SEM-V ETRX (CBSGS) 27/5/16

Signals & Systems.

Q.P. Code : **31172**

(3 Hours) [Total Marks : 80

N.B.: (1) Question **No.1** is **compulsory**.
(2) Attempt **any Three** out of remaining **Five** questions.
(3) Assume suitable **data** wherever **necessary**.
(4) **Answer's** should be in **serial order**.

1. (a) Check for periodicity of the following signals. Also find the new period. **20**

(i) $x(t) = 3\cos(15\pi t) + 4\cos\left(35\pi t - \frac{\pi}{4}\right) + 8\sin(55\pi t)$

(ii) $x(n) = 3\cos^2\left(\frac{\pi}{6}n\right) + 2\cos^2\left(\frac{\pi}{4}n\right)$

(b) Determine whether the given signal is energy or power signal. Hence obtain its energy power accordingly.

(i) $x(t) = 4 \sin t \quad -\infty < t < \infty$

(ii) $x(n) = \left(\frac{3}{7}\right)^n u(n)$

(c) Plot $x(t) = u(t) - r(t) + r(t-1)$. Hence plot its even and odd parts also.

(d) Prove time shifting property of Z - transform.

(e) Check for Dynamicity, Linearity, Time variance, causality of the system.

(i) $y(t) = t\,x(t) + x(t-1)$

(ii) $y(n) = 3x(-n) + 4$.

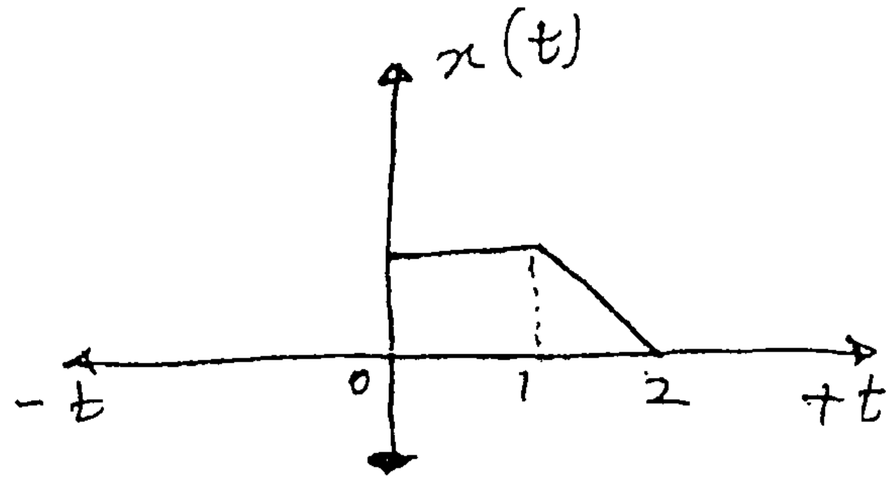
2. (a) Obtain inverse Z - transform for all possible ROC's. Also comment on Causality and Stability in each case. **10**

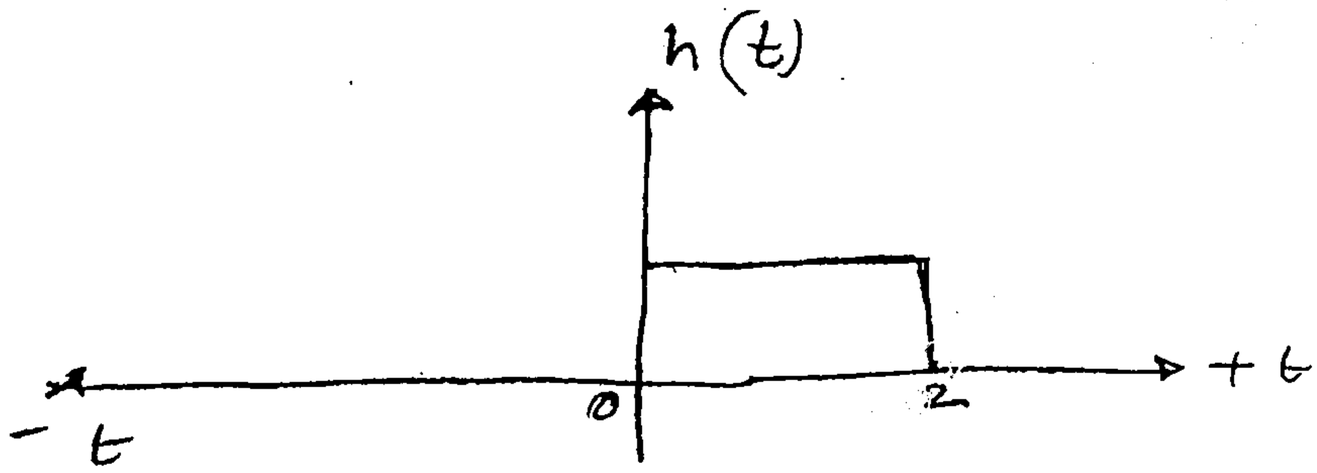
$$H(z) = \frac{z(3z-7)}{\left(z-\frac{1}{4}\right)(z+2)}$$

(b) State and prove Time Shifting and Convolution property of Continous Time Fourier Transform. **10**

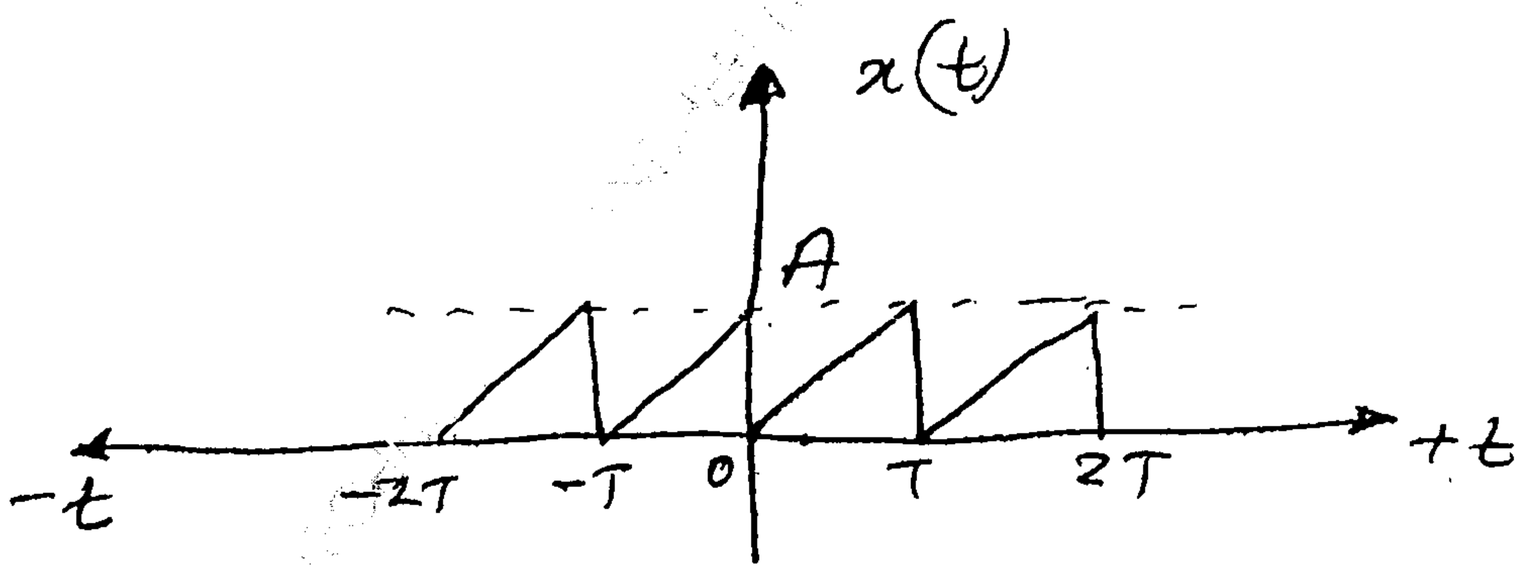
TURN OVER

3. (a) Obtain graphical convolution of following two signals. 10





(b) Obtain exponential Fourier series of the following signal. 10



4. (a) Determine h(t) for all possible ROC's. 10

If T. F. $= H(s) = \dfrac{2s+7}{(s+2)(s-3)}$

Also comment on Causality and Stability of the system for each case.

27/5/16

(b) A causal DT LTI system is described as **10**

$$y(n) = 3y(n-2) + 4y(n-1) + x(n)$$

Obtain : (1) T.F. of system

(2) Obtain step response

(3) Obtain response if input $x(n) = \left(\frac{1}{2}\right)^n u(n)$

(4) Also plot pole's and zeros of the T.F. and comment on causality and stability.

10

5. (a) Determine Impulse response and step response of a CT LTI system.

$$\frac{d^2y(t)}{dt^2} + \frac{7dy(t)}{dt} + 12y(t) = x(t)$$

10

(b) Obtain auto-correlation of following signals

(i) $x(t) = 3e^{-2t}\ u(t)$

(ii) $x(n) = \left(\frac{3}{4}\right)^n u(n)$

10

6. (a) Obtain DT Fourier Transform of following signal $h(n) = [2\ 1\ 2]$ plot its magnitude and phase spectrum. **10**

(b) Obtain :

(i) Z - transform of

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

(ii) Laplace transform of

$$x(t) = t.e^{-3t}\ u(t) + t\ u(t-1)$$

Use properties of transform only.

Sem-V ETRX (CBGS) 17/5/16.
Design with linear Integrated Circuit

QP Code : 31088

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

N. B. : (1) Question No. 1 is **compulsory**.
(2) Solve any **three** out of remaining questons.
(3) Assume suitable data if necessary.

1. (a) Explain behaviour of op-amp in linear and saturation region with neat graphs. **20**
(b) Explain non-inverting comparator with suitable example.
(c) State various methods to achieve analog to digital conversion.
(d) Explain 78XX series voltage regulator.
(e) Implement y = 3 va – 5 vb + 7 vc using op-amp, where y is output and va, vb & vc are inputs.

2. (a) Derive expression for voltage gain of inverting amplifier and hence design the same for voltage gain = 20. **10**
(b) Design a 2nd order KRC low pass filter with a cutoff frequency fo = 1 KHz and Q = 5. **10**

3. (a) Draw the circuit diagram of an inverting type schmitt trigger circuit. Design such a circuit to meet UTP = + 2.5 V & LTP = – 1 V Assume ± vsat = ± 12 V, for an input of 8sinwt, plot the graph of vo and vin. **10**
(b) Explain working of Wien bridge oscillator and hence design for fo = 5 KHz. **10**

4. (a) Explain R/2R ladder type DAC **10**
(b) Design Mono stable multivibrator using IC 555 to generate output delay of 10 msec. **10**

5. (a) Design voltage regulator using IC 723 for Vo = 10 V and I_L = 200 mA. **10**
(b) Explain internal diagram of power amplifier LM 380 **10**

6. Write short notes on :– **20**
(a) Sample and Hold circuit
(b) V-I converter
(c) Applications of IC 555
(d) Switching mode voltage regulator

FW-Con. 10269-16.

TE- SEM-V - ETRX (CBGS) 11/5/2016

E.E.

QP Code : 31046

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

N. B. : (1) Question no **1** is **compulsory**.
(2) Solve any **three** from Question no **2** to Question no **6**.
(3) Assume suitable data if required.
(4) **Right** figures indicate the **marks**.

1. Attempt any **four** :– **20**
   (a) Point charges Q_2=300μC located at (2,-1,-3) m experiences a force $\overline{F_2} = 8\overline{a_x} - 8\overline{a_y} + 4\overline{a_z}$ N. due to point charge Q_1 at (3,-4,-2)m. Determine Q_1
   (b) The height of a monopole antenna is λ/100. What is radiation resistance of antenna
   (c) State and explain Biot-Savart's law
   (d) Find out the divergence and curl of the following function $\overline{F} = 2x^2y\,\overline{a}_x + x^2z\,\overline{a}_y + yz^3\overline{a}_z$
   (e) Explain what do you mean by skin depth for lossy media with respect to signal passing through lossy media.

2. (a) Derive Maxwells integral and point form of equations for static fields **10**
   (b) Find electric field intensity *E* due to an infinite surface charge. **10**

3. (a) Define the polarization of wave. Explain different types of polarization **10**
   (b) Derive boundary conditions for electric and magnetic fields at the boundary of two dielectric media **10**

4. (a) Explain in detail FDM method also state advantage and drawback of it. **10**
   (b) State Poynting theorem and derive the average poynting vector. **10**

5. (a) Explain the significance of the term 'effective area of an antenna'. Derive the relationship between effective area and directivity of any antenna **10**
   (b) Explain the principle modes of operation of helical antenna and draw its radiation pattern **10**

6. (a) Classify and explain different types of wave propagation. **20**
   (b) Explain folded dipole antenna and its applications
   (c) Explain following terms critical frequency, virtual height, maximum usable frequency

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T. E. Sem V K. T.
E & TRX CBGS
2/06/15
Digital Communication

QP Code: 31216

(03 hours) [Total marks : 80

N.B. : 1) Question no. 1 is compulsory
2) Attempt **any three** questions out of the remaining five questions
3) Assume suitable data if required, stating them clearly.

Q. 1 **Answer the following questions: (any four)** (20)

(a) What is a random variable? Explain the moments of a random variable viz. Mean and Variance.

(b) Why is MSK signal called as "shaped QPSK" signal? Justify with expressions and Waveforms.

(c) Discuss source coding and channel coding in brief with example.

(d) The binary data 1101101101 is applied to the input of duo-binary system with a pre- coder. Construct duo-binary coder with the corresponding output.

(e) State and explain Shannon-Hartley theorem.

Q 2 (a) Show that for an input signal which is a sequence of rectangular positive and negative pulses, the integrator is the matched filter. Bring out properties of matched filter. (10)

(b) With the help of neat block diagram and waveform, explain how a message is transmitted in BFSK? What type of receiver is used for BFSK reception? Explain its working. (10)

Q.3 (a) A discrete memory less source has an alphabet of five symbols with the probabilities-

Symbol	S1	S2	S3	S4	S5
Probability	0.30	0.20	0.16	0.10	0.15

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

{ii) Calculate code efficiency and the redundancy of the code. (8)

(b) For K=3 , code rate=1/3 , of a Convolution Code encoder with generator Vectors given as g1=[101], g2=[110] and g3=[111] , draw the encoder diagram.
(i) draw its State diagram and Code tree.
(ii) Use the Code tree to find the codeword for the msg 1011. (12)

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Q.4 (a) With reference to 8-PSK, explain the following:
(i) transmitter and receiver with a neat block diagram along with mathematical expression for transmitted signal
(ii) sketch its PSD indicating the bandwidth
(iii) draw its constellation diagram and find its Euclidian distance (5+3+2)

(b) Design a Feedbck shift register encoder for a (8,4) cyclic code with generator Polynomial $g(x) = (1+ x+ x^2 + x^3)$.
(i) Find the codeword for the msg 1001, By tracing the path through the encoder.
(ii) draw the syndrome calucalator for the same and find the syndrome if the received codeword is 1101110 (5 +5)

Q.5 (a) What is ISI ? How is it caused? Discuss the remedies to overcome ISI. state the Nyquist's Condition for zero ISI (Distortion less transmission) (10)

(b) Explain Direct sequence spread spectrum system.and Define anti-jamming characteristics of spread spectrum system.

If the direct sequence spread spectrum system has the following parameters.:

Data sequence bit duration Tb=6.125 ms

PN chip duration Tc=1.5 microseconds

The probability of error is less than 10^{-5} (Eb/No=10)

Then calculate Processing gain and Jamming margin. (5+5)

Q.6 (a) Draw the signal constellation diagram for 16-ary QASK (with d=2a) and for 16-PSK System. determine the Euclidian distance for the both systems and Compare. Which of them has better noise immunity? (10)

(b) write short notes on : any two (10)

(i) Central Limit theorem

(ii) Shannon-Fano coding with an example

(iii) comparison of Offset QPSK and non-offset QPSK

(iv) Linear Transversal Equalizer
