U.S.N | | | | | | | | | | |

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

(An Autonomous Institution affiliated to VTU, Belagavi)

Fourth, Semester, B.E. - Electrical and Electronics Engineering

Semester End Examination; May/June - 2018

Signals and Systems

Time: 3 hrs *Max. Marks: 100*

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

UNIT - I

1 a. i) Evaluate the integral $\int_{-\infty}^{\infty}(t-1)\delta\left(\frac{2}{3}t-\frac{3}{2}\right)dt$ ii) Sketch the signal $x(t)=\delta(\cos t)$ 5

b. Determine whether the signal $x[n]=(-1)^n$ is periodic and find fundamental period. 5

c. Express x_2(t) interms of x_1(t) in Fig.1(c). 5

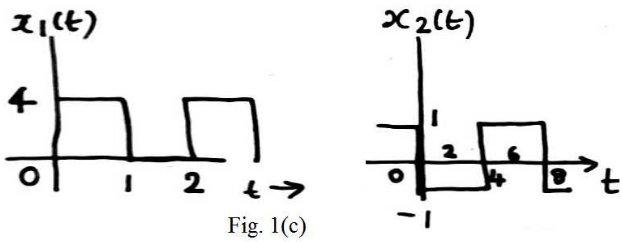

Fig. 1(c)

d. For the signal *x*(t) of Fig. 1(d) plot 2*x (2t+2).* 5

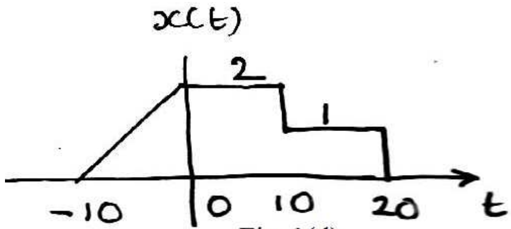

Fig. 1(d)

2 a. Determine whether the system described by *y[n] = cos(x[n+2])* is,

i) Memory-less ii) Invertible iii) Causal 10

iv) Stable v) Time invariant vi) Linear

b. Consider the signal

$x(t)=\cos 5t+3e^{-j10t}$, 5

Find fundamental period T_o and angular frequency w_o.

c. Let *x(t)* and *y(t)* be given in Fig. 2(c), sketch *x*(t) *y(t-1).* 5

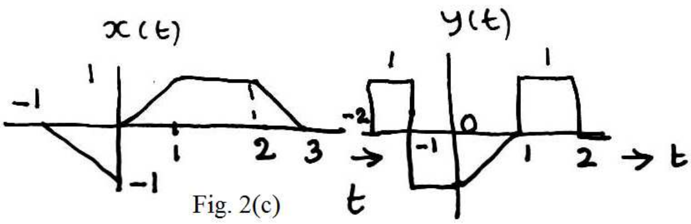

Fig. 2(c)

UNIT - II

3 a. Consider the continuous time signals depicted in Fig. 3(a). Evaluate the convolution integral $y(t) = x(t) \times h(t)$. 15

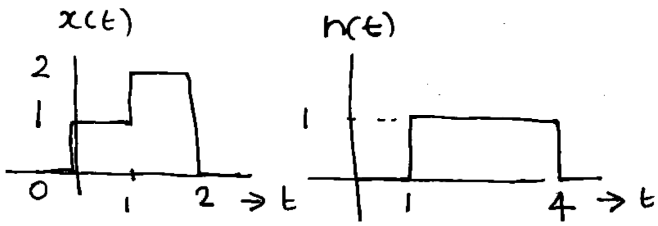

Fig. 3(a)

b. State the properties of convolution. 5

4 a. Given $x[n] = \{0, 1, 2, \underset{\uparrow}{3}, 4, 5, 0, ...\}$

$h[n] = \{0, 1, 2, \underset{\uparrow}{3}, 4, 5, 0, ...\}$ 10

Evaluate $x[n] \times h[n]$ at $n = 0,\ 2$.

b. The impulse response of the discrete LTI system is

$h[n] = n\left(\frac{1}{2}\right)^n u[n]$ 10

Check the following :

i) Stability ii) Causality

UNIT - III

5a. Determine the forced response for the system described by the following difference equation;

$y[n] - \frac{2}{5}\, y[n-1] = 2x[n]$ where input $x[n] = -(\frac{1}{2})^n\, u[n]$ 5

b. Draw direct form-I and form-II implementation for the difference equation;

$y[n] + \frac{1}{4}\, y[n-1] - \frac{1}{4}\, y[n-2] = x[n] + x[n-1]$ 10

c. Find difference equation description for the system depicted in Fig. 5(c). 5

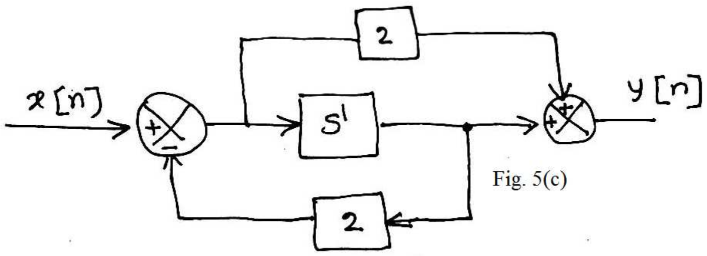

Fig. 5(c)

6 a. For the periodic waveform shown in Fig. 6(a) find the exponential Fourier series and sketch magnitude and phase spectra. 10

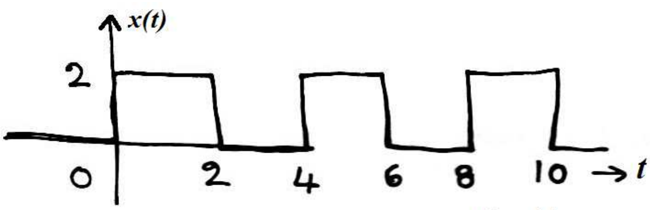

Fig. 6(a)

b. Use the definition of the Fourier series to determine the time signal represented by the following Fourier series coefficients 10

$X[k] = j\delta[k-1] - j\delta[k+1] + \delta[k-3] + \delta[k+3] \qquad w_0 = 3\pi \;\; rad/\text{sec}.$

UNIT - IV

7 a. Use the defining equation for the Fourier transform to evaluate the frequency domain representations for the signal, 10

$x(t) = e^{-|t|}$ Sketch magnitude and phase spectra.

b. Find the Fourier transform *X(w)*. Given $x(t) = \cos(w_0 t)\, u(t)$. 10

8 a. Find the Fourier transform *X(w)* of the signal 10

$x(t) = \frac{1}{1+jt}$

b. State: i) Periodicity ii) Linearity iii) Time shift 10

iv) Time reversal v) Frequency shift properties of DTFT

UNIT - V

9 a. Determine the Z-transform of;

$$x[n] = \left(\frac{1}{2}\right)^n u[n] + 2^n\, u[n]$$ 10

and depict the ROC and the location of poles and Zeros in the Z-plane.

b. i) State and prove initial value theorem

ii) Find the initial value *x[n]* given 10

$$X[z] = \left(\frac{1 - z^{-1} + z^{-2}}{(1-(1/2)z^{-1})(1-2z^{-1})(1-z^{-1})}\right)$$

with $ROC\; 1 < |z| < 2$

10 a. Find the inverse Z-transform of

$$X[z] = \frac{1 + z^{-1}}{1-(1/3)z^{-1}}$$ 6

when $ROC : |z| > \frac{1}{3}$ using longdivision method.

b. Find the inverse Z-transform of

$$X(z) = \frac{1 - z^{-1} + z^{-2}}{(1-(1/2)z^{-1})(1-2z^{-1})(1-z^{-1})}$$ 14

$with\; ROC\; 1 < |z| < 2$

Using partial fraction expansion.

* * * *