MODEL QUESTION PAPER

_ 13.702:DIGITAL SIGNAL PROCESSING(E)

Time: 3 hrs Max: 100 Marks

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Answer all questions from Part-A

Part-A

1) Give the conditions for existence for Fourier series and state the reason for Fourier Transform analysis. (2)
2) Give the advantages and limitations of DSP (2)
3) Give the steps for checking time invariance with a suitable example (2)
4) The impulse response of a discrete LTI system is given by $\frac{1}{2}^n u[n] + \left(-\frac{1}{2}^n\right) u[n]$.Check for stability (2)
5) State any two properties of DTFT (2)
6) Give the combined conditions for causality and stability of any DT LTI systems in Z domain. (2)
7) Give any four properties of ROC. (2)
8) What is twiddle factor (2)
9) State transposition theorem. (2)
10) Obtain the DF-II realization of y[n]+y[n-1] – 4y[n-3] = x[n] + 3x[n-2] (2)

Part – B

Answer any one full question from each module

MODULE-I

11) a. Derive the expression for convolution sum (5)

b. Give the steps for obtaining tabular and functional convolution sum with suitable examples (5)

c.Determine the response of the relaxed system characterized by the impulse response h[n]= $0.5^n u[n]$ and input x[n]=$2^n u[n]$ (10)

OR

12) Check whether the given systems are linear, shift variant, causal and stable

a. y[n] = x[4n+1]

b. y[n] = x[n]u[n]

c. y[n] = x[n]+nx[n+1]

d. y[n] =$log_{10} x[n]$

e. y[n] =$x^2[n]$ (5*4=20)

MODULE-II

13 .a.Obtain the trigonometric Fourier series of Half wave rectifier output (8)

b. State Parseval's Theorem (2)

c. Find the Fourier transform of sgn(n) and sketch the spectra (10)

OR

14.a. Obtain the 8 point DIF and DIT FFT of given sequence {8,8,8,0,1,4,2,3} (10)

.b. Obtain the convolution of the sequence {2,1,2,1} and {1,2,3,4} in circular and matrix method (10)

MODULE-II

15.a. Find the output response of the discrete time system described by the following difference equation.y[n]-0.75y[n-1]+0.166y[n-2]=x[n] where x[n]=$\frac{1}{5}^{n}\ u[n]$ subjected to the initial conditions y[-1] = 0 and y[-2] = 1. Also find out the step response (15)

b.Realize the given system in direct form-I y[n] = 0.5y[n-1] – 0.25y[n-2] +x[n]+ 0.4 x[n-1] (5)

OR

16.a. Obtain the inverse Z transform of the function X(Z) = $\begin{matrix} 2 \\ -3Z + 2 \\ Z \quad \underline{4Z} \end{matrix}$ using the following methods.

i. Partial fraction method
ii. Power Series Expansion
iii. Residue Method (15)

13.b. State and prove any two properties of Z transform (5)

MODULE-IV

17.a. State the desirable properties required to convert an analog filter to an digital IIR filter give methods for the same. (5)

.b. For the analog transfer function $(S) = \frac{2}{(S+1)(S+2)}$. Determine its digital equivalent using impulse invariance method and bilinear transformation method taking T= 1sec (15)

OR

18.a.Explain with a suitable example the steps for design of linear phase filters using hamming window (10)

.b.Compare Chebyshev and Butterworth filters. (10)