Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–VII (Old) EXAMINATION – WINTER 2019

Subject Code: 171003 **Date: 28/11/2019**

Subject Name: Digital Signal Processing

Time: 10:30 AM TO 01:00 PM **Total Marks: 70**

Instructions:

1. **Attempt all questions.**
2. **Make suitable assumptions wherever necessary.**
3. **Figures to the right indicate full marks.**

Q.1 **(a)** Perform the linear convolution of following sequences using graphical method. **07**
x[n]= {1,2,-1} and h[n] = {2,0,-2}
↑ ↑

(b) State and prove the following properties of DTFT. **07**
(1) Frequency Shifting
(2) Differentiation in Frequency

Q.2 **(a)** Explain the following properties of a discrete time system with suitable example. **07**
(1) Linearity (2) Causality (3) Time invariance

(b) What is ROC in context of Z-transform? List various properties of ROC. **07**

OR

(b) Define DTFT. Using DTFT, find impulse response of a LTI system described by difference equation $y[n] - \frac{1}{2}y[n-1] = x[n] - \frac{1}{4}x[n-2]$ **07**

Q.3 **(a)** Find inverse Z-transform of following: **07**

$$X(z) = \frac{1}{\left(1+\frac{1}{2}z^{-1}\right)(1-2z^{-1})(1-3z^{-1})} \qquad |z| > 3$$

(b) Write short note on Structures for linear phase FIR systems. **07**

OR

Q.3 **(a)** Find Z Transform and ROC of following signals. **07**
(1) $x[n] = na^n u[n]$
(2) $x[n] = \left(-\frac{1}{3}\right)^n u[n] - \left(\frac{1}{2}\right)^n u[-n-1]$

(b) Draw Direct form-I and Direct form-II structures for the system whose system function is **07**

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

Q.4 **(a)** What is circular convolution? How is it different from linear convolution? Determine the circular convolution of two sequences **07**
x(n) = cos(πn/2) for n=0,1,2,3
h(n) = 2^n for n= 0,1,2

(b) Discuss frequency domain representation of sampling. **07**

OR

Q.4 **(a)** With help of block diagram explain architecture of TMS320C6XXX processor. **07**

(b) Define DFT. Show relationship between DFT and DTFT. Prove any one property of DFT. **07**

Q.5 **(a)** Describe the decimation in frequency algorithm, with the help of a flow graph, for 8-point DFT computation. **07**

(b) Explain windowing method of designing FIR filter. **07**

OR

Q.5 **(a)** Describe the decimation in time algorithm, with the help of a flow graph, for 8-point DFT computation. **07**

(b) List the various methods of designing IIR filter. Explain IIR filter design using Bilinear Transformation method **07**

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