Course/Branch : B.E / ECE	**Year / Semester** : III / V	Format No.	NAC/TLP-07a.13
Subject Code : EC8553	**Subject Name** : Discrete Time Signal Processing	Rev. No.	02
Unit No : 3	**Unit Name** :**Finite Impulse Response Filter**	Date	30.09.2020

OBJECTIVE TYPE QUESTION BANK

S. No.	Objective Questions (MCQ /True or False / Fill up with Choices)	BTL
1.	Which of the following is the difference equation of the FIR filter of length M, input x(n) and output y(n)? a) y(n)=∑M+1k=0bkx(n+k) b) y(n)=∑M+1k=0bkx(n−k) c) y(n)=∑M−1k=0bkx(n−k) d) None of the mentioned Answer: c Explanation: An FIR filter of length M with input x(n) and output y(n) is described by the difference equation y(n)=∑M−1k=0bkx(n−k) where {bk} is the set of filter coefficients.	L2
2.	If H(z) is the z-transform of the impulse response of an FIR filter, then which of the following relation is true? a) zM+1.H(z-1)=±H(z) b) z-(M+1).H(z-1)=±H(z) c) z(M-1).H(z-1)=±H(z) d) z-(M-1).H(z-1)=±H(z) Answer: d	L2
3.	Which of the following condition should the unit sample response of a FIR filter satisfy to have a linear phase? a) h(M-1-n) n=0,1,2…M-1 b) ±h(M-1-n) n=0,1,2…M-1 c) -h(M-1-n) n=0,1,2…M-1 d) None of the mentioned Answer: b	L4

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Unit No : 3	**Unit Name :Finite Impulse Response Filter**	Date	30.09.2020

OBJECTIVE TYPE QUESTION BANK

4.	2. The lower and upper limits on the convolution sum reflect the causality and finite duration characteristics of the filter. a) True b) False Answer: a Explanation: We can express the output sequence as the convolution of the unit sample response h(n) of the system with the input signal. The lower and upper limits on the convolution sum reflect the causality and finite duration characteristics of the filter.	L5
5.	The roots of the polynomial H(z) are identical to the roots of the polynomial H(z-1). a) True b) False Answer: a	L1
6.	If the unit sample response h(n) of the filter is real, complex valued roots need not occur in complex conjugate pairs. a) True b) False Answer: b Explanation: We know that the roots of the polynomial H(z) are identical to the roots of the polynomial H(z-1). This implies that if the unit sample response h(n) of the filter is real, complex valued roots must occur in complex conjugate pairs.	L1
7.	What is the number of filter coefficients that specify the frequency response for h(n) symmetric? a) (M-1)/2 when M is odd and M/2 when M is even b) (M-1)/2 when M is even and M/2 when M is odd c) (M+1)/2 when M is even and M/2 when M is odd d) (M+1)/2 when M is odd and M/2 when M is even Answer: d	L2

Course/Branch : B.E / ECE	**Year / Semester** : III / V	Format No.	NAC/TLP-07a.13
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Unit No : 3	**Unit Name** :**Finite Impulse Response Filter**	Date	30.09.2020

OBJECTIVE TYPE QUESTION BANK

8.	Which of the following defines the rectangular window function of length M-1? a) w(n)=1, n=0,1,2...M-1 =0, else where b) w(n)=1, n=0,1,2...M-1 =-1, else where c) w(n)=0, n=0,1,2...M-1 =1, else where d) None of the mentioned Answer: a	L1
9.	The multiplication of the window function w(n) with h(n) is equivalent to the multiplication of H(w) and W(w). a) True b) False Answer: b	L1
10.	What is the Fourier transform of the rectangular window of length M-1? a) $e^{j\omega(M-1)/2}\sin(\omega M/2)\sin(\omega/2)$ b) $e^{j\omega(M+1)/2}\sin(\omega M/2)\sin(\omega/2)$ c) $e^{-j\omega(M+1)/2}\sin(\omega M/2)\sin(\omega/2)$ d) $e^{-j\omega(M-1)/2}\sin(\omega M/2)\sin(\omega/2)$	L3

Course/Branch : B.E / ECE	**Year / Semester** : III / V	Format No.	NAC/TLP-07a.13
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Unit No : 3	**Unit Name** :**Finite Impulse Response Filter**	Date	30.09.2020

OBJECTIVE TYPE QUESTION BANK

	Answer: d	
11.	With an increase in the value of M, the height of each side lobe _____ a) Do not vary b) Does not depend on value of M c) Decreases d) Increases Answer: d	L2
12.	Which of the following windows has a time domain sequence h(n)=1−2|n−M−12|M−1? a) Bartlett window b) Blackman window c) Hanning window d) Hamming window Answer: a	L3
13.	What is the approximate transition width of main lobe of a Hamming window? a) 4π/M b) 8π/M c) 12π/M d) 2π/M Answer: b	L1
14.	What is the peak side lobe (in dB) for a rectangular window? a) -13 b) -27 c) -32	L1

Course/Branch : B.E / ECE	**Year / Semester** : III / V	Format No.	NAC/TLP-07a.13
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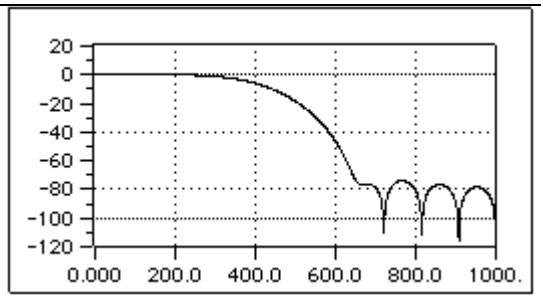
Unit No : 3	**Unit Name** :**Finite Impulse Response Filter**	Date	30.09.2020

OBJECTIVE TYPE QUESTION BANK

	d) -58 Answer: a	
15.	What is the peak side lobe (in dB) for a Hanning window? a) -13 b) -27 c) -32 d) -58 Answer: c Explanation: The peak side lobe in the case of Hanning window has a value of -32dB.	L2
16.	The oscillatory behavior near the band edge of the low pass filter is known as Gibbs phenomenon. a) True b) False Answer: a	L3
17.	How does the frequency of oscillations in the pass band of a low pass filter varies with the value of M? a) Decrease with increase in M b) Increase with increase in M c) Remains constant with increase in M d) None of the mentioned Answer: b Explanation: The frequency of oscillations in the pass band of a low pass filter increases with an increase in the value of M, but they do not diminish in amplitude.	L1
18.	Which of the following window is used in the design of a low pass filter to have a frequency response as shown in the figure?	L5

Course/Branch : B.E / ECE	**Year / Semester** : III / V	Format No.	NAC/TLP-07a.13
Subject Code : EC8553	**Subject Name** : Discrete Time Signal Processing	Rev. No.	02
Unit No : 3	**Unit Name** :**Finite Impulse Response Filter**	Date	30.09.2020

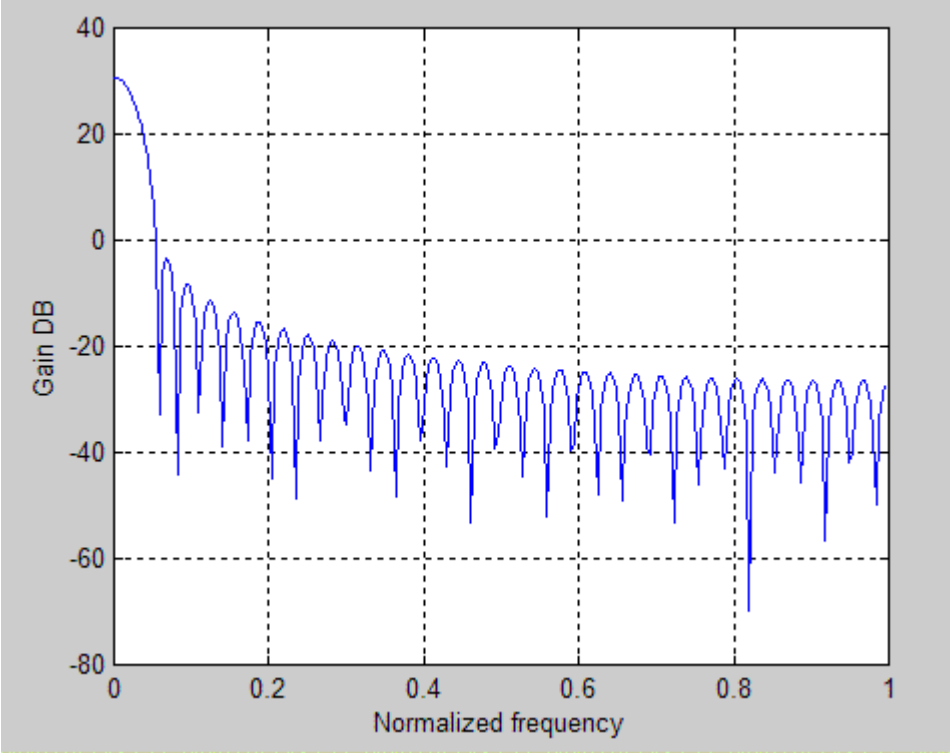
OBJECTIVE TYPE QUESTION BANK



a) Hamming window
b) Hanning window
c) Kaiser window
d) Blackman window

Answer: d
Explanation: The frequency response shown in the figure is the frequency response of a low pass filter designed using a Blackman window of length M=61.

19. Which of the following window is used in the design of a low pass filter to have a frequency response as shown in the figure?



a) Hamming window
b) Hanning window
c) Kaiser window
d) Blackman window

Answer: c

L1

Course/Branch : B.E / ECE	**Year / Semester** : III / V	Format No.	NAC/TLP-07a.13
Subject Code : EC8553	**Subject Name** : Discrete Time Signal Processing	Rev. No.	02
Unit No : 3	**Unit Name** :**Finite Impulse Response Filter**	Date	30.09.2020

OBJECTIVE TYPE QUESTION BANK

20.	Which of the following windows has a time domain sequence h(n)=12(1−cos2πnM−1)? a) Bartlett window b) Blackman window c) Hamming window d) Hanning window Answer: d Explanation: The Hanning window has a time domain sequence as h(n)=12(1−cos2πnM−1), 0≤n≤M-1	L1
21.	If the value of M increases then the main lobe in the frequency response of the rectangular window becomes broader. a) True b) False Answer: b	L2
22.	The large side lobes of W(ω) results in which of the following undesirable effects? a) Circling effects b) Broadening effects c) Ringing effects d) None of the mentioned Answer: c	L3
23.	In the frequency sampling method for FIR filter design, we specify the desired frequency response Hd(ω) at a set of equally spaced frequencies. a) True b) False Answer: a	L1

Course/Branch : B.E / ECE	**Year / Semester** : III / V	Format No.	NAC/TLP-07a.13
Subject Code : EC8553	**Subject Name** : Discrete Time Signal Processing	Rev. No.	02
Unit No : 3	**Unit Name** :**Finite Impulse Response Filter**	Date	30.09.2020

OBJECTIVE TYPE QUESTION BANK

24.	To reduce side lobes, in which region of the filter the frequency specifications have to be optimized? a) Stop band b) Pass band c) Transition band d) None of the mentioned Answer: c Explanation: To reduce the side lobes, it is desirable to optimize the frequency specification in the transition band of the filter. This optimization can be accomplished numerically on a digital computer by means of linear programming techniques.	L5
25.	What is the frequency response of a system with input h(n) and window length of M? a) $\sum M-1n=0h(n)ej\omega n$ b) $\sum Mn=0h(n)ej\omega n$ c) $\sum Mn=0h(n)e-j\omega n$ d) $\sum M-1n=0h(n)e-j\omega n$ Answer: d	L1
26.	Which of the following is equal to the value of H(k+α)? a) H*(M-k+α) b) H*(M+k+α) c) H*(M+k-α) d) H*(M-k-α) Answer: d Explanation: Since {h(n)} is real, we can easily show that the frequency samples {H(k+α)} satisfy the symmetry condition H(k+α)= H*(M-k-α).	L1
27.	The major advantage of designing linear phase FIR filter using frequency sampling method lies in the efficient frequency sampling structure. a) True b) False Answer: a	L2
28.	The linear equations for determining {h(n)} from {H(k+α)} are not simplified. a) True b) False	L3

Course/Branch : B.E / ECE	**Year / Semester** : III / V	Format No.	NAC/TLP-07a.13
Subject Code : EC8553	**Subject Name** : Discrete Time Signal Processing	Rev. No.	02
Unit No : 3	**Unit Name :Finite Impulse Response Filter**	Date	30.09.2020

OBJECTIVE TYPE QUESTION BANK

	Answer: b Explanation: The symmetry condition, along with the symmetry conditions for {h(n)}, can be used to reduce the frequency specifications from M points to (M+1)/2 points for M odd and M/2 for M even. Thus the linear equations for determining {h(n)} from {H(k+α)} are considerably simplified.	
29.	Which of the following is introduced in the frequency sampling realization of the FIR filter? a) Poles are more in number on unit circle b) Zeros are more in number on the unit circle c) Poles and zeros at equally spaced points on the unit circle d) None of the mentioned Answer: c Explanation: There is a potential problem for frequency sampling realization of the FIR linear phase filter. The frequency sampling realization of the FIR filter introduces poles and zeros at equally spaced points on the unit circle.	L1
30.	In a practical implementation of the frequency sampling realization, quantization effects preclude a perfect cancellation of the poles and zeros. a) True b) False Answer: a	L2
31.	In the frequency sampling method for FIR filter design, we specify the desired frequency response Hd(ω) at a set of equally spaced frequencies. a) True b) False Answer: a Explanation: According to the frequency sampling method for FIR filter design, the desired frequency response is specified at a set of equally spaced frequencies.	L2
32.	Why is it desirable to optimize frequency response in the transition band of the filter? a) Increase side lobe b) Reduce side lobe c) Increase main lobe d) None of the mentioned Answer: b Explanation: To reduce side lobes, it is desirable to optimize the frequency specification in the transition band of the filter.	L3

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Subject Code : EC8553	**Subject Name** : Discrete Time Signal Processing	Rev. No.	02
Unit No : 3	**Unit Name** :**Finite Impulse Response Filter**	Date	30.09.2020

OBJECTIVE TYPE QUESTION BANK

33.	What is the equation for the frequency ωk in the frequency response of an FIR filter? a) πM(k+α) b) 4πM(k+α) c) 8πM(k+α) d) 2πM(k+α) Answer: d Explanation: In the frequency sampling method for FIR filter design, we specify the desired frequency response Hd(ω) at a set of equally spaced frequencies, namely ωk=2πM(k+α) where k=0,1,2…M-1/2 and α=0 0r 1/2.	L1
34.	**What is the center of the circle represented by the image of jΩ axis of the s-domain?** **a) z=0** **b) z=0.5** **c) z=1** **d) none of the mentioned** **Answer: b**	L2
35.	What is the radius of the circle represented by the image of jΩ axis of the s-domain? a) 0.75 b) 0.25 c) 1 d) 0.5 Answer: d	L1
36.	**An analog high pass filter can be mapped to a digital high pass filter.** **a) True** **b) False** **Answer: b**	L2