T.E. Sem - V (CBSGS), Elex

Sub: Microcontrollers & Application

QP Code : 3308

(3 Hours) [Total Marks : 80

N.B. 1) Question no. one is compulsory
2) Solve any three from the remaining five questions.
3) Assume suitable additional data if necessary.

Q.1. Answer the following questions. (Any FIVE) (20)
a) Explain the difference between RET and RETI instructions as implemented in 8051 architecture.
b) What is the maximum address range of conditional jump instructions for 8051 architecture and justify the reason for the same.
c) Illustrate the circuit representation for interfacing single LED and relay to the port pins of 8051 architecture based processor.
d) Explain pipelining feature in ARM7TDMI architecture. Justify advantages and disadvantages.
e) Explain the significance of letters and numbers in – 'ARM7TDMI'.
f) Explain the bit orientations of CPSR register for ARM7TDMI architecture.

Q.2. a) Write a note on the various modes of operation of ARM7TDMI based processor. (10)
b) Explain the following 8051 architecture based instructions:
i) MOV C,0X10 ii) MUL AB iii) MOVC A, A+@0x2000 iv) INC 0X45
v) ANL A,@R0 (10)

Q.3. a) With a neat circuit representation illustrate interfacing of a typical 8-bit DAC to 8051 architecture based processor. Using DAC write a program in 8051 assembly to generate a triangular wave. (12)
b) Explain the programmer's model (register structure) in ARM7TDMI architecture. (08)

Q.4. a) Explain the various addressing modes with suitable examples available in 8051-architecture. (10)
b) Using internal timers write a program in 8051 assembly to generate a square wave of 10kHz frequency and 50% duty cycle on port pin P1.0. (10)

Q.5. a) Explain the following ARM7TDMI architecture based instructions as well as their implications
i) BL Square ii) ADD R0, R1, R2, LSL#3 iii) MOVEQS R1,R0
iv) LDR R8, [R3, #4] v) STR R2, [R1, #0x100] (10)
b) Write a brief note on the process of interrupts and their mechanism of acknowledgement in 8051 – architecture. (10)

Q.6. Write brief notes on
a) ARM7TDMI thumb mode of operation. (07)
b) Interfacing stepper/continuous motor to 8051 based microcontroller. (07)
c) Serial port and modes of operation in 8051 architecture. (06)

T.E. sem V Elex Signals & Systems
CBGS
29.5.15

QP Code : 3313

(3 Hours) **[Total Marks : 80**

N.B. : (1) Questions **No.1** is **compulsory**.
(2) Attempt any **three** questions from the remaining questions.
(3) Solve **every** question in an **order**.

1. (a) Prove convolution property of Fourier Transform. **20**
(b) State and prove final value Theorem of Laplace Transform.
(c) Prove shifting property of Z transform.
(d) Determine energy and/or power of following signals.

(i) $x(n) = \left(\frac{3}{5}\right)^n u(n) - (4)^n u(-n-1)$

(ii) $x(t) = 4e^{-2t} u(t)$

2. (a) Obtain output $y(t) = x(t) * h(t)$ using graphical convolution. **10**

$x(t) = 1+t \quad \text{for } -1 \le t \le 0$
$= 1-t \quad \text{for } 0 \le t \le 1$

$h(t) = 1 \quad \text{for } 0 \le t \le 2$
$= 0 \quad \text{elsewhere}$

(b) Obtain h (n) for all possible ROC conditions. Also plot the ROC comment on causality and stability at the system. **10**

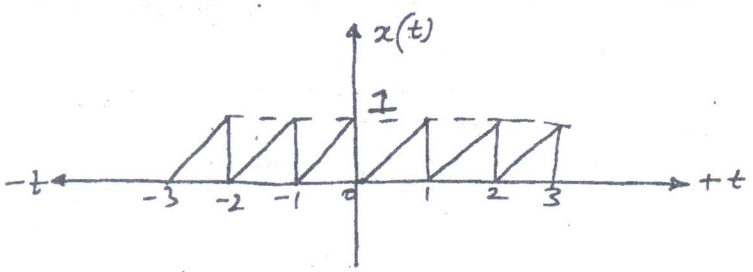
$$H(z) = \frac{4z(z^2-8z+9)}{(z-\frac{1}{3})(z-3)(z+4)}$$

3. (a) A C.T. LTI system has **8**

$$\frac{d^2y(t)}{dt^2} + \frac{5dy(t)}{dt} + 6y(t) = \frac{7dx(t)}{dt} - 3x(t)$$

(i) Determine Transfer function.
(ii) Obtain impulse response.
(iii) Obtain unit Ramp response.

(b) Plot the magnitude and phase spectrum of the periodic signal. Shown below. **8**



TURN OVER

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(c) Obtain initial and final value 4

$$\text{if } X(z) = \frac{3z^2}{4z^2 - 5z + 1}$$

4. (a) If two subsystem are connected in cascade 8

$h_1(n) = (0.9)^n \; u(n) - 0.5(0.9)^{n-1} \; u(n-1)$

$h_2(n) = (0.5)^n \; u(n) - (0.5)^{n-1} \; u(n-1)$

Determine overall impulse response of the interconnected system.

(b) Obtain z transform of the following signal using properties of z transform. 6

$$x(n) = \left(\frac{3}{4}\right)^{n-1} \sin\left(\frac{\pi}{6} n\right) u(n)$$

(c) Prove Parsevals theorem of Fourier series. 6

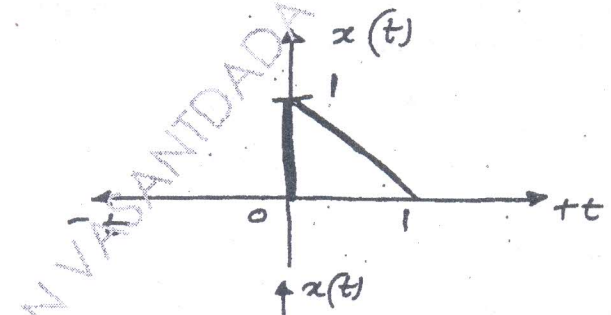
5. (a) Obtain circular convolution of 5

$x_1(n) = [3\ 2\ 1\ 4]$

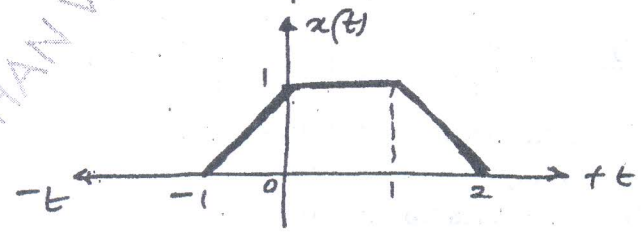
$x_2(n) = [5\ 7\ -8\ 2]$

(b) Obtain Laplace Transform of following waveforms using its properties. 5

(i)



(ii)



(c) Obtain zero input response, zero state response and total response of a D. T. L. T. I. system. 10

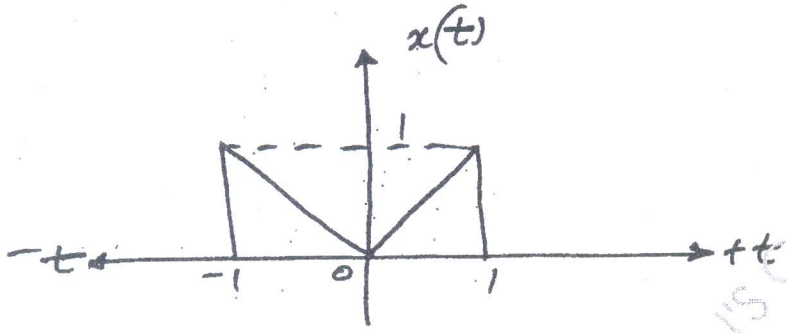
$y(n) + 7y(n-1) + 12\,y(n-2) = 4\,x(n) - 11\,x(n-1)$

If $y(-1) = 1 \quad y(-2) = 2 \quad x(-1) = 0.$

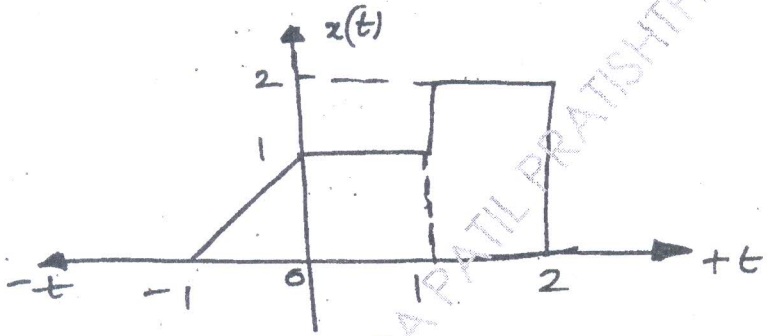
If input $x(n) = u(n)$ = unit step signal

TURN OVER

6. (a) Obtain Fourier transform of the following signal. 5



(b) Plot even and odd parts of following signals. 6



(c) Obtain h (t) for causal and stable system If 8

$$H(s) = \frac{s^2 - 3s + 11}{(s-1)(s+2)(s+3)}$$

Plot the ROC and pole's and zero's of the system.

T.E. Sem V CBGS Elex
D.C. 4/6/15

QP Code : 3315

(3 Hours) **[Total marks: 80**

N.B:1. Question No.1 is compulsory

2. Answer ANY THREE questions from Q2 to Q6

Q1. Answer (ANY FIVE)

(a) State and explain central limit theorem. (4)

(b) State and explain Shannon's theorem. (4)

(c) Why MSK is called shaped QPSK? (4)

(d) What is EYE PATTERN? Explain its significance. (4)

(e) Define Probability. Explain Conditional and Joint Probabilities. (4)

(f) Differentiate between Fast frequency hopping and slow frequency hopping. (4)

(g) Differentiate between Offset QPSK and Non-Offset QPSK. (4)

Q2. (a) A discrete memory less source has an alphabet of five symbols with the probabilities-

Symbol	S1	S2	S3	S4	S5
Probability	0.35	0.23	0.15	0.10	0.16

(i)Construct Huffman code . find entropy and average length of the code

{ii)Calculate code efficiency and the redundancy of the code.

(iii) Construct Shannon-Fano code and find its efficiency (10)

(b) What is Pseudo-noise (PN) Sequence in spread spectrum technology? Why they are used in spread spectrum modulation system? (05)

(c) Compare Inter channel Interference and Inter symbol interference (05)

Q3. (a) Show that for an input signal which is a sequence of rectangular positive and negative pulses, the integrator and Dump Filter is the Matched filter. Bring out the properties of Matched Filter (10)

(b) Explain 4-ary PSK with respect to the following :-

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

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

(iii) Mathematical expression of the transmitted signal, Signal space representation and hence Euclidian distance. (10)

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Q.4. (a) For a systematic linear block codes the three parity check digits C4, C5 and C6 are given by: (10)

$C4 = d1 \oplus d3$

$C5 = d1 \oplus d2 \oplus d3$

$C6 = d2 \oplus d3$

(i) Construct generator matrix and parity check matrix

(ii) Construct codes generated by this matrix

(iii) Determine error detection and correction capability

(iv) Decode the received codeword R(s) = 1 0 11 00.

(b) A convolution encoder has single shift register with two stages three Modul0-2 Adders and an output multiplexer the following generator sequence are combined By the multiplexer to produce the encoder O/P: (10)

gl=(1,1,1), g2=(1,O,1), g3=(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 D in (ii)

(iv) Draw the trellis diagram for the encoder.

Q.5. (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:

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

Where Eb is normalized energy per bit also draw signal constellation diagram for 16-ary QPSK and Compare with 16-ary QASK. (10)

Q.6. (a) An Analog Signal is band limited to 8 Hz 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) Explain with neat block diagram the Matched filter. (5)

(c) What is optimum receiver? Explain in detail. (5)

(d) Explain Lempel-Ziv Coding in detail (5)

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T.E. Sem V (old) Elex CTSS

29-5-15

Q.P. Code : **3774**

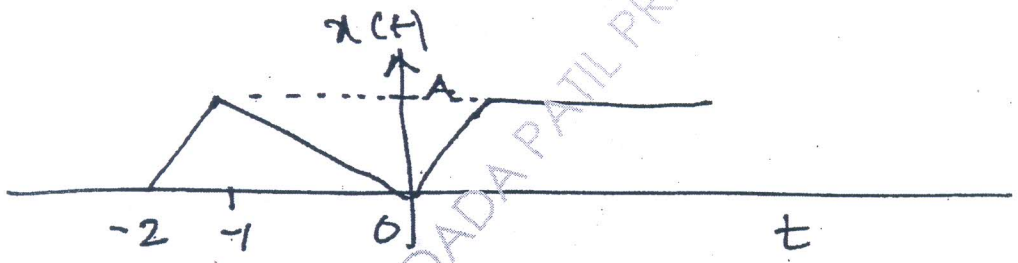
(OLD COURSE)

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

N.B. : (1) Question **No. 1** is **compulsory**.
(2) Solve any **Four** questions out of remaining **Six**.
(3) Assume **suitable** data wherever necessary.

1. (a) State following properties of Fourier Transform. **5**
(i) Time Shifting (ii) Frequency Shifting (iii) Scaling
(iv) Time differentiation (v) Homogeneity.
(b) Determine energy / power of signal **5**
(i) $x(t) = 5u(t)$, (ii) $x(t) = 10\,t\,u(t)$.
(c) Check linearity and time invariance of following systems. **5**
(i) $y(t) = t^2 x(t)+3$, (ii) $y(t) = x(t)+3x(t-1)$.
(d) State initial and final value theems of Laplace transform. **5**

2. (a) Determine odd and even components signal. **10**



(b) Determine Fourier transform of signum signal. **5**
(c) Convolve the following signals. **5**

$$x(t) = 3\delta(t+3) + 2\delta(t+1) + \delta(t) - \delta(t-1)$$
$$y(t) = 2\delta(t+2) - 3\delta(t) + 2\delta(t+1) + 4\delta(t-2)$$

3. (a) For a LTI system described by differential equation **10**

$$\frac{d^2y}{dt^2} - 6\frac{dy}{dt} - 6y(t) = x(t)$$

Find
(i) Transfer function
(ii) Impulse Response
(iii) Step Response

(b) Explain PDF of uniform, exponential & Gaussian distribution **10**

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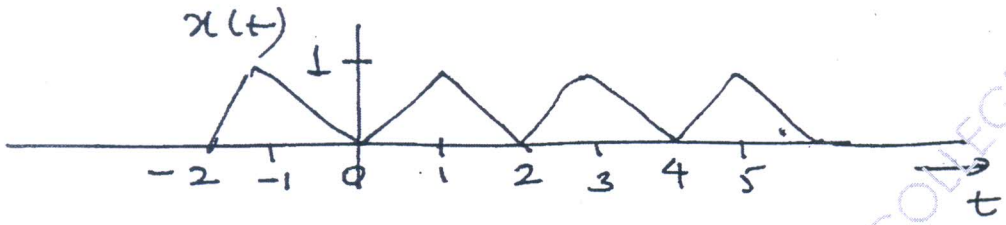
4. (a) Find Fourier series of following signal 10



(b) Obtain state variable model of LTI system described by equation. 10

$$2\frac{d^2y}{dt^2} + 3\frac{dy}{dt} + 6y(t) = 2x(t)$$

5. (a) Determine step response of system where impulse response is $h(t) = e^{-t}u(t)$. 10

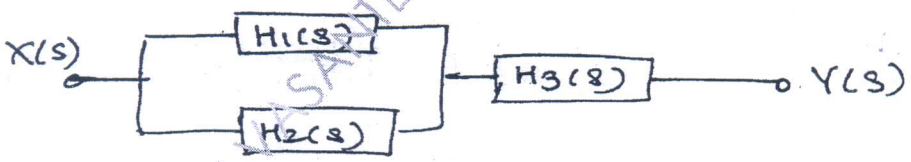
(b) Determine the different random process. 10

6. (a) Obtain inverse Laplace transform of 10

$$X(s) = \frac{4}{(s+1)(s+2)^2}$$

For all possible region of convergence. 10

(b) Find impulse response of overall system



$$H_1(S) = \frac{4}{S+2}, \quad H_2(S) = \frac{-3}{S+1}, \quad H_3(S) = \frac{S+2}{S-2}.$$

20

7. Write short notes on: (any Four)
   (a) Parseval's Theorem.
   (b) Dirichlet's Conditions.
   (c) Gibb's Phenomenon.
   (d) Rayleigh's Energy Theorm.
   (e) Auto correlation.
