7E7072

Roll No. _____ Total No of Pages: 4

7E7072

B. Tech. VII Sem. (Main / Back) Exam., Nov. – Dec. - 2018

Electronics & Communication Engineering

7E12A Digital Signal Processing

Common with AI, EC, EIC

Time: 3 Hours **Maximum Marks: 80**

Min. Passing Marks: 26

Instructions to Candidates:

*Attempt any **five questions**, selecting **one question** from **each unit**. All questions carry **equal** marks. Schematic 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.

Use of following supporting material is permitted during examination (Mentioned in form No. 205)

1. NIL 2. Nil

UNIT- I

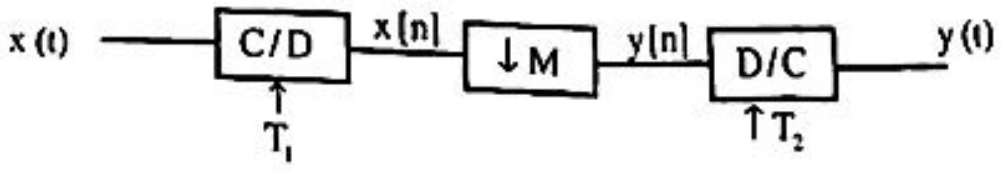
Q.1 (a) Determine the Nyquist rate & Nyquist interval for the following signal -

$$x(t) = \frac{1}{\pi t} \sin(600\pi t)$$ [6]

(b) Draw block diagram of continuous time processing of discrete time signals and write mathematical expression in term of time domain and frequency domain for output of each stage. [10]

OR

Q.1 Consider the system in figure – [16]



Assume that the input is band limited :

$$x_c(jw) = 0 \quad \text{for} \; |W| > 2\pi.1000$$

(a) What constraint must be placed on M_1T_1 & T_2 in order for ya (t) to be equal to xa (t)?

(b) If $f_1 = f_2 = 20$ KHz & M = 4, find the expression for ya (t) in terms of xa (t).

UNIT- II

Q.2 (a) Determine the homogeneous solution of the system, described by – [8]

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

(b) $H(z) = \dfrac{1+3z^{-1}}{1+\frac{1}{2}z^{-1}}$, write an expression of inverse system of H(z). [8]

OR

Q.2 (a) Define Minimum – phase system, write –

(i) Generalized expression of minimum – phase. [4]

(ii) Discuss stability and causality condition for a discrete system. [4]

(b) Write short notes on the following –

(i) All – pass system [4]

(ii) Frequency response of LTI system [4]

UNIT- III

Q.3 (a) Obtain direct form I and II realization of a system described by – [10]

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

(b) Realize the system with difference equation – [6]

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

in cascade form.

OR

Q.3 (a) Draw the cascades and parallel realizations for the following system functions - [10]

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

(b) Explain the FIR system and Transposed form. [6]

UNIT- IV

Q.4 Design an FIR linear phase filter using Kaiser Window to meet the following specification – [16]

$0.99 \leq |H(e^{jw})| \leq 1.01$, for $0 \leq |w| \leq 0.19\pi$

$|H(e^{jw})| \leq 0.01$, for $0.21\pi \leq |w| \leq \pi$

OR

Q.4 Write short notes on the following –

(a) Bilinear transformation [8]

(b) Impulse invariance transformation [8]

UNIT- V

Q.5 Explain the following –

(a) Decimation in Time FFT Algorithm [10]

(b) Properties of the DFT [6]

OR

Q.5 Determine the four point DFT of the sequence x(n) = (1, 0, 2, 1) using DIT Algorithm. [16]
