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06EC61

Sixth Semester B.E. Degree Examination, May/June 2010
Digital Communication

Time: 3 hrs. Max. Marks:100

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

PART – A

1 a. With a block diagram, explain the basic signal processing operations involved in a digital communication system. **(07 Marks)**

b. Explain 'flat-top' sampling, using waveforms and equations. **(07 Marks)**

c. The signal $x(t) = 2\cos 400\pi t + 6\cos 640\pi t$ is ideally sampled at $f_s = 500$ Hz. If the sampled signal is passed through an ideal low pass filter with cut off frequency of 400 Hz:
i) Determine the spectrum of the sampled signal and sketch.
ii) What frequency components will appear in the filter output? **(06 Marks)**

2 a. Write a note on 'TDM'. **(04 Marks)**

b. Show that the signal to quantization noise power ratio of a uniform quantizer is $[SNR]_{dB} = 1.8 + 6n$ and n = number of bits/sample. **(06 Marks)**

c. What is the necessity of non uniform quantization? Explain compounding. **(06 Marks)**

d. A telephone signal band limited to 4 KHz is to be transmitted by PCM. The signal to quantization noise power ratio is to be at least 40 dB. Find the number of levels into which the signal has to be encoded. Also find the transmission band width. **(04 Marks)**

3 a. With neat diagrams, explain the operation of DPCM. **(07 Marks)**

b. A DM system is tested with a 10 KHz sinusoidal signal with 1 V peak to peak at the i/p. It is sampled at 10 times the Nyquist rate. What is the step size required to prevent slope overload? **(04 Marks)**

c. Explain T1 – carrier system. **(05 Marks)**

d. For the binary bit sequence 10110100, draw the waveforms using: **(04 Marks)**
i) Unipolar NRZ ii) Unipolar RZ iii) Polar NRZ iv) Bipolar NRZ.

4 a. Describe Nyquist's criteria for distortionless baseband transmission. **(06 Marks)**

b. Explain the need for a precoder in a duobinary signaling. For i/p binary data 1011101, obtain the o/p precoder and o/p of duobinary coder. Explain how data can be detected at the receiver. **(08 Marks)**

c. What is equalization? Explain adaptive equalization for data transmission. **(06 Marks)**

PART – B

5 a. Explain the working of:
i) Coherent BFSK transmitter and ii) QPSK transmitter. **(10 Marks)**

b. The bit stream 1011100011 is to be transmitted using DPSK technique. Determine the encoded sequence and transmitted phase sequence. Also write the block diagram of the modulator and demodulator for the same and explain. **(10 Marks)**

6 a. A binary data is transmitted using ASK over a AWGN channel at a rate of 2.4 Mbps. The carrier amplitude at the receiver is 1 μV. Noise spectral density $N_o/2$ is 10^{-15} Watt/Hz. Find the average probability of error if the detection is coherent. Take $\in rfc(5) \simeq 3\times10^{-6}$. **(06 Marks)**

b. With a diagram, explain the model of digital communication system. **(08 Marks)**

c. Explain geometric interpretation of signals. **(06 Marks)**

7 a. Explain the detection of known signals in noise. **(10 Marks)**

b. Write a note on minimum mean square error estimate. **(04 Marks)**

c. A polar NRZ waveform is to be received by a matched filter. Binary 1 is represented by a rectangular positive pulse and binary 0 is represented by a rectangular negative pulse. Find out the impulse response of the matched filter and sketch it. **(06 Marks)**

8 a. Mention the applications of spread spectrum system. Explain the principle of direct sequence spread spectrum system. **(08 Marks)**

b. Explain the frequency hopped spread spectrum system. **(08 Marks)**

c. A slow FH/MFSK system has the following parameters:
The number of bits / MFSK symbol = 04
The number of MFSK symbol / hop = 05
Calculate the processing gain of the system in decibels. **(04 Marks)**

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06EC62

Sixth Semester B.E. Degree Examination, May/June 2010
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. Explain in brief the functions of 'execution unit', with a neat block diagram. **(07 Marks)**

b. Explain: i) How physical address is generated by 8086?
ii) 16 byte paragraph boundary.
iii) Segment override prefix. **(06 Marks)**

c. Explain with at least two examples, the register indirect addressing and register relative addressing. Identify the addressing modes for the following instructions: **(07 Marks)**
i) MOV AX, BP [100] ii) XCHG num[BX + SI], SP iii) MOV CL, 'A'

2 a. What are the differences between 8086 and 8088 processors? **(04 Marks)**

b. What is wrong, if any, in the following instructions? Correct them and explain the operation performed by these instructions. **(06 Marks)**
i) ADD [23A5H], AL ii) INC [BX] iii) LEA SI, offset num

c. Write an ALP to add N one byte BCD numbers, store the result in memory location. **(10 Marks)**

3 a. What do you mean by 'assembler directives'? Explain the following assembler directives:
i) ALIGN 16 ii) PROC .... ENDP iii) ASSUME iv) EXTRN....PUBLIC **(05 Marks)**

b. Explain any four conditional branch instructions which check the carry and zero flags simultaneously. **(06 Marks)**

c. Write an ALP to convert a four digit ASCII coded hexadecimal number to its binary equivalent using SEGMENT.....ASSUME directives. **(09 Marks)**

4 a. What are the differences between a MACRO and a PROCEDURE? Write an ALP that displays a carriage return and a line feed using a MACRO. **(10 Marks)**

b. Write an ALP to find the GCD of four numbers using a procedure. **(10 Marks)**

PART – B

5 a. Describe the purpose of interrupt vector table and the condition (s) which causes the microprocessor to perform the following types of interrupts:
type 0, type 1, type 2, type 3 and type 4 **(07 Marks)**

b. Write an interrupt procedure that sets the trap flag to enable trap. **(04 Marks)**

c. Write a program that outputs characters to a printer using INT 17h interrupt. **(09 Marks)**

6 a. Explain the different types of key switches used in a computer. **(05 Marks)**

b. Draw a block diagram of 7 - segment LED display which is interfaced to a microprocessor using dedicated display controller. **(10 Marks)**

c. Explain the different types of floating point numbers stored in the memory by the coprocessor. **(05 Marks)**

7 a. Convert the following:
i) Decimal 1259.125 to single precision number ii) Decimal -29.563 to long real form.
iii) Short real 01011101011001110 0....0 to decimal. **(09 Marks)**

b. Write an ALP to find the roots of a quadratic equation $x^2 + 3x + 2 = 0$. **(11 Marks)**

8 Write short notes on : a) Minimum and maximum modes of 8086 ; b) Universal serial bus (USB) ; c) Special registers of 80386 ; d) Pentium processor. **(20 Marks)**

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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.

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06EC63

Sixth Semester B.E. Degree Examination, May/June 2010
Analog and Mixed Mode VLSI Design

Time: 3 hrs. Max. Marks:100

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

PART – A

1 a. Explain the characteristics and typical errors associated with sample and hold circuit. **(10 Marks)**

b. Briefly explain the ADC specifications. **(05 Marks)**

c. Find the resolution of DAC, if the output voltage is desired to change in 1 mV increments while using a reference voltage of 4V. **(05 Marks)**

2 a. Explain qualitatively the architecture and working of charge scaling DACs. **(10 Marks)**

b. Design a 3-bit charge scaling DAC and find the value of output voltage for $D_2D_1D_0 = 100$ and 011. Assume $V_{ref} = 5V$, C = 0.5 PF. **(05 Marks)**

c. Briefly explain the architecture & working of a pipeline digital to analog coverter. **(05 Marks)**

3 a. Explain the architecture and working of a flash ADC. **(08 Marks)**

b. If a 10-bit flash ADC is designed, determine maximum offset voltage of comparators which will make INL less than ½ LSB. Assume that resister string is perfectly matched and $V_{REF} = 4V$. **(04 Marks)**

c. Briefly explain the block diagram of a 2-step flash ADC and its working. **(08 Marks)**

4 a. Explain qualitatively preamplification and decision circuits of a CMOS comparator unit. Draw their CMOS circuits. **(10 Marks)**

b. Explain the principle of an analog multiplier. **(05 Marks)**

c. Briefly explain CMOS analog multiplier with the help of a circuit diagram. **(05 Marks)**

PART – B

5 a. Define SNR, effective number of bits and clock jitter in mixed signal circuits qualitatively. **(08 Marks)**

b. Explain the principle of averaging to improve SNR, in mixed signal circuits. **(06 Marks)**

c. Briefly explain the role of decimating filters in ADCs. **(06 Marks)**

6 a. With a neat process flow diagram, explain submicron CMOS technology and bring out the differences as compared to CMOS technology. **(10 Marks)**

b. Explain how capacitor and resister elements are fabricated in submicron technology. **(07 Marks)**

c. Explain MOSFET as a switch. **(03 Marks)**

7 a. What are delay elements? Explain how they are realized using pass transistors, inverters and C^2MOS and TSPC circuits. **(10 Marks)**

b. Realize a 4-bit pipelined adder using latches and explain its operation. **(05 Marks)**

c. Implement full adder using dynamic logic and explain. **(05 Marks)**

8 a. Consider a small signal amplification of a floating current source shown in Fig.Q8(A). Assuming NMOS cascade o/p resistance is labeled R_{ncas} , what is the small signal resistance scan by test voltage V_{test}? **(10 Marks)**

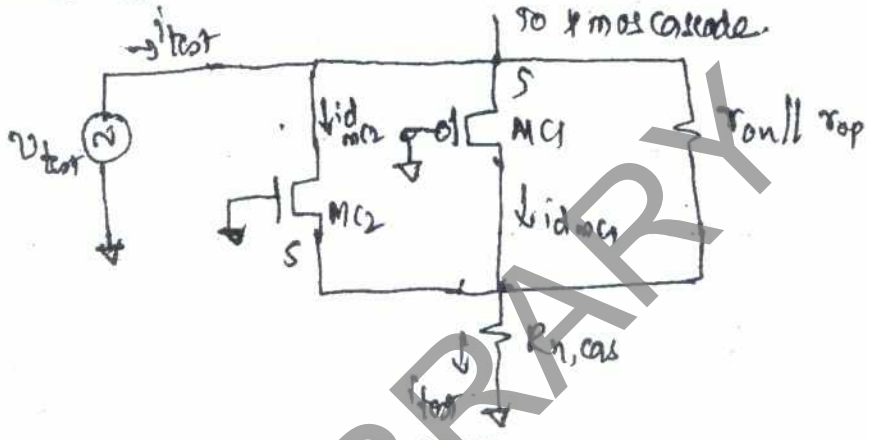

Fig.Q8(A)

b. Explain with the help of circuit diagrams, the technique of making the flow rate concern in the design of op amp. **(10 Marks)**

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06EC64

Sixth Semester B.E. Degree Examination, May/June 2010
Antennas and Propagation

Time: 3 hrs. Max. Marks:100

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

PART – A

1 a. Define the following with respect to antenna:
   i) Isotropic radiator
   ii) Directivity
   iii) Radiation pattern
   iv) Polarization. **(10 Marks)**

b. Antenna of gain G radiates Wt. Watts. Show that the free space intensity E at a distance of r metres is given by $E = \frac{\sqrt{30wt.G}}{r}$ v/m. **(05 Marks)**

c. Derive an expression for antenna efficiency in terms of radiation resistance. **(05 Marks)**

2 a. Find the directivity and beam width of the following :
   i) $U = U_m \sin\phi \cos^2\theta$ ii) $U = U_m \cos\phi \sin^2\theta$ **(10 Marks)**

b. State and prove the power theorem. **(05 Marks)**

c. Prove that $D = 2(n+1)$ for a unidirectional pattern given by $U = U_m \cos^n\theta$. **(05 Marks)**

3 a. Derive an expression for field intensity for two isotropic point sources with equal amplitude and equal phase. **(10 Marks)**

b. Draw the polar diagram of a broadside array with number of elements = 5 and spacing = $\lambda/2$. **(10 Marks)**

4 a. Derive an expression for radiation resistance of a short electric dipole. **(10 Marks)**

b. Write short notes on :
   i) Folded dipole antenna ; ii) Thin linear antenna. **(10 Marks)**

PART – B

5 a. Discuss the features of a loop antenna. Derive an expression for far field components of a loop antenna. **(10 Marks)**

b. Write notes on : i) Horn antenna ; ii) Slot antenna. **(10 Marks)**

6 a. Discuss the features of an helical antenna. Give the construction details of the helical antenna. **(10 Marks)**

b. What are parabolic reflectors? Where these antennas are used? **(05 Marks)**

c. Draw the construction details of an embedded antenna. **(05 Marks)**

7 a. Discuss the different forms of radio wave propagation. **(10 Marks)**

b. Derive an expression for wave tilt of surface wave. **(10 Marks)**

8 a. Explain different layers of ionosphere in detail. **(10 Marks)**

b. Define the following with respect to wave propagation :
   i) Critical frequency ; ii) MUF ; iii) Virtual height ; iv) Skip distance. **(10 Marks)**

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06EC65

Sixth Semester B.E. Degree Examination, May/June 2010
Information Theory and Coding

Time: 3 hrs. Max. Marks:100

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

PART – A

1 a. A binary source is emitting an independent sequence of 0's and 1's with the probabilities P and (1 – P) respectively. Plot the entropy of the source versus probability [0 < P < 1]. Write the conclusion. **(04 Marks)**

b. In a facsimile transmission of picture there are about 3.25×10^6 pixels per frame. For a good reproduction, 15 brightness levels are necessary. Assume all these levels are equally likely to occur. Find the rate of information transmission if one picture is to be transmitted every 3 minutes. **(05 Marks)**

c. The state diagram of the Mark off source is as shown in the Fig.Q1(c). P(state i) = $\frac{1}{3}$ for i = 1, 2, 3. Find : i) the entropy of each state Hi, ii) the entropy of source H, iii) G_1, G_2 and H. **(11 Marks)**

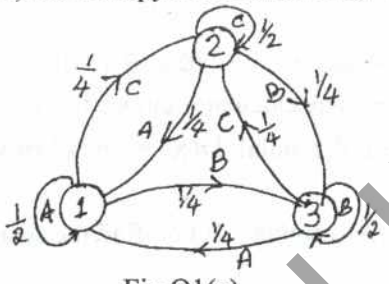

Fig.Q1(c)

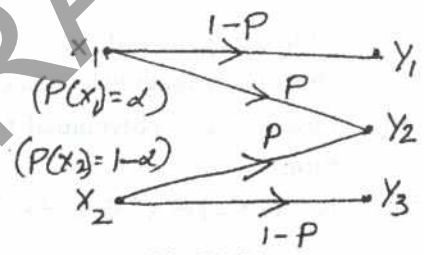

Fig.Q3(b)

2 a. What are the important properties of codes while encoding a source? **(05 Marks)**

b. A source emits an independent sequence of symbols from an alphabet consisting of five symbols A, B, C, D and E with probabilities of $\frac{1}{4}$, $\frac{1}{8}$, $\frac{1}{8}$, $\frac{3}{16}$ and $\frac{5}{16}$ respectively. Find the Shannon code for each symbol and efficiency and redundancy of the coding scheme. **(06 Marks)**

c. For a channel whose matrix is given below for which $P(x_1) = \frac{1}{2}$, $P(x_2) = P(x_3) = \frac{1}{4}$ and r_s = 10000/sec, find H(x), H(y), $H\left(\frac{y}{x}\right)$, H(x, y), I(x, y) and the capacity.

$$P\left[\frac{y}{x}\right] = \begin{bmatrix} 0.8 & 0.2 & 0 \\ 0.1 & 0.8 & 0.1 \\ 0 & 0.2 & 0.8 \end{bmatrix}$$

(09 Marks)

3 a. Design a quaternary and binary source code for the source shown, using Huffman's coding scheme.

$S = \{S_1, S_2, S_3, S_4, S_5, S_6, S_7\}$; $P = \left\{\frac{9}{32}, \frac{3}{32}, \frac{3}{32}, \frac{2}{32}, \frac{9}{32}, \frac{3}{32}, \frac{3}{32}\right\}$; $X = \{0, 1, 2, 3\}$ and $X = \|0, 1\|$. Find the coding efficiency. **(12 Marks)**

b. For a binary erasure channel shown in Fig.Q3(b), find the following:

i) Average mutual information
ii) Channel capacity
iii) Values of $P(x_1)$ and $P(x_2)$ for maximum mutual information. **(08 Marks)**

4 a. State and explain Shannon Hartley law. Derive the expression for the upper limit of the channel capacity. **(06 Marks)**

b. A voice grade channel of the telephone network has the bandwidth of 3.4 KHz. Calculate:
i) The channel capacity for a SNR of 30 dB
ii) The minimum SNR required to support information transmission at the rate of 4800 bits/sec. **(06 Marks)**

c. Show that : i) $I(x, y) \geq 0$; ii) $I(x, y) = (y, x)$; iii) $I(x, y) = H(x) + H(y) - H(x, y)$. **(08 Marks)**

PART – B

5 a. Consider the (7, 4) LBC whose generator matrix is given below. Find:
i) All code vectors ii) Parity check matrix, H
iii) The minimum weight and distance of this code.

$$[G] = \begin{bmatrix} 1000 & 101 \\ 0100 & 111 \\ 0010 & 110 \\ 0001 & 011 \end{bmatrix}$$ **(10 Marks)**

b. Prove that $CH^T = 0$. **(04 Marks)**

c. Why do we need error control coding? What are the types of errors and types of coding to combat them? **(06 Marks)**

6 a. A (15, 5) linear cyclic code has a generator polynomial, $g(x) = 1 \oplus x \oplus x^2 \oplus x^4 \oplus x^5 \oplus x^8 \oplus x^{10}$.
i) Draw block diagrams of an encoder and syndrome calculator circuit for this code.
ii) Find the code polynomial for the message polynomial $D(x) = 1 \oplus x^2 \oplus x^4$ (in a systematic form).
iii) Is $V(x) = 1 \oplus x^4 \oplus x^6 \oplus x^8 \oplus x^{14}$ a code polynomial? If not, find the syndrome of V(x). **(12 Marks)**

b. What is a binary cyclic code? Discuss the features of encoder and decoder used for cyclic codes using an (n – k) bit shift register. **(08 Marks)**

7 a. Explain briefly the following: **(09 Marks)**
i) Golay code ii) BCH code
iii) Shortened cyclic code iv) Reed Solomon code.

b. Consider a [15, 9] cyclic code generated by $g(x) = 1 \oplus x^3 \oplus x^4 \oplus x^5 \oplus x^6$. Find the burst error correcting efficiency of this code. **(06 Marks)**

c. List the advantages and disadvantages of cyclic codes. **(05 Marks)**

8 Fig.Q8 below shows the convolutional encoder:

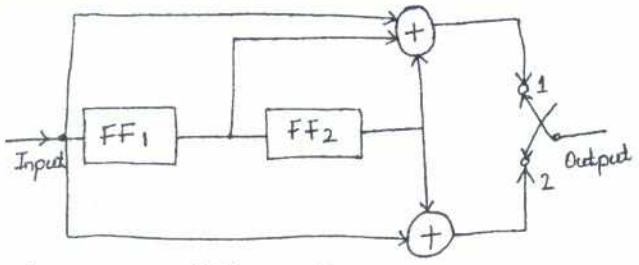

Fig.Q8

a. Write the impulse response of this encoder. **(03 Marks)**

b. Find the output for the message (10011) using time domain approach. **(05 Marks)**

c. Find the output for the message (10011) using transform domain approach. **(05 Marks)**

d. Draw the code tree for the encoder. **(07 Marks)**

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06EC661

Sixth Semester B.E. Degree Examination, May/June 2010
Programming in C++

Time: 3 hrs. Max. Marks:100

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

PART – A

1 a. What is an object oriented programming? What are the advantages of OOP? **(06 Marks)**

b. What is meant by dynamic binding? How is it useful in OOP? **(04 Marks)**

c. Explain the following terms, with suitable examples:
i) Classes ii) Inheritance iii) Polymorphism
iv) Encapsulation v) Message communication. **(10 Marks)**

2 a. Explain the two ways of type conversion, using a suitable C++ program. **(08 Marks)**

b. What is a pointer? Explain the difference between a pointer and a reference, with a suitable example. **(05 Marks)**

c. A motorcycle covers a distance of 45 km per liter of petrol consumption. The cost of petrol is Rs.30.00 per liter. Write a program in C++ to calculate the cost of petrol to travel a distance of 120 km. **(07 Marks)**

3 a. Compare and contrast the if-else statement with a conditional operator, using a C++ program. **(07 Marks)**

b. How does using name space standard statement performs? Explain its function and usage, with an example. **(07 Marks)**

c. Write a C++ program to find the sum of digits of a given number (minimum length is 5 digits). **(06 Marks)**

4 a. Write a simple C++ program to accept a string and counts the number of alphabets, digits and special symbols present in a given string. **(06 Marks)**

b. What is an inline function? Write the rules for inline function. Give an example for inline function. **(06 Marks)**

c. Explain the call-by-value and call-by-reference parameter passing methods, with an example of each. **(08 Marks)**

PART – B

5 a. What is an exception handling? What is the need for it? Name the different types of exceptions. **(08 Marks)**

b. Explain the meaning and syntax of a catch block and try block. **(04 Marks)**

c. Write a C++ program to illustrate the process of catching all uncaught exceptions thrown in a try block. **(08 Marks)**

6 a. With a simple C++ program, using a class, explain the terms: object, private, public, class member and friend function. **(10 Marks)**

b. Distinguish between a constructor and a destructor. Develop a program to implement overloaded constructors and show the corresponding output. **(10 Marks)**

7 a. What are new and delete operators? Write a C++ program to allocate memory to three integers. Use new and delete operators for allocating and deallocating memory. Initialize and display values. **(07 Marks)**

b. What is the use of operator overloading? Write a C++ program to add two complex numbers by overloading the operator +. **(08 Marks)**

c. Explain the mechanism of virtual function. **(05 Marks)**

8 a. What is the difference between multiple and multi-level inheritance? **(04 Marks)**

b. Explain what is meant by a class relationship, base class, derived class and protected members, with the help of examples. **(10 Marks)**

c. Combining the concepts of array and class, develop a C++ program to model a stack of computer memory. **(06 Marks)**

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06EC662

Sixth Semester B.E. Degree Examination, May/June 2010
Satellite Communication

Time: 3 hrs. Max. Marks:100

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

PART – A

1 a. Explain briefly the various services provided by a satellite. **(06 Marks)**

b. State Kepler's three laws of planetary motion, with the help of a neat diagram and give necessary equations. **(08 Marks)**

c. Define Keplerian elemental set. **(06 Marks)**

2 a. An earth station is located at latitude 30° S and longitude 65° E. Calculate the antenna look angles for the satellite at 156° E. **(08 Marks)**

b. Briefly explain the launching orbits for a geostationary satellite. **(06 Marks)**

c. A quasi-geo satellite is in a circular equatorial orbit, close to the geosynchronous attitude. Its orbital period is exactly 24 hours, one solar day. Calculate:

i) The radius of the orbit

ii) The rate of drift around the equator of the subsatellite point in degree/solar day. An observer on the earth sees that the satellite is drifting across the sky.

iii) Is the satellite moving towards the east or towards the west? **(06 Marks)**

3 a. For satellite transmission $El = 22°$, $R_{0.01} = 15$ mm/h, $h_0 = 600$ m, $h_R = 1500$ m. Calculate rain attenuation for vertical polarization at an operating frequency of 14 GHz. ($a_v = 0.0335$, $b_v = 1.128$). **(07 Marks)**

b. Explain the different transmission losses in a satellite link. **(07 Marks)**

c. Define saturation flux density. Obtain the equation for saturation EIRP for uplink. **(06 Marks)**

4 a. What is meant by satellite altitude? Briefly describe three axis method of satellite stabilization. **(07 Marks)**

b. With the help of a neat diagram, explain TTC and M subsystem. **(07 Marks)**

c. What is meant by frequency reuse? Briefly describe the working of a wide band receiver. **(06 Marks)**

PART – B

5 a. With a neat block diagram, explain the outdoor and indoor unit for analog FM/TV. **(12 Marks)**

b. Explain the spade system, with a neat diagram. **(08 Marks)**

6 a. With a neat diagram, explain frame and burst formats for a TDMA system. **(07 Marks)**

b. Explain the working of carrier recovery circuit with single tuned circuit having AFC. **(07 Marks)**

c. Determine : i) Miss probability for the values N = 4, E = 5, $P = 10^{-3}$.

ii) False detection for the values N = 40, E = 5. **(06 Marks)**

7 a. Calculate the bit rate that can be carried in the 36 MHz channel using QPSK, allowing a roll-off factor of 0.2. **(05 Marks)**

b. Explain the very small aperture terminal system. **(08 Marks)**

c. Give the applications of Radar Sat. Explain a 'dawn to dusk' orbit. **(07 Marks)**

8 a. Explain the global positioning system, in detail. **(08 Marks)**

b. Write short notes on : i) System noise temperature ii) Preassigned FDMA. **(12 Marks)**

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6 a. With respect to IP datagram/packet format, explain the role of the following header fields.
   i) IHL
   ii) TOS
   iii) Total length
   iv) Flag bits. **(08 Marks)**

b. What is the meaning of IP address class? With the help of a diagram, explain the different types of IP address formats. **(08 Marks)**

c. Explain how RARP is used to enable a diskless host to determine its own IP address from its local server. **(04 Marks)**

7 a. With the help of a diagram, explain broadband ATM cell formats. **(10 Marks)**

b. Explain the general structure of ATM switch architecture. **(10 Marks)**

8 a. Explain the meaning of the following terms in relation to the operation of TCP :
   i) Reliable stream service
   ii) Segment
   iii) Maximum segment size.
   State why both flow control and congestion control procedures are required with TCP. **(08 Marks)**

b. With the aid of a diagram, explain briefly UDP datagram header fields. **(04 Marks)**

c. In relation to the RTP packet format, explain briefly the meaning and use of the following fields :
   i) CC and CSRC
   ii) M and payload type
   iii) Sequence number. **(08 Marks)**

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