U.S.N

P.E.S. College of Engineering, Mandya - 571 401

(An Autonomous Institution affiliated to VTU, Belgaum)

Third Semester, B.E. - Electronics and Communication Engineering
Semester End Examination; Dec - 2016/Jan - 2017
Fundamentals of Signal

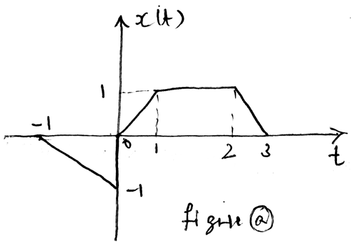
Time: 3 hrs *Max. Marks: 100*

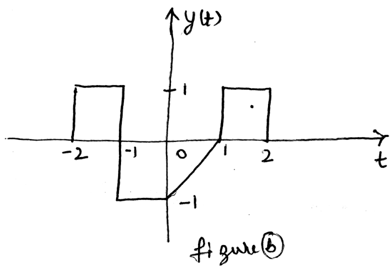
***Note**: Answer **FIVE** full questions, selecting **ONE** full question from each unit.*

UNIT - I

1 a. Mention the classification of signals and explain each with example. 8

b. For the given signals $x(t)$ and $y(t)$ are shown in figure (a) and figure (b). Sketch the even and odd signals. 6





c. Analyze whether the following signals are periodic or non-periodic. If periodic, find the fundamental period. i) $x(n)=\cos(\frac{n\pi}{7})\sin(\frac{n\pi}{3})$ ii) $x(n)=\cos n\pi\left[u(n+4)-u(n-5)\right]$. 6

2 a. Show that the product of two even signal or two odd signals is an even signal, while the product of even and odd signal is an odd signal. 6

b. Analyze the given system is stable, casual, linear, time invariant and memory less, 8

i) $y(t)=\dfrac{dx(t)}{dt}$ ii) $y(t)=x(2-t)$.

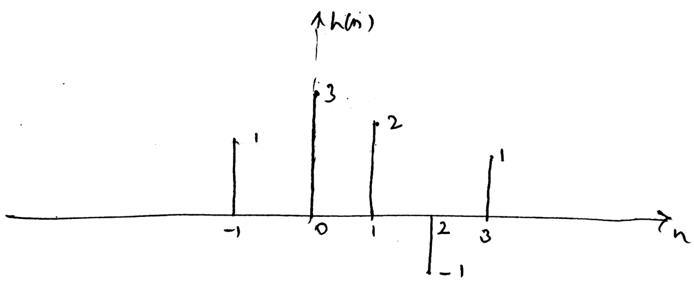
c. Find the energy or power, whichever is appropriate for the following signals, 6

i) $x(t)=tu(t)$ ii) $x(n)=\left(\frac{1}{3}\right)^{n}u[n]$.

UNIT - II

3 a. Compute the convolution of two sequences $x_1(n)$ and $x_2(n)$, where $x_1(n)=\{\underset{\uparrow}{1},2,3\}$ and $x_2(n)=\{1,2,\underset{\uparrow}{3},4\}$. 6

b. A discrete Time LTI system has Impulse response $h(n)$ as shown in figure. Use linearity and time Invariant. Analyze the system output $y(n)$, if the output $y(n)$ is $x(n)=u(n)-u(n-3)$ 8



c. Develop the system output for the given input Impulse response, 6

$y(n) = u(n) * u(n-3)$.

4 a. Design the LTI system output response for the given system difference equation : 10

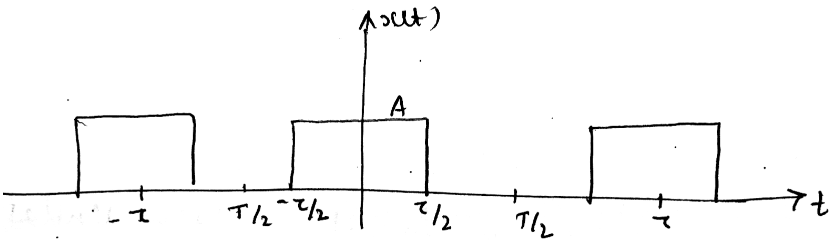
$y(n) - \frac{1}{9} y(n-2) = x(n-1)$ with $y(-1) = 1, y(-2) = 0$ and $x(n) = u(n)$.

b. Implement the system given below using Discrete form I and direct form II, 10

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

UNIT - III

5 a. Determine the Fourier series representation of the Waveform shown below, 10



b. State and prove the properties of Fourier series; 10

i) Convolution ii) Time shift.

6 a. State and prove the convolution and modulation properties of Fourier transform. 10

b. Find the Fourier transform of the following signals; 10

i) $x(t) = e^{-t-1} u(t)$ ii) $x(t) = e^{-t-j\pi t} u(t)$.

UNIT - IV

7 a. State and prove the convolution and Parseval's property of DTFT. 10

b. Determine the DTFT of the following signals 10

i) $x(n) = u(n)$ ii) $x(n) = (-1)^n u(n)$ iii) $x(n) = u(n) - n(n-6)$

8 a. State and prove sampling theorem. Define aliasing distortion. 10

b. The transfer function of a system is, 10

$H(w) = \frac{16}{4 + jw}$ Find the domain response $y(t)$ for the Input $x(t) = u(t)$.

UNIT - V

9 a. State and prove time shifting and convolution properties of Z-transform. 8

b. Find the Z-transform of $x(n)$ and plot pole-zero location. Indicate ROC, 8

i) $x(n) = \sin \Omega_0 n - u(n)$ ii) $x(n) = nu(n)$.

Contd….3

c. Find the Inverse Z-transform of,

$X(Z) = \frac{z(z^2-4z+5)}{(z-3)(z-1)(z-2)}$ for the following ROCs, 6

i) $2<|z|<3$

ii) $|z|>3$

iii) $|z|<1$

10 a. Solve the difference equation using unilateral Z-transform, 5

$y(n+2)+3y(n+1)+2y(n)=0$ with $y(0)=0$; $y(1)=1$.

b. A stable system described by difference equation,

$$y(n)-y(n-1)+\frac{1}{4}y(n-2)=x(n)+\frac{1}{4}x(n-1)-\frac{1}{8}x(n-2)$$

Determine; 10

i) Impulse response of the system

ii) If, $y(n)=\left(\frac{1}{4}\right)^n u(n)+\left(-\frac{1}{2}\right)^n u(n)$.

c. If $h(n)=\left(\frac{1}{3}\right)^n u(n)+\left(\frac{1}{2}\right)^{n-2} u(n-1)$, 5

Determine the transfer function and difference equation.

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