AJEENKYA
D Y PATIL UNIVERSITY

End Term Examination (December 2019)

School: School of Engineering **Program: B.Tech (Mechatronics Engineering)**

Course: Digital Signal Processing **Course Code: MTE303**

Semester: V **Max Marks: 40** **Duration (mins): 90**

PART-A

(Write Very Short / One Line Answer)

Note: Answer all questions. Each question carries 1 mark. **[10]**

1. What is signal?
2. Explain initial value theorem.
3. Define δ(t).
4. Write the general expression of z-transform.
5. Write the various properties of δ(t) in continuous and discrete domain.
6. Draw and explain the ramp signal in discrete domain
7. What are various filters used in digital signal processing.
8. Write the general expression of DFT.
9. What is twiddle factor?
10. Explain time scaling properties.

PART-B

(Short Answer Questions – Not More Than 150 Words)

Note: Answer any FOUR questions. Each question carries 5 marks. [20]

11. If a signal x(t) is as shown in figure (1), then plot of the signal x(1-t), x($\frac{2}{3}$t-1).

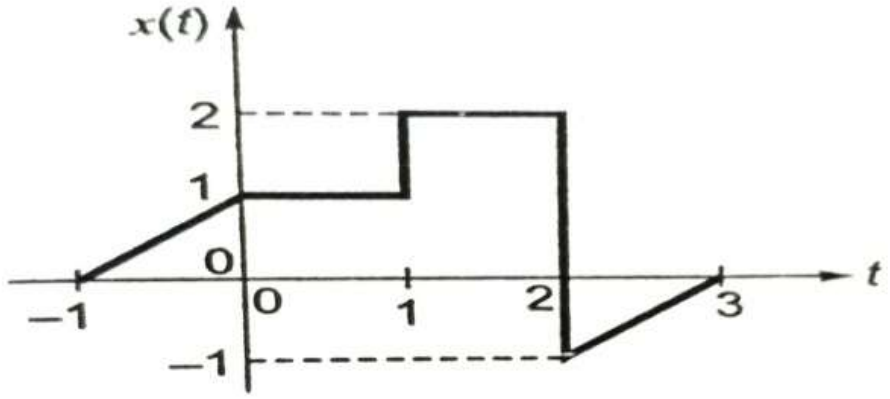

figure (1)

12. Evaluate the following integrals:

(a) $\int_{-1}^{1}(3t^2+1)\delta(t)\,dt$ **(b)** $\int_{1}^{2}(3t^2+1)\delta(t)\,dt$ **(c)** $\int_{-\infty}^{\infty}(t^2+cos\pi t)\delta(t-1)\,dt$

(d) $\int_{-\infty}^{\infty}e^{-t}\,\delta(2t-2)\,dt$ **(e)** $\int_{-\infty}^{\infty}e^{-t}\delta\,(t)\,dt$

13. A voltage is expressed as V(s) = $\frac{(s+1)}{(s^2+4s+4)}$ if this voltage is applied across a resistance of 0.25 Ω only, find the current through resistor in time domain.
14. Find DFT of the sequence x(n)= {1,1,0,0}.
15. Find the response of FIR filter with impulse response h(n) = $\{1,2,4\}$ to input sequence x(n)= $\{1,2\}$.
16. Use the backward difference for the derivative and convert the analog filter with system function. H(s) = $\frac{1}{s^2+16}$.

PART-C

(Long/Case Study/Essay Type Answer Questions)

Note: Answer any one question. Each question carries 10 marks. [10]

17. Find IDFT of the sequence X(k) = {5,0,1-j,0,1,0,1+j,0}.
18. A low pass filter is to be designed with the following desired frequency response

$H_d(e^{j\omega}) = \begin{cases} e^{-j2\omega} & , -\pi/4 \leq \omega \leq \pi/4 \\ 0 & \frac{\pi}{4} < |\omega| \leq \pi \end{cases}$

Determine the filter coefficients $h_d(n)$ if the window function is defined as

$\omega(n) = \begin{cases} 1 & , 0 \leq n \leq 4 \\ 0 & , \quad otherwise \end{cases}$

Also, determine the frequency response of $H(e^{j\omega})$ of the designed filter.