Reg. No. :

Question Paper Code : X61331

B.E./B.Tech. DEGREE EXAMINATIONS, NOVEMBER/DECEMBER 2020
Fifth Semester
Electrical and Electronics Engineering
EC2314 – DIGITAL SIGNAL PROCESSING
(Regulations 2008)

Time : Three Hours Maximum : 100 Marks

Answer ALL questions

PART – A **(10×2=20 Marks)**

1. Define BIBO stable.

2. State and prove the time reversal property of Z-transform.

3. Given a difference equation y(n) = x[n] + 3x[n – 1] + 2y[n – 1]. Determine the system function H(z).

4. Find the stability of the system whose impulse response $h(n)=\left(\frac{1}{2}\right)^n u(n)$.

5. List any two properties of DFT.

6. List the advantages of FFT algorithms.

7. State warping and give the necessity of prewarping.

8. Define the condition for stability of digital filters.

9. List any two special features of DSP architecture.

10. Give examples for fixed point processor and floating point processor.

PART – B **(5×16=80 Marks)**

11. a) i) Give two examples for static. Time variant, casual and linear systems. **(8)**

ii) Tabulate the difference between energy and power signal with examples. **(8)**

(OR)

b) i) State whether the following system is linear, time varying, casual and stable $y(n) = nx^2(n)$. **(8)**

ii) State the expression for Nyquist rate ? If the sampling rate is less than the Nyquist rate, what happens ? Justify it with an example. **(8)**

12. a) i) Find the Z transform and its associated ROC for the following discrete time signal $x[n] = \left(\frac{-1}{5}\right)^n u[n] + 5\left(\frac{1}{2}\right)^{-n} u[-n-1]$. **(8)**

ii) Evaluate the frequency response of the system described by system function $H(z) = \frac{1}{1-0.5z^{-1}}$. **(8)**

(OR)

b) Using z-transform determine the response y[n] for $n \geq 0$ if

$$y[n] = \frac{1}{2}y[n-1] + x[n],\ x[n] = \left(\frac{1}{3}\right)^n u(n) y(-1) = 1.$$ **(16)**

13. a) i) Derive the computational equation for the 8-point FFT DIT. **(8)**

ii) State and prove any five properties of DFT. **(8)**

(OR)

b) Find the X(K) for the given sequence x(n) = {1, 2, 3, 4, 1, 2, 3, 4}. **(16)**

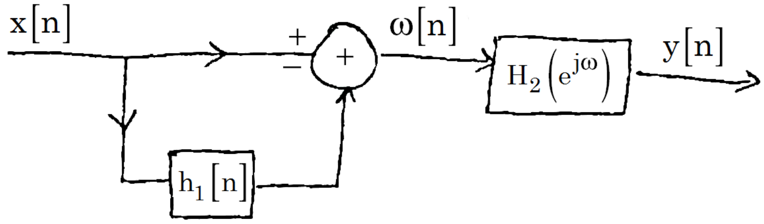
14. a) Design and realize a digital filter using bilinear transformation for the following- specifications. Monotonic pass band and stop band – 3.01 dB cut-off at 0.5 π rad magnitude down atleast 15dB at ω = 0 . 7 5 π rad. **(16)**

(OR)

b) i) Consider the causal linear shift invariant filter with system function

$$H(z) = \frac{1+0.875z^{-1}}{\left(1+0.2z^{-1}+0.9z^{-2}\right)\left(1-0.7z^{-1}\right)}$$. Draw the structure using a parallel interconnection of first and second order systems. **(8)**

ii) Consider the following interconnection of a linear shift invariant system.



Where $x[n] = \delta[n]$

$h_1[n] = \delta[n-1]$

$$H_2\left(e^{j\omega}\right) = \begin{cases} 1 & |\omega| \le \pi/2 \\ 0 & \pi/2 < |\omega| \le \pi \end{cases}$$

Find the overall impulse response h[n] of the system. **(8)**

15. a) i) With a flow diagram explain the Multiply and Accumulated (MAC) unit in a digital signal processor. **(8)**

ii) Write a note on commercial processors. **(8)**

(OR)

b) With examples explain the different addressing formats supported by DSP processors, for various signal processing applications. **(16)**