7E7072

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B.Tech. VII- Semester (Main & Back) Examination, November - 2019
Electronic Instrumentation & Control Engg.
7EI2A Digital Signal Processing
(Common for AI, EC, EIC)

Time : 3 Hours

Maximum Marks : 80
Min. Passing Marks : 24

Instructions to Candidates:

Attempt any five questions, selecting one question from each unit. All Questions carry equal marks. (sSchematic diagrams must be shown wherever necessary. Any data you feel missing suitably be assumed and stated clearly) Units of quantities used/calculated must be stated clearly.

UNIT - I

1. Explain the following using suitable mathematical derivation and wave form
   a) Decimation
   b) Interpolation **(8+8)**

(OR)

1. a) Obtain the two fold expanded signal y(n) of the input signal x(n)

$$x(n)=\begin{cases}x, x>0\\0, otherwise\end{cases}$$ **(8)**

   b) Explain discrete time processing of continuous time signals. **(8)**

UNIT - II

2. Explain the following linear systems
   a) Minimum phase system
   b) All - pass system. **(8+8)**

(OR)

2. a) Determine H(z) and its poles and zeros if

$$y(n)+\frac{3}{4}y(n-1)+\frac{1}{8}y(n-2)=x(n)+x(n-1)$$ **(8)**

   b) Determine the magnitude response of the system given by

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

UNIT - III

3. a) Determine direct form I and II for the second order filter given by

$$y(n) = 2b\cos w_0 y(n-1) - b^2 y(n-2) + x(n) - b\cos w_0 x(n-1)$$ **(10)**

b) Explain basic Realisation block diagram and signal flow graph of digital linear system. **(6)**

(OR)

3. Obtain the cascade and parallel realisations for the system function given by

$$H(z) = \frac{1+\frac{1}{4}z^{-1}}{\left(1+\frac{1}{2}z^{-1}\right)\left(1+\frac{1}{2}z^{-1}+\frac{1}{4}z^{-2}\right)}$$ **(16)**

UNIT - IV

4. a) For the analog, transfer function.

$H(s) = \frac{1}{(S+1)(S+2)}$ determine H(z) using impulse invariant technique Assume T = 1S. **(8)**

b) Apply bilinear transformation to $H(s) = \frac{2}{(S+1)(S+3)}$ with T = 0.1 S. **(8)**

(OR)

4. Design a digital Butterworth filter that satisifies the following constraint using bilinear transformation. Assume T = 1S.

$0.9 \le |H(e^{jw})| \le 1 \quad 0 \le w \le \pi/2$

$|H(e^{jw})| \le 0.2 \quad \frac{3\pi}{4} \le w \le \pi$ **(16)**

UNIT - V

5. Explain the following :
   a) Properties of the DFT
   b) DIT Algorithm. **(8+8)**

(OR)

5. Given x(n) = {1,2,3,4,4,3,2,1}
   Find x(K) using DIF. FFT Algorithm. **(16)**