

## Introduction to TFA and Wavelet Transforms

### Assignment 6: Lectures 7.1 to 7.7

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1. The relation between scale and frequency:
  - (a) is same for all signals.
  - (b) depends on the center frequency of the reference signal.
  - (c) depends on the bandwidth of the reference signal.
  - (d) None of the above.
  
2. Select the correct statement with respect to wavelet transforms:
  - (a) Dilating the mother wave results in narrow analyzing functions.
  - (b) Dilating the mother wave results in a high pass filter.
  - (c) Compressing the mother wave results in narrow analyzing functions.
  - (d) Compressing the mother wave results in a low pass filter.
  
3. Select the correct statement from the following with respect to the CWT  $T_x(\tau, s)$  of the signal  $x(t)$ :
  - (a) It can be interpreted as the output of an LTI system with input as the signal and  $\psi_s(t)$  as the impulse response.
  - (b) It can be interpreted as the output of an LTI system with input as the signal and  $\overline{\psi}_s(t)$  as the impulse response.
  - (c) Both (a) and (b).
  - (d) None of the above.
  
4. Select the correct statement from the following:
  - (a) The center frequency of a DOG(2) wavelet is approximately 0.4 Hz.
  - (b) The center frequency of a DOG(2) wavelet is approximately 0.8 Hz.
  - (c) The center frequency of a Paul(2) wavelet is approximately 0.4 Hz.
  - (d) The center frequency of a Paul(2) wavelet is approximately 0.8 Hz.

5. Select the correct statement with respect to the computational aspects of the CWT
  - (a) In the FFT based method, the CWT is evaluated at all values of  $\tau$  in one run.
  - (b) In the convolution based method, the CWT is evaluated at all values of  $\tau$  in one run.
  - (c) The convolution method assumes periodic extension of the signal.
  - (d) None of the above.
  
6. Select the correct **statement(s)** from the following in regard to wavelet transforms:
  - (a) The aggregate of all details at scales  $s > 1$  can be treated as an approximation of the signal at  $s = 1$ .
  - (b) The aggregate of all details at scales  $s < 1$  contain the complementary details to fully recover the signal.
  - (c) The aggregate of all details at scales  $s < 1$  can be treated as an approximation of the signal at  $s = 1$ .
  - (d) The aggregate of all details at scales  $s > 1$  contain the complementary details to fully recover the signal.
  
7. Select the correct **statement(s)** with respect to scaling functions (Assume admissibility condition is satisfied):
  - (a) The scaling function can be thought of as the frequency response of a band pass filter.
  - (b) The scaling function can be thought of as the step response of a low pass filter.
  - (c) The scaling function can be thought of as the impulse response of a low pass filter.
  - (d) The scaling function can be thought of as the impulse response of an all pass filter.
  
8. Select the correct statement from the following:
  - (a) Real valued wavelets are useful in analysis of oscillations.
  - (b) Use of non-orthogonal wavelets result in larger memory requirements.
  - (c) The complex valued Morlet wavelet can be used for filtering.
  - (d) All of the above.
  
9. For a sinusoidal signal corrupted with an impulse at time  $t_0$ :
  - (a) The discontinuity is finely localized at all scales at time  $t_0$ .
  - (b) The discontinuity is spread equally in time around  $t_0$  across all scales.
  - (c) The discontinuity spreads itself across all scales, but lesser and lesser at finer scales.
  - (d) None of the above.
  
10. Which of the following are requirements on the wavelet for perfect reconstruction of a signal ?
  - (a) It must have zero average.
  - (b) It must be admissible.
  - (c) Both zero average and admissibility conditions must be met.
  - (d) None of the above.