UNIT III & IV

PARTA 2marks

1. Define canonic and non canonic form realizations**.** (2)

2. Draw the direct form realizations of FIR systems? (2)

3. Mention advantages of direct form II and cascade structure? (2)

4. Define Bilinear Transformation. (2)

5. What is prewar ping? Why is it needed? (2)

6. Write the expression for location of poles of normalized Butterworth filter. (2)

7. Distinguish between FIR and IIR Filters. (2)

8. What is linear phase filter? (2)

9. What are the design techniques available for IIR filter? (2)

10. What is the main drawback of impulse invariant mapping? (2)

11. Compare impulse invariant and bilinear transformation. (2)

12. Why IIR filters do not have linear phase? (2)

13. Mention the properties of Butterworth filter? (2)

14. Mention the properties of Chebyshev filter? (2)

15. Why impulse invariant method is not preferred in the design of high pass IIR filter? (2)

16. Give the transform relation for converting LPF to BPF in digital domain. (2)

17. What are Gibbs oscillations? (2)

18. Explain briefly Hamming window (2).

19. If the impulse response of the symmetric linear phase FIR filter of length 5 is h(n) =

{2, 3, 0, x, y), then find the values of x and y. (2)

20. What are the desirable properties of windowing technique? (2)

21. Write the equation of Bartlett window. (2)

22.Why IIR filters do not have linear phase? (2)

23.Why FIR filters are always stable? (2)

24.Why rectangular window are not used in FIR filter design using window method? (2)

25.What are the advantages of FIR filter? (2)

26.What are the advantages and disadvantages of window? (2)

27.What is the necessary condition and sufficient condition for the linear phase characteristic of a

FIR filter? (2)

28.Compare Hamming and Hanning window? (2)

29.Why triangular window is not a good choice for designing FIR Filter? (2)

30.Why Kaiser window is most used for designing FIR Filter? (2)

31.What is the advantages in linear phase realization of FIR systems? (2)

PART B 16 Marks

Structures of IIR systems:

1. Obtain the cascade and parallel form realizations for the following systems (16)

Y (n) = -0.1(n-1) + 0.2 y (n-2) + 3x (n) +3.6 x (n-1) +0.6 x (n-2)

2.a) Obtain the Direct form II

y (n) = -0.1(n-1) + 0.72 y(n-2) + 0.7x(n) -0.252 x(n-2) (8)

b) .Find the direct form II

H (z) =8z-2+5z-1+1 / 7z-3+8z-2+1 (8)

3. Obtain the i) Direct forms ii) cascade iii) parallel form realizations for the following systems

y (n) = 3/4(n-1) – 1/8 y(n-2) + x(n) +1/3 x(n-1) (16)

4.Find the direct form –I, cascade and parallel form for (16)

H(Z) = z -1 -1 / 1 – 0.5 z-1+0.06 z-2

IIR FILTER DESIGN:

6. Explain the method of design of IIR filters using bilinear transform method. (16)

7. a)Derive bilinear transformation for an analog filter with system function H(s) = b/ s + a (8)

b) For the analog transfer function H(s) = 2 / (s+1) (s+3) .

Determine H (z) using bilinear transformation. With T=0.1 sec (8)

8. a)Convert the analog filter H(s) = 0.5 (s+4) / (s+1)(s+2) using impulse invariant transformation

T=0.31416s (8)

b)The normalized transfer function of an analog filter is given by H a (sn) = 1/ sn

2 +1.414 s n +1.

Convert analog filter to digital filter with cut off frequency of 0.4 π using bilinear transformation.

(8)

9. Design a single pole low pass digital IIR filter with -3db bandwidth of 0.2Π by using bilinear

transformation. (16)

10. For the constraints

$0.8 \leq |H(e^{jw})| \leq 1, 0 \leq \omega \leq 0.2\pi$

$|H(e^{jw})| \leq 0.2, 0.6\pi \leq \omega \leq \pi$ with T= 1 sec .Determine system function H(z) for a Butterworth

filter using Bilinear transformation. (16)

11.Design a digital Butterworth filter satisfying the following specifications

$0.7 \leq |H(e^{jw})| \leq 1, 0 \leq \omega \leq 0.2\pi$

$|H(e^{jw})| \leq 0.2, 0.6\pi \leq \omega \leq \pi$ with T= 1 sec .Determine system function H(z) for a Butterworth

filter using impulse invariant transformation. (16)

12. Design a digital Chebyshev low pass filter satisfying the following specifications 0.707 ≤ |H (e

jw)| ≤1, 0 ≤ ω ≤ 0.2π

|H (e jw)| ≤0.1 0.5 ≤ ω ≤π with T= 1 sec using for bilinear transformation. (16)

13.Design a digital Butterworth High pass filter satisfying the following specifications

0.9 ≤ |H (e jw)| ≤1, 0 ≤ ω ≤ π/2

|H (e jw)| ≤0.2, 3π/4 ≤ ω ≤π with T= 1 sec. using impulse invariant transformation (16)

14. Design a realize a digital filter using bilinear transformation for the following specifications

i) Monotonic pass band and stop band

ii) -3.01 db cut off at 0.5 π rad

iii) Magnitude down at least 15 db at ω = 0.75 π rad. (16)

FIR FILTER

15.a) Prove that an FIR filter has linear phase if the unit sample response satisfies the condition h(n)

= ± h(M-1-n), n =0,1,….. M-1.Also discuss symmetric and anti symmetric cases of FIR filter.

(8)

b) Explain the need for the use of window sequence in the design of FIR filter. Describe the

window sequence generally used and compare the properties. (8)

16. Design a HPF of length 7 with cut off frequency of 2 rad/sec using Hamming window. Plot the

magnitude and phase response. (16)

17. Explain the principle and procedure for designing FIR filter using rectangular window (16)

18. Design a filter with

H d (e

jώ) = e - 3 jώ , π/4 ≤ ω ≤ π/4

0. $\pi/4 \leq \omega \leq \pi$ using a Hamming window with N=7. (16)

19. H (w) =1 for $|\omega| \leq \pi/3$ and $|\omega| \geq 2\pi/3$

0 otherwise for N=11. and find the response. (16)

20.Design a FIR filter whose frequency response (16)

$H(e^{j\omega}) = 1 \quad \pi/4 \leq \omega \leq 3\pi/4$

0. $|\omega| \leq 3\pi/4$.

Calculate the value of h(n) for N=11 and hence find H(z).

21.Design an ideal differentiator with frequency response $H(e^{j\omega}) = jw \quad -\pi \leq \omega \leq \pi$

using hamming window for N=8 and find the frequency response. (16)

22.Design an ideal Hilbert transformer having frequency response

$H(e^{j\omega}) = j \quad -\pi \leq \omega \leq 0$

$-j \quad 0 \leq \omega \leq \pi$ for N=11 using rectangular window. (16)

FIR structures:

23.a) Determine the direct form of following system (8)

$H(z) = 1+2z^{-1} - 3z^{-2} + 4z^{-3} - 5z^{-4}$

b). Obtain the cascade form realizations of FIR systems (8)

$H(z) = 1+5/2\, z^{-1}+ 2z^{-2} +2\, z^{-3}$