BE(ETRX) VII (OLD)
Filter Theory and Applications

Con. 3270–11. **(OLD COURSE)** **RK–2952**

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

N.B. : (1) Question No. **1** is **compulsory.**
(2) Attempt any **four** questions out of remaining **six** questions.
(3) Draw **neat** sketch whenever **necessary.**
(4) Assume **suitable** data if **required** and **justify** it.

1. (a) Find the cutoff frequency of an analog filter if the digital filter to be designed, make use of bilinear transformation and has a cutoff frequency of 450 Hz and sampling frequency of 1200 Hz. **20**
   (b) Find the pole location of a normalized third order butterworth filter and show their pole location.
   (c) Show that in the linear phase FIR filter with Antisymmetric Coefficients Impulse response and even length will have compulsory zero location at $Z = 1$ and $Z = -1$.
   (d) Explain the method of Matched Z – Transform technique in IIR digital filter design.
   (e) Describe and explain characteristics of Blackman and Bartlett window function used in FIR filter design.

2. (a) Design a butterworth first order digital filter having cutoff frequency of 200 Hz with sampling frequency of 1200 Hz using – **14**
      (i) Impulse Invariance Technique
      (ii) Bilinear Transformation Technique.
   (b) Find Transfer Function H(z) of a filter using Impulse invariant technique from an analog domain filter – **6**

$$H(s) = \frac{1}{(s+1)\ (s-3)}$$

   when sampling frequency is 500 Hz.

3. (a) Design an analog butterworth filter transfer function that satisfy following constraints :– **14**

$$0 \cdot 75 \leq \left| H(e^{j\Omega}) \right| \leq 1 \text{ for } 0 \leq \Omega \leq 0 \cdot 2\,\pi$$

$$\left| H(1^{j\Omega}) \right| \leq 0 \cdot 25 \text{ for } 0 \cdot 4\,\pi \leq \Omega \leq \pi$$

   (b) Derive an expression to obtain the relation between digital frequency and analog frequency while designing a digital filter. **6**

[TURN OVER

4. (a) Design a fourth order FIR high pass filter using window function – 14

$$W(n) = 0{\cdot}5\left[1 - \text{Cos}\left(\frac{2\pi n}{M-1}\right)\right] \text{ for } 0 \le n \le M-1$$

$$= 0 \quad \text{otherwise}$$

with cutoff frequency 0·20 KHz and sampling frequency 1 KHz. Also plot the magnitude response of this filter and verify that designed filter is a highpass filter.

(b) Why a 'window function' is needed while designing a FIR filter ? What is the criterion for selection of a proper window ? 6

5. (a) Determine the coefficients of a linear phase FIR filter which has symmetric unit sample response and DFT samples are given by – 12

$$H\left(\frac{2\pi K}{10}\right) = \{1, 1, 0, 0, 0, 0, 0, 0, 0, 1\}$$

(b) Explain design steps for FIR filter design using Kaiser window. 8

6. (a) For a fifth order linear phase FIR filter with antisymmetric coefficients if one of the zeros is at $0{\cdot}25\, e^{\left(j\frac{\pi}{3}\right)}$ find the location of other zeros. Draw pole – zero diagram and find the impulse response h(n) of a filter. 8

(b) Find the stopband attenuation in dB for a fourth order butterworth filter at frequency 7·5 KHz. The passband edge of the filter is located at 3 KHz with attenuation not less than 1 dB in the passband. 6

(c) Compare butterworth, chebyshev and elliptic filter. 6

7. (a) Explain cascade and parallel realization in Digital IIR function with examples. 20

(b) Discuss design procedure for elliptic filter design.

(c) Discuss the merits of optimal linear phase FIR filter over other FIR filter design methods.

(d) Explain zero-input and overflow limit cycle oscillations due to quantization in digital filters.

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BE ETRX VII (old)
Instrumentation System

Con. 3057-11. (OLD COURSE) RK-2970

(3 Hours) [Total Marks : 100

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

1. (a) Discuss Basic requirements of a Transducer. 5
(b) Compare Thermistor with RTD. 5
(c) What are the various mechanical and electrical defects produces noise in potentiometer, when used for displacement measurement ? 5
(d) Disucss the factors in specifying the dynamic performance. 5

2. (a) Explain the basic concept of resistance strain gauge. With the help of proper circuit, how the strain measurement is carried out ? Discuss the gauge factor for semiconductor strain gauge and mental strain gauge. 10
(b) Explain in detail with proper circuit, how variable capacitance transducer can be used for displacement measurement. 10

3. (a) Explain the seebeck and peltier effects in the thermocouples type temperature measurements. Also explain the laws of thermocouples type temperature transducers. 10
(b) Describe with neat diagrams, how electrical pressure transducers based on principle of variable resistance, inductance and capacitance are developed for converting the deflection or stresses developed in elastic elements into corresponding electrical signals. 10

4. (a) State the classification of flow-meters. Derive the expression for the fluid velocity from Bernoulli's theorem in head type flow meter. 10

   (b) Explain with diagrams for analog multiplexed data acquisition system and digital multiplexed data acquisition system. Compare their advantages and disadvantages. 10

5. (a) Show the schematic arrangement for a servo accelerometer. In which application is it ideally suited ? Explain in detail, how acceleration is measured by the above device. 10

   (b) Explain with neat diagrams the working of a photodiode in photoconductive region and photovoltaic region. 10

6. (a) Discuss the piezoelectric transducer with signal conditioning system for vibration measurement. 10

   (b) What are the different methods of torque measurement ? Explain in detail with diagram any one method of torque measurement. 10

7. Write short notes on any **three** :— 20

   (a) Virtual Instrumentation
   (b) Digital Accelerometer
   (c) Optical Pyrometer
   (d) Ultrasonic flow meter
   (e) Data Logger.

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BE ETRX VTT (old)
Basics of VLSI

AGJ 1st half (p) 9

Con. 3450-11. **(OLD COURSE)** **RK-2955**

(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) 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}	$J/^{\circ}K$
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^{-3} (at 27 °C)

Que 1:- Solve any four of the following. (4 X 5 = 20 marks).

(a) Realize EXOR gate using NMOS pass transistors.

(b) Discuss advantages of transmition gates in VLSI.

(c) For N channel MOSFET having threshold voltage 1.75 Volt, when V_{gs} = 5 V and V_{ds} = 2.0V is applied, the drain current is 120 μA. Find the mode of operation and W/L ratio of the device. (Assume oxide capacitance = 51.72×10^{-9} F/cm^2).

(d) Write short notes on Photolithography .

(e) Explain input protection in CMOS.

[TURN OVER

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 $t_{ox} = 200$ A° , 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 1.1 V. (7+3 marks)

(b) Explain Euler's method with suitable example and discuss its advantages. (10 marks)

Que3:- Draw a circuit diagram, stick diagram of 2 input CMOS NOR gate and its mask layout considering lambda based design rules. (20 marks)

Que4:-(a) Compare NMOS logic family with Enhancement mode and Depletion mode pull up. (10 marks)

(b) Explain latch-up in CMOS. (10 marks)

Que5:- (a) Explain self registered buried contacts in NMOS circuits. (10 marks)

(b) Explain Importance of full scaling in VLSI. (10 marks)

Que6:- (a) Explain lambda based design rules for (I) polysilicon crossing diffusion to have MOSFET and (II) metal pattern over via. Discuss the faults created, if the rules are not followed. (10 marks)

(b) Draw static RAM cell and explain its working. (10 marks)

Que 7:- (a) Draw circuit diagram and stick diagram of 4:1 multiplexer using enhancement mode and depletion mode devices and explain its operation. (10 marks)

(b) Write short notes on Ion implantation. (10 marks)

BE ETRX VII (OLD)
Digital Communication

56 1st Half-Exam -11 mina-(c).

Con. 3017-11. **(OLD COURSE)** **RK-2967**

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

N. B. : (1) Question No. 1 is **compulsory**.
(2) Attempt any **four** questions from Q. Nos. **2** to **7**.
(3) Assume **suitable** data if **necessary** but justify the **same**.

1. Answer any **four** questions from the following — 20
   (a) Explain the Nyquist Criteria for distortionless baseband binary transmission.
   (b) Distinguish between duobinary Signal and Modified duobinary Signal Pulse and compare their Magnitude Spectra.
   (c) Discuss the concept of spread spectrum techniques. Find out the process gain of a spread spectrum system using 5 mbps PN code for direct sequence spreading and 2 kbps information data signal.
   (d) Justify Bandwidth of QPSK System is one half of the Bandwidth of BPSK System.
   (e) Explain the necessity of line codes for data transmission. State different types of Line Codes and distinguish between Source Code and Channel Codes.

2. (a) The probability of error in transmission of digital data through a noisy channel is $P_e = 0\text{-}001$. If each transmission is an independent event :—
      (i) What is the probability that out of 10 transmission 9 are correct and one is incorrect ? 2
      (ii) What is the probability that more than two are erroneous out of 100 transmissions ? 5
      (iii) More than one are erroneous out of 100 transmission. 3
   (b) A discrete memoryless channel has six symbols M_1, M_2, M_3, M_4, M_5, and M_6 with probabilities 0·3, 0·25, 0·2, ·12, 0·08, 0·05 respectively. Find the code words, average No. of bits per message, code efficiency, redundancy and variance by using Huffman Coding. 10

3. (a) What is intersymbol interference ? How does it arise in a communication system ? With the help of neat diagram, explain eye diagram. 10
   (b) Consider a (7, 4) linear block code with : 10

$$P_1 = M_4 + M_5 + M_6$$
$$P_2 = M_5 + M_6 + M_7$$
$$P_3 = M_4 + M_5 + M_7$$

   (i) Design the encoder
   (ii) List all the code words
   (iii) What is the error correcting capacity ?
   (iv) Find the code word for message 1001
   (v) Prove that $CH^T = 0$.

[TURN OVER

4. (a) For a (7, 4) cyclic code with generator Polynomial $g(x) = x^3 + x + 1$.
   (i) Sketch shift register implementations for encoder and syndrome calculator. 3
   (ii) For the menage {1101}, find the code word using the above encoder. Verify by calculation. 4
   (iii) For the received code word {10 01101}, find the syndrome using the syndrome calculator in (1). 3

   (b) A convolution encoder has the following impulse response :
   $g_1 = \{1, 1, 0\}$ $g_2 = \{1, 1, 1\}$ $g_3 = \{1, 0, 1\}$
   (i) Sketch the encoder 2
   (ii) Find the code word for the menage sequence 11001 2
   (iii) Draw the code tree, state diagram and trallis diagram for the above code word. 6

5. (a) Explain the following questions with proper illustration :—
   (i) In DEPSK transmission, error always exist in Pairs 5
   (ii) Phase continuity is maintained in MSK-Signal. 5

   (b) Draw block diagram of BFSK Transmitter and Receiver. The bit stream 10 1101011001 is to be transmitted using BFSK. Sketch transmitted and Received waveform. 10

6. (a) Distinguish between Matched filter and Correlator. Show that the integrator and dump circuit is the matched filter for a rectangular input signal with level ± V. 10

   (b) Draw the block diagram of a DS-BPSK Modulator. Explain the working and sketch the waveforms at output of each block. 10

7. (a) Differentiate between :— 10
   (i) Offset and Non-offset QPSK
   (ii) Slow frequency hopping and fast frequency hopping.

   (b) Write short notes (any **two**) :— 10
   (i) Central Limit Theorem
   (ii) Tapped Delay Line Equalizer
   (iii) Linear Predictive Vocoders.

B.E. ETRX VII (OLD)
Elective I - Microcomputer System Design.

Ishalt 11-SG 91-(C)

Con.3794-11. **(OLD COURSE)** **RK-2958**

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

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

1. (a) Give special Cycles of Pentium. 5
   (b) Explain Bus Access Latency in PCI. 5
   (c) What is the difference between Selection and Reselection phase in SCSI ? 5
   (d) Explain data transfers in USB. 5

2. (a) Explain Pentium. State Transition with diagram. 10
   (b) Draw the burst bus cycle in pentium to transfer data from main memory. 10

3. (a) Explain the interrupt structure of pentium. 10
   (b) Explain code cache structure and split line access. 10

4. (a) Explain PCI interrupt chaining process. 10
   (b) Explain PCI Read and Write transaction. 10

5. (a) Explain Instruction Branch prediction. 10
   (b) Explain PCI bus arbitration using timing diagram. 10

6. (a) Explain various IDE protocols. 10
   (b) Explain SCSI bus phases with timing diagrams. 10

7. (a) Explain various transfer types of USB. 10
   (b) Explain the enumeration process in USB. 10

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B.E E&TRX VII (Old)
Elective-I - Wireless Commun.

Con. 3962-11. **(OLD COURSE)** **RK-2962**

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

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

1. (a) What is mobile assisted Hand-off ? Explain the strategy. 20
(b) Distinguish between FDD and TDD.
(c) Justify the use of hexagonal cell geometry.
(d) Explain orthogonal covering in CDMA.

2. (a) What is Sectoring ? How does the Sectoring improve the capacity of cellular systems ? 4
(b) For knife-edge diffraction geometry, derive the expression for path difference between direct and diffracted paths. State assumptions made. 8
(c) Derive the following relation using Ground-Reflection—two-ray model : 8

$$E_{tot}(d) \approx \frac{2E_o d_o}{d}\left[\frac{2\pi h_t h_r}{d}\right] \text{ where}$$

$E_{tot}(d)$ = total received 'E' field at distance 'd'.

3. (a) With the help of block diagram, explain the GSM architecture and explain the different radio interfaces and sub-systems and functions of each unit :— 12
(b) With respect to AMPS, explain the following :— 8
(i) Supervisory Audio Tone (SAT)
(ii) Singaling Tone (ST)
(iii) Wideband Blank and Burst Signaling.

4. (a) Distinguish between the following :— 10
(i) Flat Fading and Frequency Selective Fading
(ii) Fast Fading and Slow Fading.
(b) Define and explain types of small scale fading based on Multipath time delay and doppler spread. 10

5. (a) With respect to CDMA, explain Power Control subchannel and soft Hand-off. Also compare CDMA and GSM. 10
(b) With the help of neat block diagram, explain the forward CDMA channel Modulation Process. 10

6. (a) Explain the Logical Channels used in GSM. 10
(b) Explain the Authentication, Cipher-key generation and Encryption Process in GSM. 10

7. (a) Explain Data Services in DECT and PACS . 10
(b) Write short notes on GPRS and CT2. 10