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10EC/TE61

Sixth Semester B.E. Degree Examination, Dec.2013/Jan.2014

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. With a block diagram, explain the generation and reconstruction of quadrature sampling of band pass signal. **(08 Marks)**

b. The signal $g(t) = 4\cos(4\pi t)\cos(400\pi t)$ is sampled at the rate of 500 sample/sec.
i) Determine the spectrum of the resulting sampled signal.
ii) What is the Nyquist rate for g(t)?
iii) What is the cut-off frequency of ideal reconstruction filter? **(08 Marks)**

c. List the advantages of digital communication over analog communication. **(04 Marks)**

2 a. Derive an expression for output SNR of the quantizer and show that $(SNR)_0 = 1.8 + 6n$ in decibels if a sinusoidal signal is quantized. **(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. **(04 Marks)**

c. What is the necessity of non-uniform quantization? Explain two compounding methods used in practice. **(08 Marks)**

3 a. What is slope overload distortion and granular noise in delta modulation and how it can be reduced? **(08 Marks)**

b. A binary data sequence is 0110011…. Sketch the waveform for the following formats:
i) NRZ unipolar
ii) RZ polar
iii) NRZ bipolar **(06 Marks)**

c. Obtain an expression for power spectral density of NRZ polar waveform. **(06 Marks)**

4 a. What is ISI? Derive an expression for Nyquist pulse shaping criterion for distortionless baseband binary transmission. **(08 Marks)**

b. Discuss the performance of the data transmission using eye pattern. **(06 Marks)**

c. What is the necessity of equalization in digital transmission? What is adaptive equalization? **(06 Marks)**

PART – B

5 a. Derive an expression for the average probability of symbol error of coherent binary FSK system. **(10 Marks)**

b. With a block diagram, explain noncoherent differential phase shift keying transmitter and receiver and give that the average probability of error for DPSK is $P_e = \frac{1}{2}\exp\left(-\frac{E_b}{N_o}\right)$. **(10 Marks)**

6 a. Write a short note on Gram-Schmidt orthogonalization. **(06 Marks)**

b. Three signals $s_1(t)$, $s_2(t)$ and $s_3(t)$ are as shown in Fig.Q6(b). Apply Gram-Schmidt orthogonalization to obtain orthonormal basis functions for signals. Express the signals $s_1(t)$, $s_2(t)$ and $s_3(t)$ in terms of orthonormal basis functions.

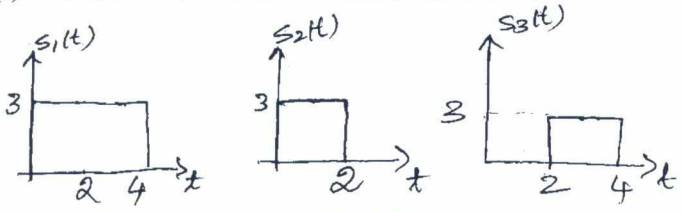

Fig.Q6(b) **(06 Marks)**

c. With necessary illustration, explain the geometric representation of signals for the case when N = 2 and M = 3. **(08 Marks)**

7 a. Show that the probability of bit error of a matched filter is given by $P_e = \frac{1}{2}\text{erfc}\sqrt{\frac{E_b}{N_o}}$. **(08 Marks)**

b. Write a note on correlation receivers. **(08 Marks)**

c. 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 mV. The noise spectral density $\frac{N_o}{r} = 10^{-15}$ Watt/Hz. Find average probability of error if the detection is coherent (where erfc(5) = 3×10^{-6}). **(04 Marks)**

8 a. What is spread spectrum? Explain the principle of direct sequence spread spectrum system. **(08 Marks)**

b. The direct sequence spread spectrum communication system has following parameters:

Data sequence bit duration, $T_b = 4.095$ ms

Pin chip duration, $T_c = 1$ μs

$\frac{E_b}{N_o} = 10$ for average probability of error less than 10^{-5}.

Calculate processing gain and jamming margin. **(04 Marks)**

c. Explain the principle of slow frequency hopping, and list advantages and disadvantages of FH-SS system. **(08 Marks)**

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10EC/TE62

Sixth Semester B.E. Degree Examination, Dec.2013/Jan.2014
Microprocessors

Time: 3 hrs. Max. Marks:100

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

PART – A

1 a. Explain with block diagram the personal computer model showing address, data and control bus structure. **(05 Marks)**

b. With a neat sketch, explain the execution unit and bus interface unit of the 8086 microprocessor. **(10 Marks)**

c. Explain segmentation in 8086 and advantages of using segment registers. **(05 Marks)**

2 a. Explain the different string instructions of the 8086. **(08 Marks)**

b. What are assembler directives? Explain the following :
(i) total db 00h (ii) inc word ptr [si] (iii) mov dx, offset msg (iv) assume **(08 Marks)**

c. Explain :
(i) MN / $\overline{MX}$ (ii) $AD_{15} - AD_0$ (iii) $\overline{RD}$ (iv) $\overline{WR}$ **(04 Marks)**

3 a. Write a display macro using for statement to display 'VTU' on the screen. **(05 Marks)**

b. Write an assembly language program to arrange '10' bytes of data in descending order. **(10 Marks)**

c. Differentiate between macros and procedures. **(05 Marks)**

4 a. Draw the 8086 interrupt-pointer table and explain the dedicated interrupt pointers, reserved interrupt pointers and available interrupt pointers. **(10 Marks)**

b. Explain the priority of 8086 interrupts. **(05 Marks)**

c. Write a program to check if a given byte is bitwise palindrome. **(05 Marks)**

PART – B

5 a. Explain the different key switches used on keyboards. **(08 Marks)**

b. Explain the detection of matrix keyboard, key press, debouncing and encoding with a microcomputer using 4*4 keyboard. Also draw the flowchart for the same. **(12 Marks)**

6 a. Explain the 8087 architecture. Also explain the bit pattern of status register and control register. **(12 Marks)**

b. Explain :
(i) FLDZ (ii) FLD1 (iii) FLDPI (iv) FLDL2E **(08 Marks)**

7 a. Write a note on parallel printer interface (LPT). **(10 Marks)**

b. Explain the write cycle timing diagram for minimum mode. **(07 Marks)**

c. Explain the following :
(i) M / $\overline{IO}$ (ii) ALE (iii) $\overline{INTA}$ **(03 Marks)**

8 a. Draw the internal programming model of the 80486 and explain. **(10 Marks)**

b. Explain the memory system of 80386. **(05 Marks)**

c. Write a brief mote on Pentium processors. **(05 Marks)**

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10EC63

Sixth Semester B.E. Degree Examination, Dec.2013/Jan.2014
Microelectronics Circuits

Time: 3 hrs. Max. Marks:100

Note: *1. Answer FIVE full questions, selecting at least TWO questions from each part.*
2. State all assumptions, including missing data.

PART – A

1 a. Derive an expression for drain-to-source current i_{DS} from i_D v/s V_{DS} relationship for triode and saturation regions of n-MOSFET. **(10 Marks)**

b. For an 0.8μm technology for which t_{OX} = 15nm, μ_n = 550 cm^2/V. Find k'_n and c_{OX} and the overdrive voltage $V_{ov} = V_{as} - V_t$ required to operate a transistor having W/L = 20 in saturation with I_D = 0.2 mA. What is the minimum V_{DS} needed? **(06 Marks)**

c. Design the circuit shown in Fig.Q.1(c) to obtain a drain voltage of 0.1V. What is the effective resistance between drain and source? At this operating point, let V_t = 0.8V and $K_n^1\left(\frac{W}{L}\right) = 1mA/V^2$. **(04 Marks)**

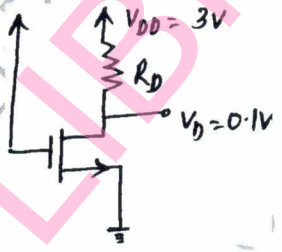

Fig.Q.1(c)

2 a. Briefly explain any two types of biasing methods in MOS amplifier circuits. **(06 Marks)**

b. For a common source amplifier with g_m = 2 mA/V, r_0 = 50KΩ and R_D = 10KΩ, R_G = 10MΩ, R_L = 20KΩ and R_{sig} = 0.5MΩ. Calculate R_{in}, G_v, A_v, A_{vo}, R_{out}. **(10 Marks)**

c. Mention any 4 comparison of important characteristics of MOSFET and the BJT. **(04 Marks)**

3 a. Explain the CMOS implementation of IC common source amplifier and hence explain how to determine its small signal voltage gain. **(10 Marks)**

b. For the common gate amplifier with W/L = 4μm/0.2μm, $\mu_n C_{OX}$ = 350 $\mu A/V^2$, r_0 = 18 KΩ, I_D = 100μA, g_m = 1.2 mA/V, χ = 0.2, R_s = 10KΩ, R_L = 100 KΩ, C_{gs} = 20fF, C_{gd} = 5fF, C_L = 5fF. Find A_{vo}, R_{in}, R_{out}, G_v, G_{is}, G_i and f_H. **(10 Marks)**

4 a. Explain the circuit of MOS cascade amplifier and hence obtain an expression for short circuit transconductance G_M. **(10 Marks)**

b. Explain briefly with neat circuit diagrams:
i) Wilson MOS mirror
ii) Widlar current source. **(10 Marks)**

PART – B

5 a. Explain the basic operation of BJT differential pair. **(08 Marks)**

b. For the nMOS differential pair with a common-mode voltage V_{cm} applied as shown in Fig.Q.5(b). let $V_{DD} = V_{SS} = 2.5V$, $K_n' W/L = 3mA/V^2$, $V_{tn} = 0.7V$, I = 0.2mA, $R_D = 5K\Omega$. Neglect channel length modulation.

i) Find V_{OV} and V_{GS} for each transistor.

ii) For $V_{CM} = 0$ find V_s, i_{D1}, i_{D2}, V_{D1} and V_{D2}.

iii) Repeat (ii) for $V_{cm} = 1V$.

iv) What is the highest value of V_{cm} for which Q_1 and Q_2 remain in saturation, if current source I requires a minimum voltage of 0.3V to operate properly. What is the lowest value for V_s and hence for V_{cm}. **(12 Marks)**

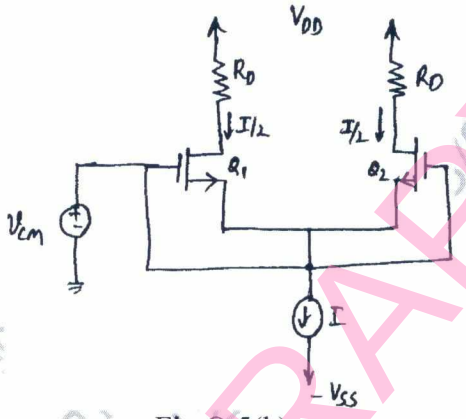

Fig.Q.5(b).

6 a. Explain briefly with expressions the properties of negative feedback. **(08 Marks)**

b. A series-shunt feedback amplifier employs a basic amplifier with input and output resistances each of 1KΩ and gain A = 2000 V/V. The feedback factor β = 0.1 V/V. Find the gain A_f the input resistance R_{i_f} and output resistance R_{o_f} of the closed loop amplifier. **(06 Marks)**

c. Explain briefly an alternative approach for finding loop gain Aβ. **(06 Marks)**

7 a. Explain instrumentation amplifier with neat circuit diagrams. **(08 Marks)**

b. With neat diagram, explain the sample and hold circuit using opamp. **(07 Marks)**

c. Derive an expression for an input resistance of the inverting amplifier taking into account the finite open loop gain A of the opamp shown in Fig.Q.7(c). **(05 Marks)**

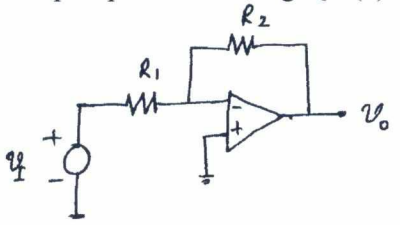

Fig.Q.7(c)

8 a. Briefly discuss the parameters used to characterize the operation and performance of logic circuit families. **(08 Marks)**

b. Write the expressions for propagation delay of an inverter. **(05 Marks)**

c. Sketch a CMOS logic circuit that realizes the function $Y = AB + \overline{AB}$ using equivalence or co-incidence function. **(07 Marks)**

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10EC64

Sixth Semester B.E. Degree Examination, Dec.2013/Jan.2014
Antennas and Propagation

Time: 3 hrs. Max. Marks:100

Note: ***1. Answer FIVE full questions, selecting at least TWO questions from each part***
2. Draw diagrams wherever necessary.

PART – A

1 a. What is directivity? Obtain the value of beam area in terms of radiation intensity. **(05 Marks)**

b. What is effective length for an antenna? Obtain the value in the case of $\lambda/2$ dipole. **(06 Marks)**

c. Calculate the exact directivity for the following sources having following power patterns:

i) $U = U_m \cdot \sin^2\theta \cdot \sin^3\phi$.

ii) $U = U_m \cdot \sin\theta \cdot \sin^3\phi$.

iii) $U = U_m \cdot \sin^2\theta \cdot \sin^3\phi$.

U has value only for $0 \le \theta \le \pi$ and $0 \le \phi \le \pi$ and is zero else where. **(09 Marks)**

2 a. State and explain power theorems in terms of power density and radiation intensity. **(05 Marks)**

b. Explain the different radiation patterns for an antenna. **(07 Marks)**

c. Derive the expression for the field intensity in the case of 'n' number of isotropic sources with uniform spacing. **(08 Marks)**

3 a. Obtain the electric field intensity in the case of a thin linear antenna. **(10 Marks)**

b. Calculate the value of radiation resistance in the case of a short dipole. **(06 Marks)**

c. Obtain the value of directivity when two isotropic sources oppositely exited. **(04 Marks)**

4 a. Explain with neat diagrams different types of slot antenna and its working concept. **(08 Marks)**

b. Obtain the value of impedance of slot antenna in terms of its complimentary dipole antenna impedance Z_d. **(06 Marks)**

c. Explain Babinet's principle with illustrations. **(06 Marks)**

PART – B

5 a. Explain various types of horn antennas with neat diagrams. **(06 Marks)**

b. Explain the working of a log-periodic antenna with a neat diagram. **(08 Marks)**

c. Determine the cut-off frequencies and band pass of a log-periodic dipole array with a design factor of 0.7. Ten dipoles are used in the structure, the smallest having a dimension equal to $\frac{l_1}{2} = 0.3\,\text{mtrs}$. **(06 Marks)**

6 a. Explain a yagi-uda antenna structure with a neat diagram. **(07 Marks)**

b. Explain lens antenna and find the radius of curvature (R) in the case of a convex lens. **(07 Marks)**

c. A paraboloid reflector of 1.8mtr diameter is used at 6 GHz. Calculate beam width between the nulls and gain in dB. Area factor for dish is 0.65. **(06 Marks)**

7 a. Derive an expression for field intensity in the case of a space wave propagation. **(10 Marks)**

b. Explain duct propagation. **(05 Marks)**

c. A transmitter radiates 100 watts of power at a frequency of 50MHz in space wave propagation. The transmitting antenna has a gain of 5 and a height of 50mtrs. The receiving antenna height is 2mtrs. It is estimated that a field strength of 100μV/meter is required to give satisfactory signals at the receiver. Calculate the distance between the transmitting and receiving antennas assuming flat earth. **(05 Marks)**

8 a. Explain the mechanism of ionospheric wave propagation. Also derive an expression for the refractive index of ionosphere. **(10 Marks)**

b. Define the terms: i) Critical frequency and ii) Skip distance for ionosphere with neat diagrams. **(05 Marks)**

c. Calculate the value of frequency at which the electromagnetic wave should be propagated in the D-region. It is given that refractive index $\mu = 0.5$ and electron density $N = 10^{12}$ electrons/m^3. **(05 Marks)**

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10EC65

Sixth Semester B.E. Degree Examination, Dec.2013/Jan.2014
Operating Systems

Time: 3 hrs. Max. Marks:100

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

PART – A

1 a. Define an operating system. What are the different facets of user convenience? **(06 Marks)**

b. Explain partition based and pool based resource allocation strategies. **(06 Marks)**

c. Explain time sharing operating system with respect to, i) Scheduling and ii) Memory management. **(08 Marks)**

2 a. What are the functions of an operating system? Explain. **(06 Marks)**

b. Explain virtual machine operating system (VMOS). What are the advantages of using virtual machines? **(08 Marks)**

c. In a batch processing system, the results of 1000 students are to be printed. Reading a card or printing a result needs 100 msec whereas read/write operation in a disck needs only 20 msec. Processing a record needs only a 10 msec of CPu time. Compute the program elapsed time and CPu idle time with and without spooling. **(06 Marks)**

3 a. What is a process? What are the components of a process? Explain. **(04 Marks)**

b. Explain with neat diagrams, i) User threads ii) Kernel level threads. **(08 Marks)**

c. With a neat diagram, explain different states of a process and state transitions in the UNIX operating system. **(08 Marks)**

4 a. Explain the techniques used to perform memory allocation by using a free list. **(10 Marks)**

b. Explain internal and external fragmentation with examples. **(06 Marks)**

c. Compare contiguous and non-contiguous memory allocation methods. **(04 Marks)**

PART – B

5 a. What are the functions performed by the virtual memory manager? Explain. **(08 Marks)**

b. For the following page reference string, calculate the number of page faults with FIFO and LRU page replacement policies when i) Number of page frames are three ii) Number of page frames are four.

Page reference string : 5 4 3 2 1 4 3 5 4 3 2 1 5

Reference time string : $t_1, t_2, t_3, \ldots\ldots\ldots, t_{13}$ **(12 Marks)**

6 a. With a neat diagram, explain the facilities provided by the file system and IOCS layers. **(08 Marks)**

b. Explain the index sequential file organization with an example. **(08 Marks)**

c. What is a link? With an example, illustrate the use of a link in an acyclic graph structure directory. **(04 Marks)**

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.

7 a. Compare : i) Preemptive and non-preemptive scheduling ii) Long term and short term schedulers. **(08 Marks)**

b. Describe the shortest request next (SRN) and highest response ratio next (HRN) scheduling policies and determine the average turn around time and weighted turn around time for the following set of processes shown in Table Q7 (b). **(12 Marks)**

Table Q7 (b)

Processes	P_1	P_2	P_3	P_4	P_5
Arrival time	0	2	3	4	8
Service time	3	3	5	2	3

8 a. Explain i) Direct and indirect naming.
ii) Blocking and non blocking sends. **(06 Marks)**

b. What is a mail box? With an example, explain the features of mailboxes and its advantages. **(08 Marks)**

c. Explain pipes and message queues in UNIX. **(06 Marks)**

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10EC662

Sixth Semester B.E. Degree Examination, Dec.2013/Jan.2014
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. Describe briefly the main advantages offered by satellite communications. Explain what is meant by a distance insensitive communication system. **(06 Marks)**

b. Explain the various frequency bands used and various services provided by a satellite. **(08 Marks)**

c. Describe briefly the development of INTELSAT starting from the 1960s through the present. **(06 Marks)**

2 a. Explain briefly the orbital parameters required to determine a satellite orbit. **(08 Marks)**

b. The two satellites are moving in different elliptical orbits with the same perigee but different apogee distances. The semimajor axes of the two orbits are 16000 km and 24000 km. Determine the orbital period of satellite 2 if the orbital period of satellite 1 is 600 min. **(04 Marks)**

c. An earth station is located at latitude 30°S and longitude 130°E. calculate the antenna-look angles for satellite at 156°E. Assume radius of earth 6371 km and a_{GSo} = 42,164 km. **(08 Marks)**

3 a. Explain what are rain rate, specific attenuation and effective path length in connection to rain attenuation? **(06 Marks)**

b. For an uplink the required [C/N] ratio is 20 dB. The operating frequency is 30 GHz, and the bandwidth is 72 MHz. The satellite [G/T] is 14.5 dBK^{-1}. Assuming operation with 11 dB input BO (i) Calculate the saturation flux density [RFL] are1 dB (ii) The total losses amount to 218 dB. Calculate the earth station [EIRP] required. **(08 Marks)**

c. What is the system noise temperature? Derive the expression for equivalent noise temperature. **(06 Marks)**

4 a. Explain briefly the Telemetry, Telecommand and Tracking control (TTC-m) monitoring system of a communication satellite, with a block diagram. **(08 Marks)**

b. What is attitude control as applicable to satellites? Explain with the help of a diagram, spin stabilization of satellites. **(08 Marks)**

c. Explain: (i) Satellite transponder (ii) Frequency reuse. **(04 Marks)**

PART – B

5 a. With the aid of a block schematic, describe the functioning of a transmit-receive earth station used for telephone traffic. **(06 Marks)**

b. Explain what is meant by the term redundant earth station. **(04 Marks)**

c. (i) The desired carrier [EIRP] from a satellite is 34 dBW, and the ground station receiving antenna gain is 44 dB in the desired direction and 24.47 dB toward the interfering satellite. The interfering satellite also radiates an [EIRP] of 34 dBW. The polarization discrimination is 4 dB. Determine the carrier-to-interference ratio at the ground receiving antenna.

(ii) Station A transmits at 24 dBW with an antenna gain of 54 dB, and station C transmits at 30 dBW. The off-axis gain in the S_1 direction is 24.47 dB, and the polarization discrimination is 4 dB. Calculate the [C/I] ratio on the uplink.

(iii) Find the overall ratio $[C/I]_{ant}$, using the uplink and downlink values of [C/I] calculated. **(10 Marks)**

6 a. Explain the spade system, with a neat diagram. **(07 Marks)**

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

c. A 14 GHz uplink operates with transmission losses and margins totaling 212 dB and a satellite [G/T] = 10 dB/K. The required uplink $[E_b/N_o]$ is 12 dB. (i) Assuming FDMA operation and an earth-station uplink antenna gain of 46 dB, calculate the earth-station transmitter power needed for transmission of a T_1 baseband signal. (ii) If the downlink transmission rate is fixed at 74 dBb/s, calculate the uplink power increase required for TDMA operation. **(06 Marks)**

7 a. Describe the operation of a typical VSAT system. State briefly where VSAT system found widest application. **(10 Marks)**

b. With respect to direct broadcast satellite services, explain (i) Orbital spacing (ii) Power rating and number of transponders (iii) Frequency of operation. **(10 Marks)**

8 a. Explain the global positioning system, in detail. **(10 Marks)**

b. Describe the main features of the Irridium system and comment briefly on how is this different from the orbcomm system. **(10 Marks)**

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