B.TECH. (AUTUMN SEMESTER) EXAMINATION
ELECTRONICS ENGINEERING
DIGITAL ELECTRONICS
EL-311

Maximum Marks: 60  Credits: 04  Duration: Three Hours

Answer all the questions.
Assume suitable data if missing.
Notations used have their usual meaning.

Q.No.    Question                                      M.M.
1(a) Give the circuit for ECL OR/NOR gate and explain its operation. [8]
1(b) What are the advantages and disadvantages associated with open collector TTL? How can the limitation of this circuit be overcome? [7]

OR

1'(a) Define the various parameters associated with logic families. [8]
1'(b) Give the TTL circuit for NAND gate and explain its operation. [7]

2(a) Draw voltage transfer characteristic (VTC) of CMOS inverter and explain each region of the curve. [6]
2(b) Give the circuit to implement the following logic function using NMOS logic. [5]

\[ Y = \overline{A}B + C + D \]

2(c) Give the circuit for OR/NOR gate using complementary pass transistor logic (CPTL). [4]

(OR)

2'(a) Give the circuit to implement the following logic function using CMOS logic. [5]

\[ \overline{Y} = A + BC + DE \]

2'(b) Why do we get a poor ‘1’ in single NMOS pass transistor logic (PTL) while a good ‘1’ in CMOS transmission gates? [5]
2'(c) How a memory cell is realized in static RAM (SRAM)? Give a brief description. [5]

3(a) Draw the diagram for EPROM cell and explain how it stores a ‘1’ or ‘0’. [5]
3(b) What is charge coupled device (CCD)? [5]
3(c) Differentiate between programmable logic devices (PLDs), programmable array logic (PAL) and programmable logic array (PLA). [5]

4(a) Explain the operation of binary weighted digital to analog converter (DAC) with suitable diagram. [7]
4(b) Using a suitable diagram, give the working of successive approximation type ADC. [8]
2012-13
B.TECH. (AUTUMN SEMESTER) EXAMINATION
ELECTRONICS ENGINEERING
ACTIVE NETWORK SYNTHESIS
(EL-312)
Credits: 04

Maximum Marks: 60

Duration: Three Hours

Answer all the questions.
Assume suitable data if missing.
Notations used have their usual meaning.

Q.No.      Question                                     M.M.
1(a)       Classify the filters on the basis of  [06]
            (i) loss characteristics (ii) components (active and passive )
1(b)       Synthesise the following driving point function using Cauer I and Cauer II  [06]

\[ Z(s) = \frac{(s^3 + 4s)}{2s^4 + 20s^2 + 18} \]

OR

1'(a)      Derive the expressions for Chebyshev loss for high frequencies (\( \omega >> \omega_p \))  [06]
1'(b)      The pass band loss of a fourth order LP Butterworth filter function is 1dB at 500Hz.  [06]
Beyond what frequency is the loss greater than 40 dB?

2(a)       What are the factors affecting the gain sensitivity? Derive the expressions for the  [06]
            change in gain due to simultaneous variations in \( \omega_p \) and \( Q_p \) realizing the second order
            function

\[ f^- (s) = s^2 + \frac{\omega_p}{Q_p} s + \omega_p^2 \]

2(b)       Draw the operational amplifier based Sallen key band pass filter. Identify the feedback  [06]
            and feed forward transfer functions Vo/Vi, biquadratic filter parameters assuming
            ideal operational amplifier.

Contd………2
2'(a) What is the frequency transformation technique? How it can be used to obtain a symmetrical band reject filter.

2'(b) Design Antoniou GIC based second order band pass filter with a centre frequency of 10 KHz, 3db band width of 500hz and a centre frequency gain of 10. Use C = 1.2nF.

3 Show the block diagram implementation of the following transfer function and realize the block diagram to obtain the Tow Thomas biquad. Design the circuit for K = 2, Q = 2 and \( \omega_0 = 2 \text{Krad/sec} \), assuming capacitors of 1nF

\[
\frac{V_o}{V_i} = \frac{-K}{s^2 + \frac{\omega_0}{Q} s + \omega_0^2}
\]

4(a) Realize CM ideal grounded integrator and differentiator circuits using CCII and grounded passive components and convert these CCII-RC circuits into electronically tunable circuits using CCCII.

4(b) What are audio mixers? How can a mixer be realized using a operational amplifier based summer. What are the applications of audio mixers.

5(a) Realize the ideal grounded inductor using OTA and grounded capacitor. Also give the attractive features of the circuit realized.

5(b) What are the quadrature oscillators? Explain the function of operational amplifier based quadrature oscillator with the help of circuit diagram.

OR

5'(b) What are tuned amplifiers? Describe the function of single tuned amplifier with the help of circuit diagram. Also give its frequency response.
Maximum Marks: 60
Credits: 04
Duration: Three Hours

Answer all the questions.
Assume suitable data if missing.
Notations used have their usual meaning.

Q.No. Question M.M.
1(a) Explain the memory write cycle with timing diagram. [08]

OR

1(a)' Explain how address and data bus can be demultiplexed in an 8085 microprocessor with the help of block diagram. [08]

1(b) Specify the content of the accumulator and carry flag when the following instructions are executed.
   MVI A, C5H
   ORA A
   RAL
   RRC
   [07]

2(a) Mention various types of interrupts in 8085. Give their respective priorities, trigger mode and interrupt type. [07]

2(b) Differentiate between interrupt driven data transfer and direct memory access. [08]

OR

2(b)' List major components of the 8259A interrupt controller and explain their functions. [08]

3(a) Draw a memory address decoder circuit using 74LS138 for a 2K RAM starting from B000 H. [07]
3(b) Write Instructions to define port A as input port in Mode 0, Port B as output port in Mode 1 and Port C_{upper} as input, 8255 address starts from 60H.

OR

3(b)' Draw & explain functional pin diagram of 8251 USART.

4(a) Give the organization of registers present in 8086 microprocessor. Explain the role of each register.

4(b) Write short notes on any two

(i) MDS

(ii) Simulator

(iii) Incircuit emulator

(iv) Logic analyzer
2013-14
B.TECH. (AUTUMN SEMESTER) EXAMINATION
ELECTRONICS ENGINEERING
MICROPROCESSORS & MICROCONTROLLERS
EL-332

Maximum Marks: 60  
Credits: 04  
Duration: Three Hours

Answer all the questions.
Assume suitable data if missing.
Notations used have their usual meaning.

Q.No.  

1(a)  Explain the memory write cycle with timing diagram.  

OR

1(a)'  Explain how address and data bus can be demultiplexed in an 8085 microprocessor with the help of block diagram.  

1(b)  Write an assembly language program to transfer a block of 5 bytes from starting memory location 2000H to starting destination address 3000H.  

2(a)  Mention various types of interrupts in 8085. Give their respective priorities, trigger mode (edge or level) and interrupt type (vectored or non-vectored).  

2(b)  What is handshaking? Why and how it is done? What are its advantages?  

OR

2(b)'  What is the function of 8259? How many initialization command words are used in it? Explain them.

3(a)  Draw a memory address decoder circuit using 74LS138 for a 2K RAM starting from B000 H.  

3(b)  Write Instructions to define port A as input port in Mode 0, Port B as output port in Mode 1 and Port C upper as input, 8255 address starts from 60H.  

Contd........2
3(b)' Draw & explain functional pin diagram of 8251 USART.

4(a) Name the major differences between a microprocessor and a microcontroller.

4(b) Explain the various bits of PSW register of 8051.

4(c) Give the organization of registers present in 8086 microprocessor. Explain the role of each register.

OR

4(c)' Design time delay using a register pair. Load the register pair with 8000H, and calculate the loop delay $T_L$ if the system clock frequency is 3.072MHz (ignore three T-states difference of the last cycle)
2013 – 2014
B Tech (Autumn Semester) Examination
(Electronics Engineering)
DIGITAL COMMUNICATION
EL – 342
Credits: 4

Maximum Marks: 60
Duration: Three Hours

Notes:
1. Answer all questions.
2. Any missing information can suitably be assumed.

1. (a) Differentiate between the detection and the estimation. In a typical communication system which process (detection or estimation) is performed first and why? 3
   (b) What is the advantage of using signal space representation? How many dimensions are required to represent random signals? Give a signal space representation of zero mean white Gaussian random process.
   (c) A ternary signaling has 3 equiprobable signals for transmission $m_0 : 0$, $m_1 : 2p(t)$, $m_2 : -2p(t)$, where $p(t)$ is a pulse of energy $E_p$ and duration $T$.
      (i) Determine the optimum decision regions and the error probability $P_e$ of the optimum receiver as a function of average signal energy $E_{av}$. Assume an AWGN (zero mean and $N_0/2$ power spectral density) channel.
      (ii) Find $P_e$ as a function of $E_{av}/N_0$.

   OR

   (c') Consider a binary transmission system where, at the end of each symbol interval, the output of the demodulation is $r = \begin{cases} \alpha + n + Z & \text{if sent} \\ -\alpha + n + Z & \text{if not sent} \end{cases}$, where $\alpha (\geq 0)$ is a constant, $n$ is a Gaussian RV with 0 mean and variance $\sigma^2$, $Z$ is a discrete RV with $P[Z=+1]=0.25$, $P[Z=0]=0.5$ and $P[Z=-1]=0.25$. Assuming that symbols 1 and 0 are equally likely, show that bit error rate, $P_b = \frac{1}{4} \left[ Q\left(\frac{\alpha}{\sigma}\right) + Q\left(\frac{\alpha}{\sigma} + z\right) + Q\left(\frac{\alpha}{\sigma} - z\right) \right]$. 8

2. (a) Differentiate between binary orthogonal and antipodal signaling. What is the correlation coefficient between the modulation symbols in each case?
   (b) A binary FSK modulator generates the signals $s_i(t) = A \cos(2\pi f_i t + \theta_i)$, $0 \leq t \leq T_b$, $i=1, 2$ and $f_i$ is chosen an integer multiple of $1/T_b$. Derive the conditions that the signals $s_1(t)$ and $s_2(t)$ are orthogonal over $[0, T_b]$ if
      (i) $\theta_1 = \theta_2$
      (ii) $\theta_1 \neq \theta_2$.

   OR
3. (a) A ternary channel matrix is given by

\[
p(Y|X) = \begin{pmatrix}
  1 & 0 & 0 \\
  0 & p & 1-p \\
  0 & 1-p & p 
\end{pmatrix}
\]

Given a priori probabilities as \( P(x_1) = \alpha, P(x_2) = P(x_3) = \beta \).
Determine \( H(X), H(Y), H(X|Y) \) and \( H(Y|X) \).

(b) Four codewords of a linear block code, \( C \), are as follows:
- 1101000
- 0110100
- 0011010
- 0001101

(i) Show that these 7-tuple vectors are linearly independent.
(ii) Find the remaining codewords of the code \( C \).
(iii) Determine a generator matrix \( G \) for the code.
(iv) How many errors this code can correct?

4. (a) What is the difference between slow frequency hopping and fast frequency hopping? Discuss with examples.

(b) A 10 stage maximum length shift register is used to generate the PN sequence in a DSSS system. The chip duration is 1 \( \mu \)s.
(i) Determine the processing gain of the system in dB.
(ii) Determine the jamming margin if the required \( E_b/N_0 = 10 \).

(c) In a fast FHSS system, the information is transmitted via FSK, with noncoherent detection. Suppose there are 3 hops/bit, with hard decision decoding of the signal in each hop.
(i) Determine the probability of error for this system in an AWGN channel with power spectral density \( N_0/2 \) and \( \text{SNR} = 13 \) dB (total SNR over 3 hops).
(ii) Compare the result in (i) with the error probability of an FHSS system that hops once per bit.

OR

(c') Derive an expression for DSSS system that employs BPSK modulation.
AUTUM SEMESTER B.TECH. EXAMINATION 2013-14
ELECTRONICS ENGINEERING
DIGITAL SIGNAL PROCESSING -I
EL-343 N

Max. Marks: 60  Credits: 04  Time: Three Hours

Attempt ALL Questions

1 a Determine the response of the system with an impulse response:
\[ h[n] = a^n u[n] \]  \hspace{1cm} (7)
to the input signal
\[ x[n] = u[n] - u[n-10] \]

1 b A FIR filter has an impulse response \( h[n] \) for the input \( x[n] \). Find the output \hspace{1cm} (8)
using linear as well as circular convolution for the following conditions:
\[ h[n] = [1, 2, 4] \quad x[n] = [1, 2] \]
OR

1'a Determine the zero-state response of the system:
\[ y[n] = \left( \frac{1}{2} \right) y[n-1] + 4x[n] + 3x[n-1] \]  \hspace{1cm} (8)
to the input
\[ x[n] = e^{j\omega_0 n} u[n] \]

What is the steady state response of the system?

1'b An FIR filter has the unit impulse response sequence \( y[n] = [2, 2, 1] \). Determine the \hspace{1cm} (7)
output sequence in response to the input sequence
\( x[n] = [3, 0, -2, 0, 2, 1, 0, -2, -1, 0] \) using Overlap-Save method with 4 input samples at a time.

2 a Comment on the validity of the following statement, “The convolution of the \hspace{1cm} (3)
minimum phase system is always a minimum phase system”.

2 b Determine the parallel realization of the IIR filter with the transfer function:
\[ H(z) = \frac{10 \left( 1 - \frac{1}{2} z^{-1} \right) \left( 1 - \frac{2}{3} z^{-1} \right) \left( 1 + 2z^{-1} \right)}{\left( 1 - \frac{3}{4} z^{-1} \right) \left( 1 - \frac{1}{8} z^{-1} \right) \left( 1 - \left( \frac{1}{2} + j \frac{1}{2} \right) z^{-1} \right) \left( 1 - \left( \frac{1}{2} - j \frac{1}{2} \right) z^{-1} \right)} \]  \hspace{1cm} (6)

2 c Determine the order of a low-pass Butterworth filter that has -3 dB bandwidth \hspace{1cm} (6)
of 500 Hz and an attenuation of 40 dB at 1000 Hz.

OR

2'a A causal, stable and non-minimum phase channel has the system function \hspace{1cm} (8)
specified as:

Contd………2
Show that the channel can be represented as a cascade of a minimum phase system and an all-pass system. Also find the system function of a gain equalizer corresponding to this channel.

2'b Explain briefly the significance of group delay in a system.

2'c What is the significance of the canonical form of realization of an IIR filter

3 a For a Type 3 FIR linear phase system, find the locations of poles and zeros in the z-plane. Comment on the restrictions imposed on the location of zeros for Type 3 systems.

3.b What are the features that a window function must satisfy? Calculate the main lobe width obtained for a rectangular window function.

3 c A causal, linear, time-invariant discrete-time system has a system function:

\[ H(z) = \frac{(1 - 0.5z^{-1})(1 + 4z^{-2})}{(1 - 0.64z^{-2})} \]

Find expressions for a different minimum-phase system \( H_2(z) \) and a generalized linear phase FIR system \( H_{lin}(z) \) such that:

\[ H(z) = H_2(z)H_{lin}(z) \]

4 a Explain with suitable example the effect of down sampling on the spectrum of a signal.

4 b Under what conditions order of the cascaded blocks shown in figure can be interchanged with no change in input-output relation?

4 c What are the different types of limit cycles present in IIR digital filters? Why are these limit-cycles absent in FIR digital filters?
2013-14
B.TECH. (AUTUMN SEMESTER) EXAMINATION
ELECTRONICS ENGINEERING
MICROWAVE AND ANTENNA
EL-354

Maximum Marks: 60  Credits: 04  Duration: Three Hours

Answer all the questions. Assume suitable data if missing. Notations used have their usual meaning.

Q.No.  Question                                                                                              M.M.
1(a)  Draw pictorial view of a hybrid ring and explain its operation in brief. When might it be preferred to magic tee? [5]
1(b)  The electric field intensity of dominant TE_{10} mode in a lossless rectangular waveguide is given by

\[ E_y = E_0 \sin \left( \frac{\pi x}{a} \right) e^{-j\beta z} \]

i) Find the magnetic field intensity H
ii) Calculate the value of transmitted power in the guide. [5]
1(c)  The impedance matrix of a certain lumped-network is given by

\[ [Z] = \begin{bmatrix} 4 & 2 \\ 2 & 4 \end{bmatrix} \]

Determine scattering matrix \([S]\) of the network. [5]

2(a)  Explain how oscillations are sustained in the cavity magnetron, with suitable sketches, assuming that the \(\pi\)-mode oscillations already exist. Make it clear why more energy is given to the rf field from e-beam than taken from it. [5]
2(b)  A 4-cavity klystron has the following parameters: \(V_0 = 10\text{kV}, I_0 = 0.7\text{A}, f = 4\text{ GHz}, \rho_0 = 5 \times 10^{-5}\text{ C/m}^3, V_1 = 2\text{V (rms)}, R_{stb}=10\text{k}\Omega, R_{sh}=5\text{k}\Omega\) and \(\omega_q=0.598 \times 10^9\text{ rad/s}.\)

Determine: (i) the induced voltage in the output cavity; and (ii) the output power delivered to the load. Assume beam coupling coefficient \(\beta_i=\beta_o=1.\) [5]
2(c)  Show that efficiency (\(\eta\)) of a reflex klystron is given by

\[ \eta = \frac{2X'J_1(X')} {2m - \pi / 2} \]

Where \(X'\) is the bunching parameter, \(J_1(X')\) is 1st order Bessel Function and \(r\) is the device mode of operation. [5]

(OR)

2(a')  What can be the possible solutions to the limitations of conventional tubes at high frequencies? Which one is the best? Justify your answer. [5]
2(b') By incorporating charge density effect in a 4-cavity klystron amplifier, show that output power $P_{out}$ is proportional to $f^6$, where $f$ is the operating frequency.

2(c') How does the function of the magnetic field in TWI differ from its function in a magnetron? What is the fundamental difference between the beam-rf field interactions in two devices?

3(a) Use Ridley-Watkins-Hilsum (RWH) theory to explain the operation of multiple-valley semiconductor devices?

3(b) What are the applications of micro-strip and strip-lines? A parallel strip line has the following parameters: $e_{wi}=2.1$, $w=25\text{mm}$ and $d=5\text{mm}$. Calculate the (i) characteristic impedance of the strip line (ii) strip-line capacitance.

3(c) What do acronyms IMPATT and TRAPATT stand for? An IMPATT diode has a drift length of 2\(\mu\text{m}\). Determine drift time of the carriers and the operating frequency of the IMPATT diode.

(OR)

3(a') Write a short note on Tunnel Diode.

3(b') The figure of merit for a diode nonlinear capacitor in an up converter parametric amplifier is 8, and the ratio of the output frequency $f_o$ over the signal frequency $f_s$ is 8. The diode temperature is $300^\circ\text{K}$. Calculate: (i) the maximum power gain in decibels; (ii) the bandwidth (BW).

3(c') Briefly describe the basic operating mechanism of TRAPATT diode, using a suitable sketch.

4(a) What is the maximum power received at a distance of 0.75 km over a free space 1.0 GHz circuit consisting of a transmitting antenna with a 27 dB gain and a receiving antenna with a 20 dB gain? The transmitting antenna input is 175 W. Also derive the formula used.

4(b) (i) Estimate the directivity of an antenna with half-power beam width in the two principle planes as $\theta_{HP}=3^\circ$, $\phi_{HP}=-2^\circ$, and (ii) find the gain of this antenna if efficiency factor $k=0.5$.

4(c) Write a short note on antenna array.