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06EC61

Sixth Semester B.E. Degree Examination, June 2012

Digital Communication

Time: 3 hrs. Max. Marks:100

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

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.
2. Any revealing of identification, appeal to evaluator and /or equations written eg, 42+8 = 50, will be treated as malpractice.

PART – A

1 a. With a neat block diagram, explain the operations of digital communication system. Explain the functioning of each block. **(06 Marks)**

b. A signal $g(t) = 10\cos(20\pi t)\cos(200\pi t)$ is sampled at the rate of 250 samples/sec.
   i) Sketch the spectrum of the sampled signal
   ii) Specify the cut-off ideal reconstruction filter so as to recover g(t) from $g_s(t)$
   iii) Specify the Nyquist rate for the signal g(t). **(08 Marks)**

c. What is flat-top sampling? Derive an expression for the flat-top sampled signal. **(06 Marks)**

2 a. Show that the signal to quantization noise power ratio of a uniform quantizer is $\frac{P}{\sigma_Q^2} = \left[\frac{3P}{g_{max}^2}\right]2^{2n}$. **(08 Marks)**

b. For a binary PCM signal, determine L if the compression parameter $\mu = 100$ and the minimum $[SNR]_{0,\,dB} = 45$ dB. Determine the $[SNR]_{0,\,dB}$ with this value of L. **(06 Marks)**

c. With a neat block diagram and waveform, explain time division multiplexing. **(06 Marks)**

3 a. With a neat block diagram, explain delta modulator transmitter and receiver, and also explain the errors in delta modulation. **(08 Marks)**

b. Obtain the power spectral density of NRZ polar format and draw normalized diagram. **(08 Marks)**

c. Compare DM with DPCM. **(04 Marks)**

4 a. Derive the Nyquist criterion for distortionless baseband binary transmission. **(08 Marks)**

b. What is eye pattern? Explain in detail. **(06 Marks)**

c. With a neat filter structure, explain the concept of adaptive equalization process. **(06 Marks)**

PART – B

5 a. List the important requirements of passband transmission scheme. **(04 Marks)**

b. Estimate the power spectral density of a BPSK signal from Fourier transform of basic NRZ pulse. **(12 Marks)**

c. What are the advantages of MSK over QPSK? **(04 Marks)**

6 a. Explain geometric interpretation of signals. **(08 Marks)**

b. Three signals $S_1(t)$, $S_2(t)$ and $S_3(t)$ are shown in Fig.Q6(b). Apply Gram-Schmidt procedure to obtain an orthonormal basis for the signals. Express signals $S_1(t)$, $S_2(t)$ and $S_3(t)$ in terms of orthonormal basis functions. Also give the signal constellation diagram. **(12 Marks)**

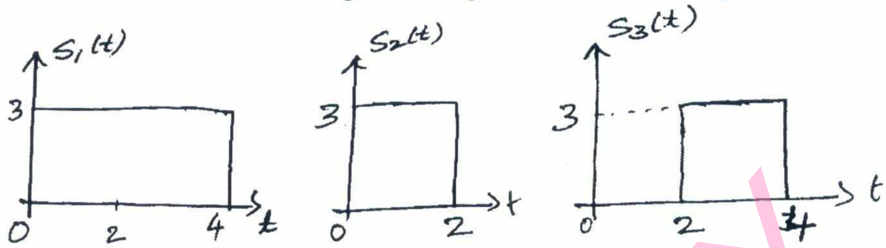

Fig.Q6(b)

7 a. Show that the probability of bit error of a matched filter receiver is given by:

$$P_e = \frac{1}{2}\operatorname{erfc}\sqrt{\frac{E_b}{N_o}}.$$ **(12 Marks)**

b. Draw and explain the block diagram of correlation receiver. **(08 Marks)**

8 a. What is spread spectrum technique? Explain the working of direct sequence spread spectrum transmitter and receiver. **(10 Marks)**

b. Explain the properties of PN sequence. **(06 Marks)**

c. Compare slow and fast frequency Hopping. **(04 Marks)**

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06EC62

Sixth Semester B.E. Degree Examination, June 2012
Microprocessors

Time: 3 hrs. Max. Marks:100

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

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.
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PART – A

1 a. What is a microprocessor? What are the components required to build a minimum microcomputer system? Explain with a neat diagram. **(06 Marks)**

b. What are the roles of each element in the BIU of 8086 CPU? Explain with a neat diagram. How is the 20-bit physical address for memory generated? Explain with an example. **(10 Marks)**

c. What is the minimum size and maximum size of an instruction in 8086? Explain with examples. **(04 Marks)**

2 a. Explain the importance of each field in Byte-1 and Byte-2 of the 8086 instruction template. If the 6-bit op-code for ADD instruction is "000000" then formulate the op-code/s for "ADD AX, CX" instruction. **(07 Marks)**

b. What are the pseudo codes? Explain the following directives with examples:
i) ENDP ii) EXTRN iii) GLOBAL iv) PROC. **(07 Marks)**

c. Write the single instruction equivalent for the following program segments if available and justify your answer; assume that these program segments are starting from memory location FFFF0h and 8086 is reset just before execution.

i) FFFF0:		ii) FFFF0:	
	MOV CL, 10h		XOR AX, AX
	XCHG AX, BX		MOV BX, AX
	ROR AX, CL		ADD AX, BX
	XCHG AX, BX		XCHG AX, BX

(06 Marks)

3 a. What is a procedure? What are its advantages? **(04 Marks)**

b. Write a 8086 procedure to convert a packed BCD number in AL to ASCII equivalent in AX. **(06 Marks)**

c. How do you invoke near procedures and far procedures in 8086? What are the methods available for parameter passing in procedures? **(06 Marks)**

d. What makes a MACRO facility to be preferred over a procedure in a program development? **(04 Marks)**

4 a. What is the response of 8086 μp when interrupted? Explain clearly. **(06 Marks)**

b. Explain the interrupt system of 8086 CPU with all the sources of interrupts. **(08 Marks)**

c. How many string instructions are available in 8086 instruction set? Explain briefly. **(06 Marks)**

PART – B

5 a. Why interfacing is required? Explain. **(03 Marks)**

b. What do you mean by key-debouncing? Explain briefly hardware debouncing and software debouncing methods. **(05 Marks)**

c. Interface a 4×4 keypad to 8086 CPU and write a program to identify any key pressed. Write necessary comments. **(12 Marks)**

6 a. What are the functions of the following 8087 instructions? Explain.
i) FBSTP TAX ii) FSUBR Dt, Sr iii) FXAM iv) FLDL2E **(06 Marks)**

b. Interface 8087 NDP to 8086 CPU; indicate all critical signal connections. **(07 Marks)**

c. Write a program to compute roots of a quadratic equation using 8087 instructions. **(07 Marks)**

7 a. What is maximum mode of operation for 8086 CPU means? Show all necessary arrangements for 8086 maximum mode. **(07 Marks)**

b. Write a program using 8086 instruction to check whether PCI bus extension is available using BIOS. **(06 Marks)**

c. For an USB in personal computer give;
i) Pin configuration ii) Two CRC polynomials iii) Token packet & data packet. **(07 Marks)**

8 a. Using a block diagram, briefly indicate different signal groups on 80386 processor. **(10 Marks)**

b. With a neat block diagram, explain the Pentium architecture and features. **(10 Marks)**

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06EC63

Sixth Semester B.E. Degree Examination, June 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. Determine the number of quantization levels needed if one wanted to make a digital thermometer that is capable of measuring temperature within 0.1°C accuracy over the range –50°C to 150°C. What is the resolution of ADC? **(04 Marks)**

b. Calculate DNL for a 3 bit ADC for the transfer curve shown in Fig.Q1(b). Assume V_{ref}= 5V. Draw the quantization error Q_e in units of LSB. **(06 Marks)**

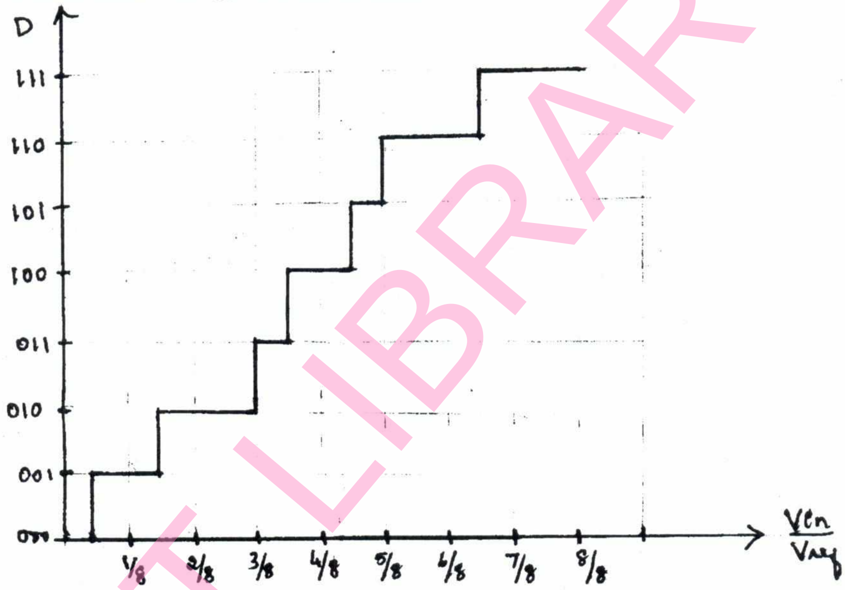

Fig.Q1(b)

c. With a neat diagram, explain the mixed signal layout issues in detail. **(10 Marks)**

2 a. Plot the transfer curve of a 3-bit R-2R DAC, if all R_s = 1.1 kΩ and $2R_s$ = 2 kΩ. What is the max INL for the converter? Assume all of the switch to be ideal and V_{ref} = 5 V. **(12 Marks)**

b. Design a 3 bit pipeline DAC and explain its operation. Also find the output voltage for a 3-bit pipeline DAC for 3 cases D_A = 101, D_B = 010, D_C = 011. Show that the conversion time to perform all three conversions is 5 clock cycles using pipeline approach. Assume V_{ref} = 5 V. **(08 Marks)**

3 a. With a neat diagram, explain the operation of a parallel feed through ADC along with its advantages and disadvantages. **(08 Marks)**

b. Design a 3 bit pipeline ADC. Analyse the conversion process by making a table for D_2, D_1, D_0, V_2, V_1 for V_{in} = 2V, 3V, 4.5V. Assume V_{ref} = 5V. Let V_3 be residue of 1st stage and V_2 be residue of 2nd stage. **(06 Marks)**

c. Explain the operation of a single slope ADC, with a neat diagram. **(06 Marks)**

4 a. Draw the block diagram of a high performance comparator and hence explain the operation of a decision circuit and obtain an expression for switching point. **(10 Marks)**

b. Explain the operation of a CMOS quad multiplier and hence obtain an expression for the multiplier output voltage. **(10 Marks)**

PART – B

5 a. Develop an expression for the effective number of bits in terms of measured SNR if the input sinewave has a peak amplitude of 40% of ($V_{ref+} - V_{ref-}$). **(06 Marks)**

b. Explain dump and interpolate circuit used for interpolation and reverse averaging. **(08 Marks)**

c. What is the magnitude response of $(1 - z^{-1})^3$. Sketch a block diagram implementation of the filter. **(06 Marks)**

6 a. Explain the sub-mirror CMOS process flow with a neat diagram. **(12 Marks)**

b. Estimate the size of Metal1 only to obtain the capacitance of 1 pF for the capacitor layout shown in Fig.Q6(b). Also estimate the bottom parasitic capacitance. **(04 Marks)**

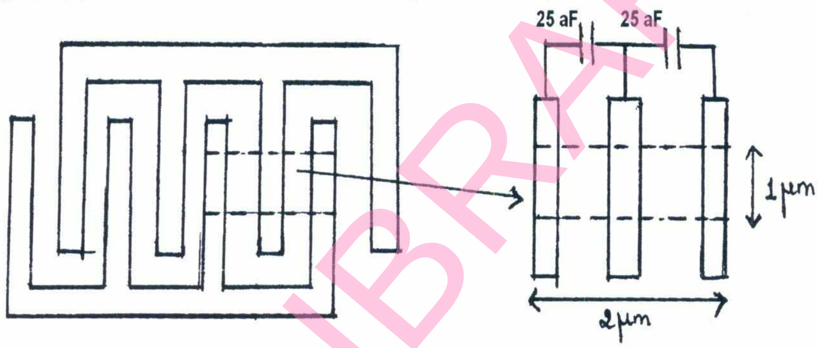

Fig.Q6(b)

c. Explain the fabrication of resistor using n-well. **(04 Marks)**

7 a. Explain the operation of D-Flip flop using TSPC logic and clocked CMOS logic with a neat diagram. **(08 Marks)**

b. Write the design equation for full adder. Using the equation, design full adder using dynamic logic. **(08 Marks)**

c. For the circuit shown in Fig.Q7(c), estimate the delay time. **(04 Marks)**

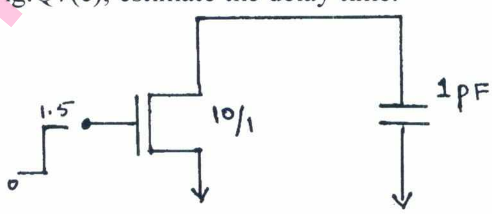

Fig.Q7(c)

8 a. Show that the floating current source will not load or decrease the resistance seen by cascade structure. **(08 Marks)**

b. Implement high speed, low power differential output op-amp and explain the operation. **(12 Marks)**

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Sixth Semester B.E. Degree Examination, June 2012
Antenna 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. State and explain: Aperature efficiency, effective height and bandwidth of an antenna. **(09 Marks)**

b. Show that the directivity of an antenna is the ratio of the area of a sphere to the beam area. **(05 Marks)**

c. Derive Friis transmission formula. **(06 Marks)**

2 a. The radial component of the radiated power density of an infinitesimal linear dipole of length $l << \lambda$ is given by $\frac{a_r A_m \text{Sin}^2\theta}{r^2}$ where A_m = peak value of the power density, a_r = radial unit vector. Find the directivity of the antenna. **(06 Marks)**

b. Prove that directivity for a source with unidirectional pattern of Um $\text{Cos}^n\theta$ (where n is any number) can be expressed as D = 2(n + 1). **(06 Marks)**

c. Obtain the field pattern for two point sources situated symmetrically with respect to the origin. Two sources are feed with equal amplitude and equal phase signals. Assume: Distance between two sources = $\lambda/2$. **(08 Marks)**

3 a. Derive an expression for electric field component of a linear antenna of length $\lambda/2$ long. **(12 Marks)**

b. Derive the expression for radiation resistance of a short dipole with uniform current. **(08 Marks)**

4 Write notes on:

a. Pattern multiplication. **(07 Marks)**

b. Power distribution in broad side array. **(06 Marks)**

c. Radiation pattern. **(07 Marks)**

PART – B

5 a. Derive the expression for E field component of a small circular loop antenna of radius ‘a’, carrying current I. **(12 Marks)**

b. State and illustrate Babinets principle. **(08 Marks)**

6 Write short notes on:

a. Lens antenna. **(07 Marks)**

b. Log-periodic antenna. **(07 Marks)**

c. Antennas for ground penetrating radar. **(06 Marks)**

7 a. What is meant by diffraction of radio waves? Define knife edge diffraction gain. **(07 Marks)**

b. Describe ground wave propagation. **(07 Marks)**

c. Obtain the expression for line of sight distance between the transmit and receiver antennas. **(06 Marks)**

8 a. Discuss the reflection mechanism where by electromagnetic waves are bent back by a layer of the ionosphere. Include in your discussing a description of the virtual height of a layer. **(12 Marks)**

b. Describe briefly the strata of the ionosphere and their effects on sky wave propagation. **(08 Marks)**

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06EC65

Sixth Semester B.E. Degree Examination, June 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. A binary source is emitting independent sequence of 0's and 1's with probabilities p and (1 - p) respectively. Plot the entropy of this sources versus probability ($0 < p < 1$). Write the conclusion. **(04 Marks)**

b. Find the interrelationships between hartleys, hats and bits. **(06 Marks)**

c. For the 1st order Markov sources shown in the Fig.Q1(c)

i) Find the stationary distribution ii) Entropy of each state and hence entropy of source

iii) Entropy of adjacent source and verify whether $H(s) < H(\bar{s})$ **(10 Marks)**

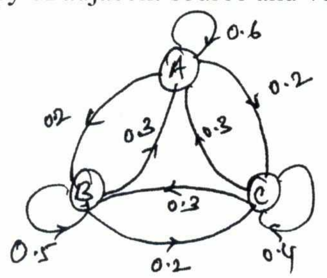

Fig.Q1(c)

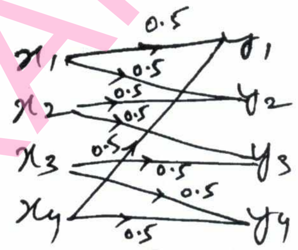

Fig.Q2(c)

2 a. Explain the important properties of codes to be considered while encoding a source. **(05 Marks)**

b. Using Shannon's binary encoding procedure, construct a code for the following discrete source.

$S = \{ s_1, s_2, s_3, s_4, s_5 \}$

$P = \{ 0.4, 0.25, 0.15, 0.12, 0.08 \}$ **(10 Marks)**

c. Determine the channel capacity of the discrete channel depicted in the Fig.Q2(c). **(05 Marks)**

3 a. A discrete memoryless source with alphabets A to H has respective probabilities 0.22, 0.20, 0.18, 0.15, 0.10, 0.08, 0.05 and 0.02. Construct binary and ternary codes for the same using Huffman's encoding algorithm. Determine code efficiency in each case. **(12 Marks)**

b. Noise matrix of a binary symmetric channel is illustrated below which has the following source symbol probabilities:

$P(x_1) = 2/3$; $P(x_2) = 1/3$; $P(y/x) = \begin{bmatrix} 3/4 & 1/4 \\ 1/4 & 3/4 \end{bmatrix}$

i) Determine H(x), H(y), H(x, y), H(x/y), H(y/x) and I(x, y)

ii) Also determine channel capacity. **(08 Marks)**

4 a. State and explain the Shannon-Hartley law. Obtain an expression for the maximum capacity of a continuous channel. **(10 Marks)**

b. A b/w TV picture may be viewed as consisting of approximately 3×10^5 elements, each one of which may occupy 10 distinct brightness levels with equal probability. Assuming the rate of transmission as 30 picture frames/sec and an SNR of 30 db, calculate the minimum bandwidth required to support the transmission of the resultant video signal. **(10 Marks)**

PART – B

5 a. Parity matrix for a systematic (6, 3) linear block code is given as

$$P = \begin{bmatrix} 1 & 0 & 1 \\ 0 & 1 & 1 \\ 1 & 1 & 0 \end{bmatrix}$$, find all the possible code vectors. **(10 Marks)**

b. Define hamming weight, hamming distance and minimum distance of linear block codes. **(06 Marks)**

c. If 'C' is a valid code vector such as C = DG, then prove that $CH^T = 0$, where H is the parity check matrix. **(04 Marks)**

6 a. A (15, 5) cyclic code has a generator polynomial $g(x) = 1 + x + x^2 + x^4 + x^5 + x^8 + x^{10}$.

i) Draw the block diagram of an encoder and syndrome calculator of this code.

ii) Find code polynomial for $D(x) = 1 + x^2 + x^4$ in systematic form.

iii) If $V(x) = 1 + x^4 + x^6 + x^8 + x^{14}$ check whether it is a valid code polynomial or not. **(12 Marks)**

b. Consider a (15, 11) cyclic code generated using $g(x) = 1 + x + x^4$.

i) Design a feedback resister encoder for the same.

ii) Illustrate the encoding procedure with the message vector [11001101011] by listing the states of the register assuming right most bit as the earliest bit. **(08 Marks)**

7 Write short notes on:

a. RS codes

b. Shortened cyclic codes

c. Golay codes

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

8 a. For the convolutional encoder shown in Fig.Q8(a), if information sequence D = 10011, find the output sequence using

i) time domain approach ii) transform domain approach. **(12 Marks)**

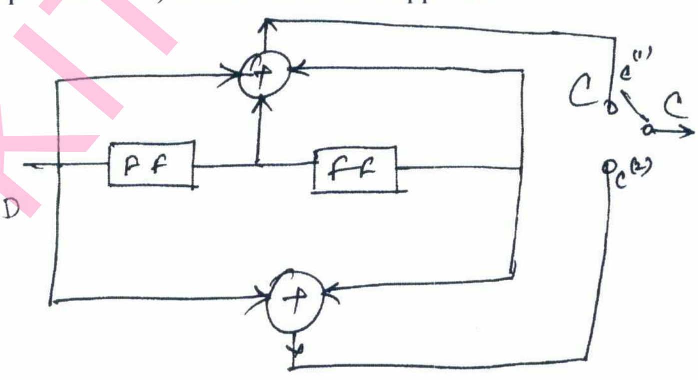

Fig.Q8(a)

b. For a (3, 1, 2) convolutional code with $g^{(1)} = (110)$, $g^{(2)} = (101)$ and $g^{(3)} = (111)$. Draw the encoder block diagram and also find the generator matrix. **(08 Marks)**

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06EC661

Sixth Semester B.E. Degree Examination, June 2012
Programming in C++

Time: 3 hrs. Max. Marks:100

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

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PART – A

1 a. Explain enumeration data types with examples. **(04 Marks)**

b. What do mean by dynamic initialization of a variable? What is the primary difference between static and dynamic memory allocation. **(08 Marks)**

c. Write a note on #define directive and const modifier. **(04 Marks)**

d. Explain the difference between the four objects defined below:
   i) int ival = 1024
   ii) int *pi2 = new int (1024)
   iii) int *pi = &ival
   iv) int *pi3 = new int [1024]. **(04 Marks)**

2 a. What is pointer? Explain the advantages of a pointer. Indicate the difference between address operator and indirection operator. **(10 Marks)**

b. What are the basic operations performed on string. Write a program in C++ to find the length of the string using string type. **(06 Marks)**

c. Give the output of the following:

```
void main( )
{
        int  i = 4, j = -1, k = 0, w, x, y, z;
        w = i ||j ||k;
        x = i && j && k;
        y = i ||j && k;
        z = i && j ||k;
   cout <<w<<x<<y<<z;
}
```
(04 Marks)

3 a. What are bitwise operators? Explain the left shift and right shift operations with examples. **(04 Marks)**

b. Explain the various looping constrants available in C++ with their syntax and examples. **(06 Marks)**

c. Explain with the syntax the components of the switch statements. Write a program in C++ to count the number of vowels in a given string. **(10 Marks)**

4 a. Explain the call by value and call by reference parameter passing method with an example of each. **(10 Marks)**

b. Write a recursive function to find factorial of n numbers. **(05 Marks)**

c. What is a function? Mention the advantages of using functions. **(05 Marks)**

PART – B

5 a. What is an exception? With the help of example explain how the try block and catch block works. **(10 Marks)**

b. Write a C++ program to illustrate the process of catching all uncaught exceptions through in a try block. **(10 Marks)**

6 a. Explain parameterized constructors. Develop a C++ program to implement parameterized constructor. **(10 Marks)**

b. Explain the following features of OOP's:
  i) Classes
  ii) Objects
  iii) Polymorphism
  iv) Inheritance
  v) Encapsulation. **(10 Marks)**

7 a. What is an operator over loading? Write a C++ program to add 2 complex numbers by over loading the operator '+'. **(10 Marks)**

b. Explain how an array of objects can be created and members of the objects are accessed. Give example. **(10 Marks)**

8 a. Explain single and multilevel inheritance with examples. **(10 Marks)**

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

c. Write a note on base class and derived class. **(04 Marks)**

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06EC662

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

Time: 3 hrs. Max. Marks:100

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

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.
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PART – A

1 a. List the frequency-band designations. Which are in common use for satellite services? **(06 Marks)**
b. What is INTELSAT? How it covers the 'International traffic'? **(04 Marks)**
c. State and explain the Kepler's laws of planetary motion with neat diagrams and necessary equations. **(10 Marks)**

2 a. Determine the limits of visibility for an earth-station situated at mean sea level at latitude 48.42°N and longitude 89.26°W. Assume a minimum angle of elevation of 5°. **(06 Marks)**
b. Explain the Keplerian element set with their meanings with respect to satellite orbit. **(04 Marks)**
c. What are antenna look angles? How these are determined? **(06 Marks)**
d. Determine which of the followings years are leap years:
i) 1987 ii) 1988 iii) 2000 iv) 2100. **(04 Marks)**

3 a. Explain atmospheric and ionospheric losses for satellites. **(06 Marks)**
b. Briefly explain uplink-and-downlink rain-fade margin. **(04 Marks)**
c. Calculate 'horizontal, vertical and circular' polarizations for a frequency of 12 GHz, the rain attenuation is exceeded for 0.01% of the time in any year, for a point rain rate of 10 mm/h. The earth station attitude is 600 meter, and the antenna elevation angle is 50°. The rain height is 03 km and $a_h = 0.0188$; $b_h = 1.217$; $a_v = 0.168$; $b_v = 1.2$.
Note: All lengths and heights are in kms, and rain-rate is in mm/hour. **(10 Marks)**

4 a. What is a satellite transponder? With a neat diagram explain the overall frequency arrangement of typical C-band communication satellite. **(06 Marks)**
b. A satellite downlink at 12 GHz operates with a transit power of 6 watts and on antenna-gain of 48.2 dB. Calculate EIRP in dBW. **(04 Marks)**
c. What is meant by satellite attitude? Briefly describe three-axis method of satellite satelelization. **(10 Marks)**

PART – B

5 a. With a neat diagram, explain the outdoor-and indoor units of a receive-only home TV system. **(10 Marks)**
b. What is meant by pre-assigned FDMA? With a neat diagram, explain single channel per carrier. **(10 Marks)**

6 a. The carrier-to-interference ratio at the ground receiving antenna is 23.3 dB. For the uplink [C/I] ratio is 27.53 dB. Find the overall ratio $[C/I]_{ant}$ for $(I/C)_U = 0.001766$ and $(I/C)_D = 0.004436$. **(06 Marks)**
b. Calculate the $[C/N]_D$ for $[EIRP]_D = 27$, $[G/T]_D = 30$, $[LOSSES]_D = 196$, $[k] = -228.6$ and $[B]_{TR} = 75.56$. **(04 Marks)**
c. Explain the 'frame and burst formats' for a TDMA system. **(10 Marks)**

7 a. Explain:
   i) Transponder capacity
   ii) Frequency and polarization.
   iii) Bit-rate for digital TV. **(10 Marks)**

b. Explain in detail the satellite mobile services. **(10 Marks)**

8 Write short notes on any three choosing any one from c. and d. :

a. Geo-stationary orbit.
b. VSAT and its applications.
c. GPS and its uses.
d. Radarsat. **(20 Marks)**

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