

Assianment-5

1. A signal $X_n[e^{j\omega}]$ is the STFT of a signal $x_n[n]$ using hamming window $w[n]$. Determine the minimum frequency sampling rate where length of the window $N_w=100$ sample, and $F_s=10000$ Hz.

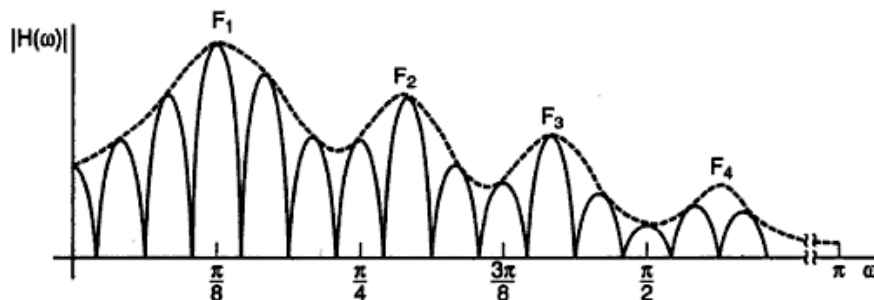
(a) **100 Hz**

(b) 200 Hz

(c) 500 Hz

(d) 1000 Hz

2. The figure given below represents the magnitude of the discrete-time Fourier transform of a steady-state vowel segment. The envelope of the spectral magnitude is sketched with a dashed line. Suppose that the sampling rate is **12 KHz** meet the Nyquist rate. Determine the value of the first formant frequency.



(a) 1.0 KHz

(b) 1.2 KHz

(c) **1.5 KHz**

(d) 2.0 KHz

3. A signal $X(n,k)$ is the STFT of a signal $x_n[n]$ and analysis is decimated in time by a factor L , where $w[n]$ is non-zero over its length N_w . $x_n[n]$ is invertible for which of the following conditions:

- I. The temporal decimation factor $L \leq N_w$
- II. The frequency sampling interval $2\pi/N \leq 2\pi/N_w$
- III. The temporal decimation factor $L > N_w$
- IV. The frequency sampling interval $2\pi/N \geq 2\pi/N_w$

(a) (I) and (IV)

(b) **(I) and (II)**

(c) (III) and (IV)

- (d) (II) and (IV)
4. Which of the following is true for the narrow band spectra?
- (a) Time resolution low, frequency resolution high
 - (b) Time resolution high, frequency resolution low
 - (c) None of the above.
5. How many complex multiplications are required to compute the 1024 point DFT using FFT algorithm?
- (a) 1024
 - (b) 1024x1024
 - (c) 10240
 - (d) 102400
6. Which of the following condition is necessary for complete recovery of the analysis signal in Overlap Add (OLA) method
- (a) Sum of all the analysis windows to add up to a constant
 - (b) Frequency responses of the analysis filters should sum to a constant across the entire bandwidth.
 - (c) Both of the above
7. A signal $X_n[k]$ is the STFT of a signal $x_n[n]$. If the length of the DFT used is 1024, determine the frequency resolution, where the sampling frequency $F_s=10$ kHz
- (a) 1024/1000
 - (b) 1024/10000
 - (c) 1000/1024
 - (d) 10000/1024
8. STFT analysis of a speech segment is required for noise reduction. If the STFT analysis is done based on the Hamming Window of length 20 ms, determine the maximum possible temporal decimation factor, so that the signal is completely invertible, when the sampling frequency $F_s=16$ kHz
- (a) 20 samples
 - (b) 40 samples
 - (c) 80 samples
 - (d) 160 samples

9. Short-Time Fourier Transform Magnitude $|S(nL, \omega)|$ is to be computed for a speech signal segment with time decimation rate $L=128$ sample. If the signal is recovered with modified decimation rate of $M=32$ samples, determine the speed-up factor.
- (a) 0.0625
 - (b) 0.125
 - (c) 0.25**
 - (d) 0.5
10. Main drawback of Time-Scale Modification of speech signal using Short-Time Fourier Transform Magnitude is
- (a) Pitch period mismatch at adjacent frames causes distortion
 - (b) Occasional reverberant characteristic of synthesized signal are perceived due to the lack of STFT phase control**
 - (c) There will not be any distortion