Call-by-pointer iii) Call-by-reference **(10 Marks)**

PART – B

5 a. What is exception handling? With an example program, explain the try, throw and catch blocks in C++. **(08 Marks)**

b. Describe the difference between class and object with an example program. **(04 Marks)**

c. How member functions are different from ordinary functions? Describe. **(04 Marks)**

d. Describe the three (03) access specifiers used to implement information hiding. **(04 Marks)**

6 a. Write a C++ program to implement a class called STRING. In the class, develop a copy constructor to copy one string to another. Write the supporting main( ) that uses the copy constructor to copy one STRING object to another. **(10 Marks)**

b. Develop a class called EMPLOYEE containing the following data members: Emp_Number, Emp_Name, Emp_Designation and Emp_Salary. Provide an appropriate set of constructors for the class and write the supporting main( ) that exercises these constructors. **(10 Marks)**

7 a. Create a class called TIME that has two data members: hour and minute. Write two constructors of which one should initialize date to zeros and another to initialize it to values provided as parameters. Overload the increment operator (both prefix and postfix) to overload the TIME object. Write the supporting main( ) to exercise the class. **(10 Marks)**

b. Explain with an example program, how the new and delete operators can be overloaded. **(10 Marks)**

8 a. What is the difference between inheritance and composition? Explain the two (02) forms of composition. **(06 Marks)**

b. How does the introduction of multiple inheritance affect the class scope lookup? Explain with an example. **(08 Marks)**

c. Briefly explain public, private and protected inheritance. **(06 Marks)**

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06EC667

Sixth Semester B.E. Degree Examination, December 2012
Digital System Design using VHDL

Time: 3 hrs. Max. Marks:100

Note: ***Answer FIVE full questions, selecting atleast TWO questions from each part.***

PART – A

1 a. Differentiate between signals and variables. **(04 Marks)**

b. A synchronous (4 bit) up/down decade counter with output Q works as follows : All state changes occur on rising edge of the CLK input, except the asynchronous clear (CLR). When CLR = 0, the counter is reset regardless of the values of other inputs.
if the LOAD input is 0, the data input D is loaded in to the counter
if LOAD = ENT = ENP = UP = 1, the counter is incremented
if LOAD = ENT = ENP = 1 and UP = 0, the counter is decremented
if ENT = UP = 1, the carry output (CO) = 1 when the counter is in state 9
if ENT = 1 and UP = 0, the carry output (CO) = 1
when the counter is in state 0.

c. Write the VHDL description of the counter. **(06 Marks)**

Derive the state graph for BCD to excess 3 code converter. The input (X) and output (Z) will be serial with the least significant bit first. Write the behavioral description of this Mealy state machine. **(10 Marks)**

2 a. The following state table is implemented, using a ROM and two D flip – flops (falling edge triggered).

$Q_1\ Q_2$	$Q_1^+\ Q_2^+$		Z	
	x = 0	x = 1	x = 0	x = 1
0 0	0 1	1 0	0	1
0 1	1 0	0 0	1	1
1 0	0 0	0 1	1	0

Draw the block diagram and write VHDL code that describes the system. Assume that the ROM has a delay of 10 ns and each flip flop has a propagation delay of 15 ns. **(08 Marks)**

b. With relevant wave form and circuit, explain the debouncing and synchronizing circuit of keypad scanner. **(06 Marks)**

c. Find a minimum –row PLA table to implement the following functions.

$f_1(A, B, C, D) = \sum_m (4, 5, 10, 11, 12)$

$f_2(A, B, C, D) = \sum_m (0, 1, 3, 4, 8, 11)$

$f_3(A, B, C, D) = \sum_m (0, 4, 10, 12, 14)$. **(06 Marks)**

3 a. With a neat block diagram, explain 4 × 4 unsigned binary multiplier. Draw state graph and write the VHDL behavioral description. **(10 Marks)**

b. With a neat block diagram, explain signed binary divider that divides 32 bit dividend by a 16 bit divisor to give a 16 bit quotient. Draw the state graph of control network. **(10 Marks)**

4 a. Convert the SM chart of Fig. Q4(a) a to proper form for use with PLA, multiplexers, register. The left mux data inputs are X1, X2, X3 and 1 selected by 00, 01, 10 and 11 respectively. Assign SO = 000. Give the complete ROM table in binary. **(06 Marks)**

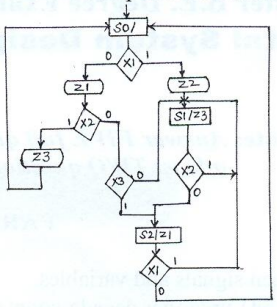

Fig. Q4(a)

b. With a neat block diagram, explain dice game and draw the SM chart. **(10 Marks)**

c. Convert the given state graph Fig. Q4(c) to SM chart. **(04 Marks)**

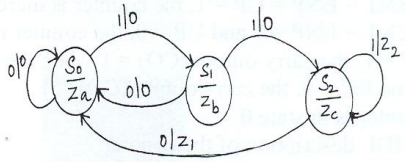

Fig. 4(C)

PART – B

5 a. With a block diagram, explain the configurable logic block (CLB) of xilinx 3000 series. **(10 Marks)**

b. Explain Altera 7000 series macrocell for EPM7032, 7064 and 7096 devices. **(10 Marks)**

6 a. Obtain flow chart for floating point multiplier. Explain the exponent adder, fraction multiplier, with block diagram. **(10 Marks)**

b. Two floating point numbers are added to form a floating point sum.

$$(F_1 \times 2^{E_1}) + (F_2 \times 2^{E_2}) = F \times 2^{E}$$

Assume F_1 and F_2 are normalized and the result should be normalized. List the steps to carry out floating point addition, including all special cases. Illustrate these steps for $F_1 = 1.0101$, $E_1 = 1001$, $F_2 = 0.1010$, $E_2 = 1000$. Note that the fractions are 5 bits, including sign and the exponents are 4 bits, including sign. **(10 Marks)**

7 a. Write a VHDL package that provides two overloaded functions for plus operator that enables the operation A <= B + C + 3, where A, B, C are bit_vectors. **(08 Marks)**

b. Write VHDL code and synthesized network of 'if' statement. **(06 Marks)**

c. Explain array attributes, with examples. **(06 Marks)**

8 a. With a neat block diagram, explain 6116 static RAM. Also write a behavioral description to model a simple RAM. **(12 Marks)**

b. With a neat diagram, explain the typical 486 bus interface to a microprocessor. **(08 Marks)**

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