SNS COLLEGE OF TECHNOLOGY

(An Autonomous Institution)

COIMBATORE-35

DEPARTMENT OF BIOMEDICAL ENGINEERING

19BMB302 - BIOMEDICAL SIGNAL PROCESSING

III YEAR/ V SEMESTER

UNIT –I TRANSFORMS

1. If x(n) and X(k) are an N-point DFT pair, then x(n+N)=x(n).

a) True

b) False

c) True if N is positive

d) True if N is Even

2. If x(n) and X(k) are an N-point DFT pair, then X(k+N)=?

a) X(-k)

b) -X(k)

c) X(k)

d) None of the mentioned

3. If X1(k) and X2(k) are the N-point DFTs of x1(n) and x2(n) respectively, then what is the N-point DFT of x(n)=ax1(n)+bx2(n)?

a) X1(ak)+X2(bk)

b) aX1(k)+bX2(k)

c) eakX1(k)+ebkX2(k)

d) None of the mentioned

4. If x(n) is a complex valued sequence given by x(n)=xR(n)+jxI(n), then what is the DFT of xR(n)?

a) $\sum_{n=0}^{N} x_R(n) \cos\frac{2\pi kn}{N} + x_I(n) \sin\frac{2\pi kn}{N}$

b) $\sum_{n=0}^{N} x_R(n) \cos\frac{2\pi kn}{N} - x_I(n) \sin\frac{2\pi kn}{N}$

c) $\sum_{n=0}^{N-1} x_R(n) \cos\frac{2\pi kn}{N} - x_I(n) \sin\frac{2\pi kn}{N}$

d) $\sum_{n=0}^{N-1} x_R(n) \cos\frac{2\pi kn}{N} + x_I(n) \sin\frac{2\pi kn}{N}$

Ans:d

5. If x(n) is a real sequence and X(k) is its N-point DFT, then which of the following is true?

a) X(N-k)=X(-k)

b) X(N-k)=X*(k)

c) X(-k)=X*(k)

d) All of the mentioned

6. If x(n) is real and even, then what is the DFT of x(n)?

a) $\sum_{n=0}^{N-1} x(n) \sin\frac{2\pi kn}{N}$

b) $\sum_{n=0}^{N-1} x(n) \cos\frac{2\pi kn}{N}$

c) $-j\sum_{n=0}^{N-1} x(n) \sin\frac{2\pi kn}{N}$

d) None of the mentioned

ans:b

7. If x(n) is real and odd, then what is the IDFT of the given sequence?

a) $j\frac{1}{N}\sum_{k=0}^{N-1} X(k) \sin\frac{2\pi kn}{N}$

b) $\frac{1}{N}\sum_{k=0}^{N-1} X(k) \cos\frac{2\pi kn}{N}$

c) $-j\frac{1}{N}\sum_{k=0}^{N-1} X(k) \sin\frac{2\pi kn}{N}$

d) None of the mentioned

ans:a

8. If x1(n),x2(n) and x3(m) are three sequences each of length N whose DFTs are given as X1(k),X2(k) and X3(k) respectively and X3(k)=X1(k).X2(k), then what is the expression for x3(m)?

a) $\sum_{n=0}^{N-1} x_1(n)x_2(m+n)$

b) $\sum_{n=0}^{N-1} x_1(n)x_2(m-n)$

c) $\sum_{n=0}^{N-1} x_1(n)x_2((m-n))_N$

d) $\sum_{n=0}^{N-1} x_1(n)x_2((m+n))_N$

Ans:c

9. What is the circular convolution of the sequences x1(n)={2,1,2,1} and x2(n)={1,2,3,4}?

a) {14,14,16,16}

b) {16,16,14,14}

c) {2,3,6,4}

d) {14,16,14,16}

10. What is the circular convolution of the sequences x1(n)={2,1,2,1} and x2(n)={1,2,3,4}, find using the DFT and IDFT concepts?

a) {16,16,14,14}

b) {14,16,14,16}

c) {14,14,16,16}

d) None of the mentioned

11. If X(k) is the N-point DFT of a sequence x(n), then circular time shift property is that N-point DFT of x((n-l))N is X(k)e-j2πkl/N.

a) True

b) False

12. If X(k) is the N-point DFT of a sequence x(n), then what is the DFT of x*(n)?
a) X(N-k)
b) X*(k)
c) X*(N-k)
d) None of the mentioned

13.By means of the DFT and IDFT, determine the response of the FIR filter with impulse response h(n)={1,2,3} to the input sequence x(n)={1,2,2,1}?
a) {1,4,11,9,8,3}
b) {1,4,9,11,8,3}
c) {1,4,9,11,3,8}
d) {1,4,9,3,8,11}

14.What is the sequence y(n) that results from the use of four point DFTs if the impulse response is h(n)={1,2,3} and the input sequence x(n)={1,2,2,1}?
a) {9,9,7,11}
b) {1,4,9,11,8,3}
c) {7,9,7,11}
d) {9,7,9,11}

15. Which of the following is true regarding the number of computations required to compute an N-point DFT?
a) N2 complex multiplications and N(N-1) complex additions
b) N2 complex additions and N(N-1) complex multiplications
c) N2 complex multiplications and N(N+1) complex additions
d) N2 complex additions and N(N+1) complex multiplications

16. Which of the following is true regarding the number of computations required to compute DFT at any one value of 'k'?
a) 4N-2 real multiplications and 4N real additions
b) 4N real multiplications and 4N-4 real additions
c) 4N-2 real multiplications and 4N+2 real additions
d) 4N real multiplications and 4N-2 real additions

17.What is the real part of the N point DFT XR(k) of a complex valued sequence x(n)?
a) $\sum_{n=0}^{N-1}[x_R(n)\cos\frac{2\pi kn}{N} - x_I(n)\sin\frac{2\pi kn}{N}]$
b) $\sum_{n=0}^{N-1}[x_R(n)\sin\frac{2\pi kn}{N} + x_I(n)\cos\frac{2\pi kn}{N}]$
c) $\sum_{n=0}^{N-1}[x_R(n)\cos\frac{2\pi kn}{N} + x_I(n)\sin\frac{2\pi kn}{N}]$
d) None of the mentioned
ans:c

18. Divide-and-conquer approach is based on the decomposition of an N-point DFT into successively smaller DFTs. This basic approach leads to FFT algorithms.
a) True
b) False

MCQ – 2 Marks
1.The computation of XR(k) for a complex valued x(n) of N points requires:
a) 2N2 evaluations of trigonometric functions
b) 4N2 real multiplications
c) 4N(N-1) real additions
d) All of the mentioned

2.If the arrangement is of the form in which the first row consists of the first M elements of x(n), the second row consists of the next M elements of x(n), and so on, then which of the following mapping represents the above arrangement?
a) n=l+mL
b) n=Ml+m
c) n=ML+l
d) None of the mentioned

3.How many complex multiplications are performed in computing the N-point DFT of a sequence using divide-and-conquer method if N=LM?
a) N(L+M+2)
b) N(L+M-2)
c) N(L+M-1)
d) N(L+M+1)

4.How many complex additions are performed in computing the N-point DFT of a sequence using divide-and-conquer method if N=LM?
a) N(L+M+2)
b) N(L+M-2)
c) N(L+M-1)
d) N(L+M+1)

5.Which is the correct order of the following steps to be done in one of the algorithm of divide and conquer method?
1) Store the signal column wise
2) Compute the M-point DFT of each row
3) Multiply the resulting array by the phase factors WNlq.
4) Compute the L-point DFT of each column.
5) Read the result array row wise.
a) 1-2-4-3-5
b) 1-3-2-4-5
c) 1-2-3-4-5
d) 1-4-3-2-5

6.If we store the signal row wise then the result must be read column wise.

a) True

b) False

7. If we split the N point data sequence into two N/2 point data sequences f1(n) and f2(n) corresponding to the even numbered and odd numbered samples of x(n), then such an FFT algorithm is known as decimation-in-time algorithm.

a) True

b) False

8. If we split the N point data sequence into two N/2 point data sequences f1(n) and f2(n) corresponding to the even numbered and odd numbered samples of x(n) and F1(k) and F2(k) are the N/2 point DFTs of f1(k) and f2(k) respectively, then what is the N/2 point DFT X(k) of x(n)?

a) F1(k)+F2(k)

b) F1(k)- WNk F2(k)

c) F1(k)+WNkNk F2(k)

d) None of the mentioned

9.How many complex multiplications are required to compute X(k)?

a) N(N+1)

b) N(N-1)/2

c) N2/2

d) N(N+1)/2

10.The total number of complex multiplications required to compute N point DFT by radix-2 FFT is:

a) $(N/2)\log_2 N$

b) $N\log_2 N$

c) (N/2)logN

d) None of the mentioned

11.The total number of complex additions required to compute N point DFT by radix-2 FFT is:

a) $(N/2)\log_2 N$

b) $N\log_2 N$

c) (N/2)logN

d) None of the mentioned

12. For a decimation-in-time FFT algorithm, which of the following is true?

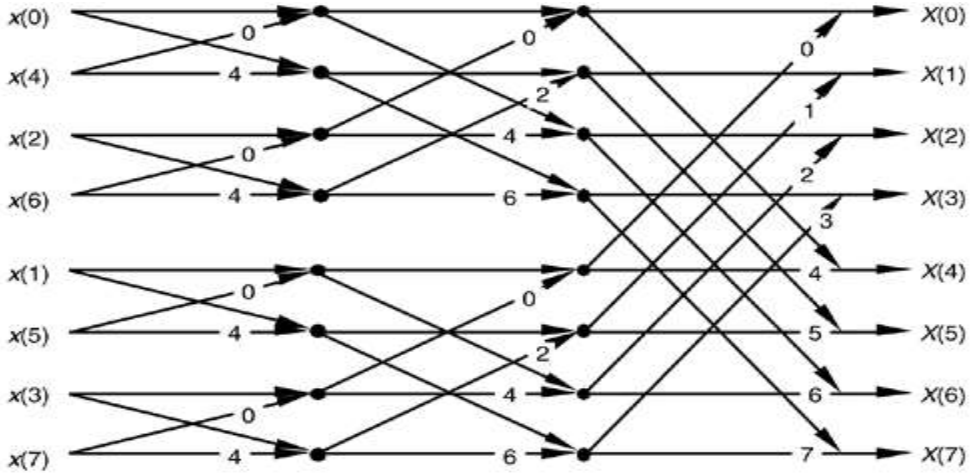
a) Both input and output are in order

b) Both input and output are shuffled

c) Input is shuffled and output is in order

d) Input is in order and output is shuffled

13.The following butterfly diagram is used in the computation of:



a) Decimation-in-time FFT

b) Decimation-in-frequency FFT

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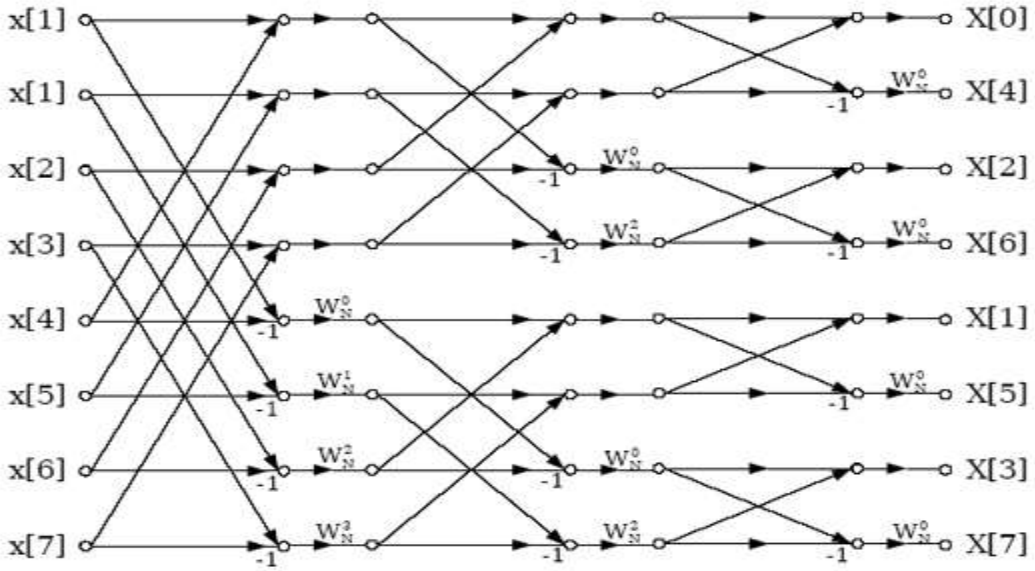

a) Decimation-in-time FFT

b) Decimation-in-frequency FFT

15.For a decimation-in-time FFT algorithm, which of the following is true?

a) Both input and output are in order

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c) Input is shuffled and output is in order

d) Input is in order and output is shuffled