13/12/2011 BE ETRX VII (OLD)
AGJ 2nd half (e+) 46
Basics of VLSI

Con. 6581-11. (OLD COURSE) MP–6157

(3 Hours) [Total Marks : 100

NOTE:-(1) Que no 1 is compulsory.

(2) Out of remaining six questions solve any four.

(3) Each question carries 20 marks and sub-questions carry equal marks.

(4) Assume suitable data if required.

(5) Useful physical constants are given in following table.

Name	Symbol	Value	Units
Boltzmann's constant	k	1.38×10^{-23}	J/K
Dielectric constant of vacuum	ε_0	8.854×10^{-14}	F/cm
Dielectric constant of Silicon	εsi	$11.7 \times \varepsilon_0$	F/cm
Dielectric constant of SiO_2	εox	$3.97 \times \varepsilon_0$	F/cm
Intrinsic carrier concentration of silicon	ni	1.45×10^{10} at 27 °c	cm^{-3}

Que 1. (A) Draw CMOS 2 input NOR gate and explain its working.

(B) Write short notes on Latch up in CMOS.

Que 2. (A)Calculate the zero-bias threshold voltage for an NMOS Silicon-gate transistor that has well doping $= 3 \times 10^{15}$,gate doping = ND $=10^{20}$ cm^{-3} , gate- oxide thickness = 250 A^0 , and 3×10^{10} / cm^2 singly charged positive ions at the oxide-Silicon interface. Also calculate the ion- implant doses needed to achieve a threshold voltage of -1 V.

(B) Write short notes on butting and buried contacts in NMOS circuits.

Que3. Draw a circuit diagram, stick diagram of CMOS inverter and its mask layout considering lambda based design rules.

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Que3. Draw a circuit diagram, stick diagram of CMOS inverter and its mask layout considering lambda based design rules.

Que4. (A) Write short notes on, " Testing of Integrated circuits".

(B) Explain Oxidation process in silicon semiconductor technology.

Que5. (A) Draw CMOS transmission gate and explain its working.

(B) Explain full scaling in VLSI.

Que6. (A) Write short notes on FET capacitance.

(B) Draw circuit diagram and stick diagram of 4:1 multiplexer using enhancement mode devices and explain its operation.

Que 7. Discuss the processing sequence of a p-well CMOS inverter with the help of cross-sectional views.

16/12/11 BE ETRX VIII (OLD) Mechatronics

AGJ 2nd half (e+) 37

Con. 6586-11. **(OLD COURSE)** **MP–4750**

(3 Hours) **[Total Marks : 100**

N.B. : (1) Question No. **1** is **compulsory**.
(2) Attempt any **four** out of remaining **six** questions.
(3) **Figures** to the **right** indicate **full** marks.
(4) Assume **suitable** data if required.

Q.1 Solve the following: [20]
a) What is range sensor and its applications.
b) Explain Mechatronics system with its key elements.
c) Explain different types of gear systems.
d) Explain the basic principle of Hall effect sensor.

Q.2 (a) Explain construction of permanent magnet stepper motors. Derive motor equations and draw block diagram model of PM stepper motor [10]
(b) Explain the following terms :
(i) Hydraulic resistance (ii) Hydraulic Capacitance
(iii) Thermal Capacitance (iv) Damper model. [10]

Q.3 (a) Draw the ladder rungs to represent :(i) Two switches are normally open and both have to be closed for a motor to operate.(ii) Either of two, normally open, switches have to be closed for a coil to be energised and operate an actuator.(iii) A motor is switched on by pressing a spring return push button start switch and the motor remains on until another spring-return push-button stop switch is pressed. [10]
(b) Device a ladder diagram that could be used with a domestic washing machine to switch on a pump to pump water for 100 sec into the machine then switch off. And switch on the heater for 50 sec to heat the water. The heater is then switched off. Another pump is used to empty the water from the machine for 50 sec. Use Master Start stop logic(Rung). [10]

Q.4 (a) Explain various properties of sensors. [5]
(b) Write a fundamental laws, which is used most mechatronics application involve rigid body system. [5]
c) Explain in detail Mechatronics design process with its block diagram, operation and importance. [10]

Q.5 (a) A force of cantilever beam is to be measured. Draw the system diagram and block diagram model. Explain hardware/ software needed to implement hardware in loop of this system. [10]
(b) Explain the basic function of the various components of Data Acquisition and Control system. [5]
(c) What are the applications of fiber optic devices in mechatronics ? [5]

Q.6 (a) What is adaptive control system and compare the performance of different types of adaptive control systems. [10]
(b) Write the steps the installation of I/O cards and software. [5]
(c) Explain brushless DC Motor [5]

Q.7 Write short note on following: [20]
a) Components of Data acquisition and Control system.
b) Hardware – in – loop
c) Control system design techniques

28/12/2011 BE ETRX VII (OLD)
Elective-I Micro Computer system Design

AGJ 2nd half (h+) 27

Con. 6805-11. **(OLD COURSE)** **MP–6145**

(3 Hours) **[Total Marks : 100**

Note:
1. Question no. 1 is compulsory. Answer any four questions from remaining questions.
2. Assume suitable data, if necessary.

Q.1.	a.	Describe Pentium Processor architecture with neat block diagram.	10
	b.	Describe SCSI bus protocol in detail.	10
Q.2.	a.	Describe code cache organization with nead diagram.	12
	b.	Describe branch prediction logic implemented on Pentium processor.	08
Q.3.	a.	Describe pipelined and non-pipelined bus cycles.	12
	b.	Describe split-line access with neat diagram.	08
Q.4.	a.	Describe reflected wave switching? Explain the advantage od reflected wave switching.	10
	b.	Explain how misaligned data transfer takes place on Pentium system.	10
Q.5.	a.	Explain how interrupts are handled on PCI bus? Also, explain how interrupts are routed on PCI bus.	12
	b.	PCI bus is called as "Green Bus". Justify.	08
Q.6.	a.	Describe IDE protocols.	06
	b.	Describe SCSI bus phases in brief.	07
	c.	Explain different types of data transfers implemented on USB bus.	07
Q.7.	Write short note on ;		20
	a.	USB bus topology	
	b.	PCI interrupt chaining	
	c.	Data Cache organization on Pentium	
	d.	PCI Read cycle	

8/12/2011 BE ETRX VII (OLD)
Instrumentation Systems

Con. 6493-11. **MP-6142**

(OLD COURSE)

(3 Hours) **[Total Marks : 100**

N.B. : (1) Question No. **1** is **compulsory**.
(2) Attempt any **four** questions out of **remaining** questions.
(3) Draw **neat** and **clear** circuit, block diagrams.

1. (a) Explain the 2-wire, 3-wire and 4-wire type PT-100 type temperature transducer, give all the connection diagram. **5**
   (b) What is LVDT ? What are the parameters those can be measured by this ? Explain it's I/O characteristic with the constructional details. **5**
   (c) Explain the principle of Strain-Gauge. Derive an expression for Gauge-Factor. Explain the Poisson's Ratio. **5**
   (d) Explain the operating principles of photo-conductive cell, photo-voltaic cell and photo-emissive cell. Also state their applications in Industrial field. **5**

2. (a) Explain the Seeback effect and Peltiar effect in thermocouple type temperature measurements. **10**
   (b) Explain the 5-laws of Thermo-couples with diagrams. **10**

3. (a) Explain the Two-types of ultrasonic type flow-measurements. Derive the equations in both the cases. **10**
   (b) Explain the Bourdon type pressure measurements, also explain how the Primary-Secondary Transducer can give pressure measurement in electrical output. **10**

4. (a) Explain the following types of displacement transducers :— **12**
      * Incremental type for Angular and Linear Displacement.
      * Encoded type Angular and Linear Displacement.

      Also explain how the Direction and Magnitudes of displacement quantities are generated.
   (b) Explain the following types of strain gauges. **8**
      * Wire type
      * Foil type
      * Semi-conductor type.

5. (a) Explain the different types of Torque Measurements Methods. Give their constructional diagrams. **10**
   (b) Describe the Dynamic Response of 2^{nd} order Instrument when subjected to step-I/P. Derive the out-put response. **10**

6. (a) Explain the Hot-Wire type Anemo-meter with constructional diagram. **10**
   (b) Explain the Electro-magnetic type flowmeter with constructional details. Explain and derive the equation for electrical out put. **10**

7. Solve any **two** :— **20**
   (a) Virtual Instrumentation with one case study.
   (b) Flow-metering using pressure measurements.
   (c) Data Logging System for Multi-Channel Inputs.
   (d) 2-port and 3-port-type Isolation Amplifier with different types.

B.E(ETRX) Sem VII (old) Digital Communication

17/12/2011 32 2nd Half-Exam -11 mina (d)

Library

Con. 6661-11. (OLD COURSE) MP-6149

(3 Hours) [Total Marks : 100

N. B. : (1) Question No. **1** is **compulsory**.
(2) Attempt any **four** questions out of remaining **six** questions.
(3) Assume **suitable** data if required and mention it with **justification**.

1. Answer any **four** questions :— **20**
   (a) Define Probability. Explain Conditional and Joint Probabilities.
   (b) Define Hamming Codes. Prove that the Hamming Code corrects only single bit error.
   (c) Show that duobinary signalling suffers from error propagation while precoded duobinary signalling does not.
   (d) Why MSK is called shaped QPSK ?
   (e) What are Pseudo-noise (PN) Sequence in spread spectrum technology ? Why they are used in spread spectrum modulation system ?

2. (a) An Analog Signal is band limited to BH_z sampled at Nyquist rate and Quantized at 5 levels with probabilities 0·5, 0·125, 0·0625, 0·25 and 0·0625. Calculate entropy and information. **5**
   (b) Prove that the entropy of extremely likely and extremely unlikely message is zero. **5**
   (c) A discrete Memoryless Source has an alphabet of five symbol with these probabilities as :— **10**

Symbol	S_1	S_2	S_3	S_4	S_5
Probability	0·40	0·19	0·16	0·10	0·15

   (i) Construct a Huffman Code.
   (ii) Calculate code efficiency η and redundancy of the code.

3. (a) With the help of neat block diagram and waveform, explain how a message transmitted in BFSK ? What type of receiver is used for BFSK reception ? **10**
   (b) Prove that for the 16-ary QASK digital modulation technique, the Euclidean distance is given by : **10**

$$d = 2\sqrt{0 \cdot 4\,Eb}$$

   Where Eb is normalized energy per bit also draw signal constellation diagram for 16-ary QPSK and Compare with 16-ary QASK.

4. (a) For a systematic linear block codes the three parity check digits C_4, C_5 and C_6 are given by : **10**

$$C_4 = d_1 \oplus d_3$$
$$C_5 = d_1 \oplus d_2 \oplus d_3$$
$$C_6 = d_2 \oplus d_3$$

   (i) Construct generator matrix
   (ii) Construct code generated by this matrix
   (iii) Determine error detection and correction capability
   (iv) Decode the received codeword R(s) = 1 0 11 00.

[TURN OVER

(b) A convolution encoder has single shift register with two stages three Modulo-2 adders and an output multiplexer the following generator sequence are combined by the multiplexer to produce the encoder O/P : **10**

$g_1 = (1, 1, 1),\ g_2 = (1, 0, 1),\ g_3 = (1, 1, 0)$

(i) Draw the block diagram of the encoder

(ii) Obtain the O/P for the data :

D = {1 0 1 1 0 LSB}

(iii) Sketch the code tree and trace the path corresponding to the message sequence in (11)

(iv) Draw the trellie diagram for the encoder.

5. (a) Show that for an input signal which is an sequence of rectangular positive and negative pulses, the integrator is the matched filter. **10**

(b) Explain 4-ary PSK alongwith the following line :— **10**

(i) Modulation and demodulation block diagram of offset QPSK.

(ii) Plot the Power Spectral density with relevent frequencies and hence Bandwidth.

(iii) Signal space representation hence Eucledian distance.

6. Differentiate between :— **20**

(a) Fast frequency hopping and slow frequency hopping.

(b) Source Coding and Channel Coding.

(c) Offset QPSK and Non-Offset QPSK.

(d) BPSK, DPSK and DEPSK.

7. (a) Draw the block diagram of DS-SSS transmitter and receiver obtain the expression for the signal at the O/P of each block and show that the original sequence can be recovered at the recevier O/P. **10**

(b) Write short notes on (any **two**) :— **10**

(i) Inter Channel and Inter Symbol Interference

(ii) Tapped-Delay line equalizer

(iii) Lempel-Ziv Coding.

2/12/2011 BE (ETRX) Sem-VII (OLD)
FTA

ws Sept-2011-165

Con. 6318–11. **(OLD COURSE)** **MP–5824**

(3 Hours) **[Total Marks : 100**

N.B. : 1) Question no 1 is compulsory.
2) Attempt any **four** questions from remaining **six** questions.
3) Figures to right indicate full marks
4) Assume suitable data, if any.

Q1) Attempt the following ; (20)
a) Discuss the design procedure for elliptic filter design.
b) Explain zero-input and over flow limit cycle oscillations due to quantization in digital filter.
c) Compare IIR filter and FIR filter.
d) To design a digital band pass filter, which type of Linear Phase FIR filter can be used? Why?

Q2) a) Design a low pass half-band filter to meet the following specifications:
Pass band edge : 8 KHz
Stop band edge : 16 KHz
Ap = 1 dB, As = 50 dB. Use Kaiser window (10)

b) Convert $H(s) = \frac{4}{(s+1)(s^2+4s+5)}$ to H(z), using impulse invariance, with $t_s = 0.5$ s. (10)

Q3) a) Derive an exact expression for the spectrum of the Blackman window. Using this expression, for $N \gg 1$, show that the main lobe width for the Blackman window is approximately $6W_s / N$. (15)

b) Explain the method of matched Z-transform. (05)

Q4) a) Design a fourth-order Butterworth band pass filter with a 2 dB pass band of 200 Hz and a center frequency of $f_0 = 1$ KHz. (10)

b) What major problem associated with designing of FIR filter using window method and frequency sampling method. How to overcome this problem? (10)

Q5) a) Design a second order digital notch filter having a notch frequency at 60 Hz and a 3 dB notch band width of 6 Hz. The sampling frequency employed is 400 Hz. (10)

b) Design a Chebyshev IIR digital high pass filter with the following specifications: Pass band edge : 700 Hz
Stop band edge : 500 Hz
Pass band ripple : 1 dB
Min. stop band attenuation : 32 dB
Sampling frequency : 2 KHz (10)

Q6) a) Discuss the design procedure of Bessel filters. Obtain 5th order normalized Bessel approximation. (10)

b) Show that the relation between analog frequency and digital frequency in bilinear transformation is given by $\Omega = \frac{2}{T}\tan(\frac{w}{2})$, using relation between 'S' and 'Z' bilinear transformation. (10)

Q7) State true or false and justify the answer : (20)

a) An ant symmetric second order linear phase FIR filter has one possible pole zero diagram whereas symmetric type filter has more than one possibility.

b) The poles of the Butterworth filter lie on a circle whereas the poles of the Chebyshev filter lie on an ellipse.

c) The analog poles will not be aliased by the impulse invariant mapping if they are confined to the S- plane's primary strip.

d) The physically realizable and stable IIR filter can have a linear phase.