20/6/2011 ME Sem - II E TRX PI&CD

164 : 1st half.11-PH(I)

Con. 4116-11.

BB-4287

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

N.B. : (1) Question No. **1** is **compulsory**.
(2) Attempt any **four** questions out of the remaining **six** questions.
(3) Draw **neat** sketches wherever **necessary**.
(4) Assume **suitable** data if **required** but **justify** the same.

1. Answer the following :–
   (a) Explain ratio and cascade control with the help of the example. **5**
   (b) Compare pneumatic, hydraulic and electronic controllers with suitable examples. **5**
   (c) Explain actuators with suitable diagram. **5**
   (d) Explain Peeler lye density control system with suitable diagram. **5**

2. (a) Explain variable area viscometer with schematic diagram. **10**
   (b) Explain the dye cycle process in detail of textile yarn and fabric. **10**

3. (a) Design a proportional Integral Controller with a proportional band of 30% and an integration gain of 0·1% (% –5). The 4 to 20 mA input converts to a 0·4 to 2 volts signal and output is to be 0 – 10 volts. Calculate the Values of G_P, G_I, R_2, R_1 and C, respectively. **10**
   (b) Explain two-position mode controller with neutral zone. Also write it's output equation. Write the names of its applications. **10**

4. (a) Explain influent water treatment plant with sand filter control system. **10**
   (b) Explain criteria for selection of an appropriate control mode for a given process parameter. **10**

5. (a) Explain in short. safety measures in process control. Also compare fuzzy logic control with classical control systems. **10**
   (b) What are the various types of flow-meters ? Explain electromagnetic flow meter with suitable diagram and flow rate equation. **10**

6. (a) Explain working of self-tuning regulator. Also give design approach for H-infinity. **10**
   (b) List the various temperature transducers. Write the resistance and temperature relation of Thermister. Also explain working principle of thermister. **10**

7. Write short notes on the following :– **20**
   (a) Control valves
   OR
   Drum level control
   (b) pH measurement
   (c) PLC
   OR
   Mcleod Gauge.
   (d) Instrumentation amplifier.

M.E. ETRX II (Rev)
VLSI Design

Con. 3313-11. **BB-4275**

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

N.B. : (1) Question No. **1** is **compulsory**.
(2) Out of remaining **six** questions solve any **four**.
(3) Each question carries **20** marks.
(4) The sub-questions in a question carries **equal** marks.
(5) Assume **suitable** data if **required**.
(6) Useful physical constants are given in following table.

Name	Symbol	Value	Units
Boltzmann's constant	K	1.38×10^{-23}	$J/^{\circ}K$
Dielectric constant of vacuum	ε_o	8.854×10^{-14}	F/cm
Dielectric constant of Silicon	ε_{si}	$11.7\varepsilon_o$	F/cm
Dielectric constant of SiO_2	ε_{ox}	$3.97\varepsilon_o$	F/cm
Intrinsic carrier concentration	n_i	1.45×10^{10}	cm^{-2} (at 27 °C)

Que 1:- Solve any four of the following:

(a)Explain the concept of strong one and strong zero levels signals in CMOS.

(b)For N channel MOSFET having threshold voltage 1.5 Volt, when V_{gs} = 5 V & V_{ds} = 2V is applied, the drain current is 100 μA. Find the mode of operation and W/L ratio of the device. (Assume oxide capacitance = $51.72 \times 10^{-9} F/cm^2$.

(c) Realize EXOR gate using NMOS pass transistors.

(d) Write short notes on Floor planning.

(e) Explain input protection in CMOS.

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Con. 3313-BB–4275-11. 2

Que 2:- (a)Calculate the zero-bias threshold voltage for an NMOS Silicon- gate transistor that has well doping $N_A = 3 \times 10^{17}\ cm^{-3}$, gate doping $N_D = 10^{20}\ cm^{-3}$, gate- oxide thickness $t_{ox} = 22\ A^{\circ}$, and $2 \times 10^{10}\ cm^{-2}$ singly charged positive ions per unit area at the oxide-Silicon interface. Also calculate the ion- implant doses needed to achieve a threshold voltage of 1 V.

(b) Euler's method with suitable example and discuss its advantages.

Que3:- Draw a circuit diagram, stick diagram of 2 input CMOS OR gate and its mask layout considering lambda based design rules.

Que4:-(a) Compare NMOS logic family with Enhancement mode and Depletion mode pull up.

(b) Draw a full adder using only NMOS pass transistors.

Que5:- Explain the processing sequence of N well CMOS inverter With cross-sectional views.

Que6:- (a) Explain lambda based design rules for (I) polysilicon crossing diffusion to have MOSFET and (II) metal pattern over contact cut. Discuss the faults created ,if the rules are not followed.

(b) Draw static RAM cell and explain its working.

Que 7:- (a) Draw circuit diagram and stick diagram of 4:1 multiplexer using only enhancement mode devices and explain its operation.

(b)Draw NOR-NOR realization of an NMOS PLA with enhancement mode pull down devices .The PLA should have 3 inputs and should be programmed to realize 4 product lines with 3 output lines. Explain operation of any one output. The product lines should be as follows:-

$P_0 = \bar{I}_0\bar{I}_1$, $P_1 = \bar{I}_0 I_1$, $P_2 = I_0 I_1 \bar{I}_2$, $P_3 = I_0 I_2$ and the output lines should be as follows:

$Y_0 = P_1 + P_3$, $Y_1 = P_0 + P_2 + P_3$, $Y_2 = P_1 + P_2$

ME ETRX II (Rev)
Microprocessor & Systems - II

16 1st half.11-AM(n)

Con. 3587-11. **BB-4272**

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

N.B. : (1) Question No. **1** is **compulsory**.
(2) Attempt any **four** questions out of the remaining **six** questions.
(3) Assume suitable **data** wherever **necessary**.

1. Master A wants to perform two transactions. The first transaction has 3 data phases while the second transaction has only single data phase. Master B wants to perform only one transaction which is of single data phase. Master B is of higher priority. Draw and explain the timing diagram for the PCI bus arbitration between these masters. **20**

2. (a) Pentium is performing the instruction MOV EAX, [0004]. The device (memory) interfaced to pentium is of 8-bits. Explain with neat diagram, how the data transfer takes place for the above instruction. Show clearly the extra hardware used. **15**
   (b) In Pentium, $\overline{\text{LOCK}}$ is asserted under certain conditions. List all the conditions. **5**

3. (a) Why $\overline{\text{FRAME}}$, $\overline{\text{IRDY}}$ and $\overline{\text{LOCK}}$ are bidirectional in PCI ? **5**
   (b) What are the contributing factors to the "Green Nature" of PCI bus ? **5**
   (c) By taking an example, explain "Fairness" algorithm for PCI. **5**
   (d) In PCI, how the user comes to know about returning of the bus to Idle state ? **5**

4. (a) The pentium performs burst cycle from main memory. Draw and explain the timing diagram. Assume one wait state per quadword. **10**
   (b) Explain with a neat diagram, Pentium state transitions. **10**

5. (a) Explain Instruction Branch Prediction in Pentium. **10**
   (b) Explain "WRITE ONCE" policy in the presense of L2 Cache. **10**

6. (a) Explain the basic features of QNX. **10**
   (b) Explain the importance of interrupt handler in QNX. **10**

7. (a) Compare USB and RS 232 C interface and justify the choice in terms of speed and addressibility for data transfers. **12**
   (b) Explain data transfer processes over USB. **8**

M.E ETRX II (Rev.)
Elective III/IV Advanced Communication Theory

Con. 3687-11. **BB-4284**

(4 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 wherever **required**.

1	a	In case of cyclic code, state the conditions to be satisfied for a valid generator polynomial. Hence, obtain a valid generator polynomial for a (7,4) cyclic code.	5
	b	Distinguish between hard decision decoding and soft decision decoding	5
	c	Distinguish between Rayleigh fading and Ricean fading channels, giving their pdfs.	5
	d	Explain Maximum-likelihood sequence estimation.	5
2	a	A systematic block code has parity check equations as given below: $p_1 = m_1 + m_2 + m_4$ $p_2 = m_1 + m_3 + m_4$ $p_3 = m_1 + m_2 + m_3$ $p_4 = m_2 + m_3 + m_4$ where m_i are the message digits and p_i are the parity check digits. i) Find the generator matrix and the parity check matrix for this code ii) How many errors can be detected and corrected? iii) If the received codeword is 10101010, find the syndrome.	10
	b	Explain 'Hamming bound'. Hence obtain the relation between 'n' and 'm' for Hamming code.	5
	c	For a (7,4) cyclic code with generator polynomial $g(x) = x^3 + x^2 + 1$, construct the generator matrix for both systematic and non-systematic codes.	5
3	a	A convolutional code is described by $g_1 = \{101\}$, $g_2 = \{111\}$, $g_3 = \{110\}$ i) Sketch the encoder and find the codeword for the message sequence,110011 ii) Find the transfer function T(D) of the code and the minimum free distance of the code	10
	b	For the encoder given in Q.3(a), if the received sequence is r = [110 110 110 111 010 101 101], use Viterbi algorithm to find the transmitted bit sequence.	10
4	a	State and prove Nyquist criterion for a bandlimited channel with zero ISI	10
	b	Justify the statement: "Raised cosine spectrum has desirable spectral properties and is widely used in practice"	5
	c	Consider the transmission of data via PAM over a channel that has a bandwidth of 1500 HZ. Show how the symbol rate, varies as a function of the excess bandwidth by determining the symbol rate for excess	5
		bandwidth of 25%, 33%, 50%, 67%, 75% and 100%	

5	a	Explain the working of a preset equalizer with a neat sketch. What are its limitations?	6
	b	The unequalized pulse in a PAM system has the following values at sampling times: $p_r(k) = 0.2 \quad k = +1$ $0.8 \quad k = 0$ $0.2 \quad k = -1$ $p_r(k) = 0$ for $\|k\| > 1$ i) Design a three tap equalizer based on zero forcing criterion and sketch the same ii) For the coefficients determined in (i), determine the equalizer output for the case of the isolated pulse i.e: $p_{eq}(k)$ for $k = \pm 2, \pm 3$ iii) Would a five tap equalizer yield $p_{eq}(k) = 1$ for $k = 0$ and $p_{eq}(k) = 0$, for $k \neq 0$	8
	c	With a neat sketch, explain the working of decision feedback equalizer	6
6	a	A shortwave ionospheric radio channel is characterised by a multipath spread of $T_m = 5$ ms and a Doppler spread of $B_d = 0.1$ HZ. i) Determine the coherence bandwidth and coherence time of the channel ii) A signal transmitted over this channel has a bandwidth of $W = 50$ Hz and a time duration of $T \approx 1/W = 20$ ms. Is this a frequency non-selective channel? Is the channel slowly fading? Explain	6
	b	Explain the working of FHSS transmitter and receiver. Distinguish between slow hopping and fast hopping.	8
	c	Explain the diversity techniques used to improve the performance of a digital communication system	6
7		Write short notes on any four:	20
	a	Convergence properties of LMS algorithm	
	b	Trellis –coded modulation	
	c	Multicarrier system	
	d	Magnitude and Phase spectrum of Duobinary signal	
	e	Eye diagram	

ME ETRX II (Rev)
Elective III/IV - Modern ~~(Rev)~~
Digital signal Processin

Con. 3438-11. **BB-4282**

(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 **necessary**.

1. (a) State the properties of Linear Prediction error filters. **5**
(b) What is the effect of step size on Convergence rate of algorithms ? **5**
(c) Justify your answer : Normal Equations for AR parametric models is a set of Linear Equations. **5**
(d) Let x(n) and y(n) be two random time series which are uncorrelated so that Cov [x(n), y(n)] = 0 for all m, n. If a new time series is constructed as p(n) = ax(n) + by(n) where 'a' and 'b' are scalers. Determine the auto correlation function $r_{pp}(m, n)$. **5**

2. (a) Establish the recursive relationship between reflection coefficients k_p and minimum mean-squared error of forward prediction error filter of p^{th} and $(p-1)^{th}$ order E_p^f and E_{p-1}^f respectively. Hence prove the relationship : **12**

$$E_p^f = \left(1 - |kp|^2\right) E_{p-1}^f.$$

(b) Prove that Backward predicition error filter exhibits maximum phase property. **8**

3. (a) An AR (3) process {x(n)} is characterized by the auto correletion sequence : **12**
$\gamma_{xx}(0) = 1$; $\gamma_{xx}(1) = 1/2$, $\nu_{xx}(2) = 1/8$ and $\nu_{xx}(3) = 1/64$
(i) Use the Schur algorithms to determine three reflection coefficients k_1, k_2 and k_3.
(ii) Sketch the Lattice filter for synthesizing x(n) from a white noise excitation.
(b) Determine the system function of all-pole filter that is describe by the Lattice coefficients obtained in part (a). **8**

4. (a) Show that the mean-squared error (MSE) in FIR Wiener filter is a quadratic function of the filter coefficients prove by driving necessary equations. **10**
(b) Comment on the condition of convergence and speed of weight vector convergence of LMS algorithms. Derive necessary equations. **10**

5. (a) Explain how a forward linear prediction filter acts as a whitening filter for a causal AR process. **10**
(b) A third order optional predictor filter has a reflection coefficients $K_3 = 1$ **10**
(i) What may be possible pole-zero pattern of this filter ?
(ii) What may be mean squared errors in this filter ?

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6. (a) Find the transfer function of third order prediction error filter $H_3(z)$ when the transfer function of a 4th order filter $H_4(z)$ is given by : **10**

$$H_4(z) = 1 + 1 \cdot 2z^{-1} + 1 \cdot 12z^{-2} + 0 \cdot 12z^{-3} - 0 \cdot 08z^{-4}.$$

(b) Consider a FIR filter with : **10**

$$h(n) = \{1, a\}$$
$$\uparrow$$

Determine the least-squares FIR inverse filter of length two.

7. (a) Let y(n) be output of stable and causal filter H(z) driven by the signal x(n). Let w(n) be another unrelated signal. Assume all signals are stationery random signals. Show the following relationship :— **10**

(i) $S_{yw}(z) = H(z) \cdot S_{xw}(z)$

(ii) $S_{wy}(z) = S_{wx} \cdot H(z^{-1})$.

(b) Prove the following :— **10**

$$\begin{bmatrix} A_m(z) \\ B_m(z) \end{bmatrix} = \begin{bmatrix} 1 & K_{mz^{-1}} \\ K_m^* & z^{-1} \end{bmatrix} \begin{bmatrix} A_{m-1}(z) \\ B_{m-1}(z) \end{bmatrix}$$

Where $A_q(z)$ and $B_q(z)$ are 9th order Polynomial Equations for forward and backward FIR filter respectively.

M.E. ETRX II
Elective III / IV
Power Electronics

VT-April.-11- 211

BB–4278

Con. 3694–11.

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

N.B. : (1) Question No. **1** is **compulsory.**
(2) Attempt any **four** from remaining **six** questions.
(3) **Figures** to the **right** indicate **full** marks.
(4) Draw **neat** sketches/waveforms wherever **necessary.**
(5) Assume **suitable** additional data, if **necessary.**

1. Answer as directed (any **five**) :–
   (a) Give necessary conditions required to turn off SCR from ON condition when operating on d.c. power supply. **4**
   (b) Explain why isolation circuit is usually provided between control circuit and power circuit. Draw two circuits providing isolation. **4**
   (c) Explain why d.c. separately excited motor is widely used in d.c. motor drives compared to ordinary d.c. shunt motor. **4**
   (d) Draw torque-speed characteristics of a.c. squirrel cage induction motor driven by variable voltage supply. Show on the characteristics range of speed possible in case of constant torque load. **4**
   (e) Explain effect of source inductance on performance of converter (i) when working as rectifier and (ii) when working as inverter. **4**
   (f) Compare power factor in full converter and semi-converter for same output active power. Give reasons for your answer. **4**

2. (a) Explain how converter fed d.c. motor drive can be operated in (i) motoring mode and in (ii) regenerative braking mode. Give range of firing delay angles in the two modes with voltage/current waveforms. **10**
   (b) A three phase full converter drives separately excited d.c. motor with rating 220 V. d.c., 1000 RPM, 100 Amps. The armature resistance R_a = 0·1 ohm and supply to converter is 440 V, 50 Hz, 3 phase a.c. Determine :– **10**
      (i) firing delay angle α for motoring mode at 700 RPM at half the full load torque and
      (ii) firing delay angle α for regenerative braking at 600 RPM with half the full load torque.

3. (a) Draw the circuit diagram of resonant pulse commutated chopper using SCR's and explain its working using voltage/current waveforms. **10**
   (b) A d.c. separately excited motor is driven by chopper circuit working on 400 V. d.c. supply If back e.m.f. constant K_V = 1·5 V/A-rad/s, armature current is 150 Amps. Field current I_f = 2 Amps and duty cycle of chopper is δ = 65%. Find motor speed, input power to chopper and torque developed. The armature resistance R_a = 0·1 ohm. **10**

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4. (a) Explain using suitable waveforms working of – **10**
   (i) mutliple pulse uniform PWM inverter
   (ii) multiple pulse sinusoidal PWM inverter.
   How V/f control is achieved in these inverters ? What are advantages of PWM inverter when compared to square wave inverter ?
   (b) Discuss effect of harmonics on performance of a.c. induction motor. Give techniques used to reduce harmonics in 3 phase inverters. **10**

5. (a) Explain working of slip power recovery system for (i) speeds below synchronous speed and (ii) speeds above synchronous speed. **10**
   (b) A 6 pole 50 Hz 3 phase slip ring a.c. induction motor is controlled using static Kramer slip power recovery system. If open circuit standstill rotor voltage is 550 V and supply voltage is 440 V, 3 phase, 50 Hz a.c. for motor speed of 650 RPM find firing advance angle (β) for inverter. Neglect overlap angles and device drops for rectifier and inverter. **10**

6. (a) Explain working of cyclo-converter using suitable waveforms for output frequency of 10 Hz. Assume supply of 440 V, 50 Hz single phase a.c. **10**
   (b) Explain working of variable reluctance stepper motor. Give typical drive circuit and ratings of such a motor. **10**

7. Write short notes on any **three** of the following :– **20**
   (a) Vector control of induction motor
   (b) Current source inverter
   (c) Dual converter – Working and applications
   (d) Techniques used in power factor improvement in 3 phase converters.

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