Mid-West University

Examinations Management Office

Chance Examinations 2081

Bachelor level/ B.E. Computer/ 7th Semester   Full Marks: 50

Time: 3 hours   Pass Marks: 25

Subject: Digital Signal Analysis and Processing (EX471/EX507)

- *Attempt all the questions*
- *Figures in the margin indicate full marks.*
- *Assume suitable values, with a stipulation, if necessary.*
- *Candidates are required to answer the questions in their own words as far as possible.*

1. a) What is linear time invariant (LTI) system. Explain its properties.   [2+3]

   b) Find the Fourier Transform of the signal x[n]=a$^{|n|}$,|a| < 1. Also plot the signal x[n].   [5]

2. Find the Z-transform and locate ROC for the signal.   [5]

$$X[n] = 2^n u[n] + \left(-\frac{1}{5}\right)^n u[n]$$

3. Plot the magnitude and phase response of the system which has poles at r = 0.6 and $\theta = \pi$.   [6]

4. a) Draw the direct form II of the following difference equation: [2.5]

$$y[n] - 0.5y[n-1] - 0.2y[n-2] + 2x[n] + 0.4x[n-1] = 0$$

   b) Obtain parallel form realization of the system: $H(z) = \frac{3(4z^2 + 10z + 8)}{(2z+1)(z+2)}$ [2.5]

   c) Draw the lattice structure from the given FIR filter's system function. Also check whether the stability of the system. $H(z) = 1 + \frac{13}{24z} + \frac{5}{8z^2} + \frac{1}{3z^3}$ [5]

5. Design the bandpass linear phase FIR filter having cutoff frequency of $\omega c1 = 1$ rad/sample and $\omega c2 = 2$ rad/sample. Obtain the unit sample response through following window: [6]

$$W(n) = \begin{cases} 1 & for\ 0 \leq n \leq 6 \\ 0 & elsewhere \end{cases}$$

6. Determine the system function of a digital filter H(z) using impulse invariance method at 2Hz sampling frequency from H$_a$(s) given below: [6]

$$H_a(s) = \frac{2}{(s+1)(s+2)}$$

7. What is discrete fourier transform (DFT) representation? Explain all the properties of DFT.   [3+4]

The End