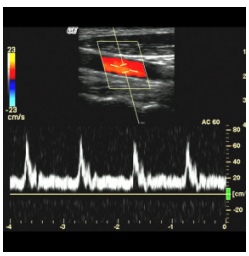
Sample Questions for Ultrasound Bioinstrumentation Class

January 2010

Part I: Multiple Choice Questions

1. Ultrasound field from a focused array of transducers can be computer by …
    a. Fresnel formula
    b. Fraunhofer formula (*)
    c. Fourier transformation
2. The effect of aperture apodization is to …
    a. Suppress side lobes magnitude
    b. Increase main lobe width
    c. Both of the above (*)
3. Phase aberration correction has a great value when the imaging in … media.
    a. Homogeneous
    b. Inhomogeneous (*)
    c. Scattering
4. M-mode acquires and displays … with time.
    a. A single B-mode line (*)
    b. A sample volume
    c. An azimuthal line
5. Doppler-mode computes and displays a spectrogram from … with time.
    a. A single B-mode line
    b. A sample volume (*)
    c. An azimuthal line
6. Parseval's theorem means that …
    a. Energy can be computed from either the spatial or spatial frequency domains. (*)
    b. Area of spatial domain can be computed from spatial frequency domains.
    c. Standard deviation of spatial domain is the same as that of the spatial frequency domain.
7. To detect a Doppler shift of 1 KHz using PW-Doppler with ultrasound center frequency of 5 MHz without aliasing, the pulse repetition rate should not be less than …
    a. 2 kHz (*)
    b. 2 MHz
    c. 10 MHz
8. Phase array ultrasound imaging probes generate sector images using …
    a. Focusing
    b. Steering (*)
    c. Mechanical motion
9. 4D ultrasound imaging means …
    a. Two perpendicular 2D slices spanning a volume.
    b. Volume imaging with time. (*)
    c. Image display with time and frequency.
10. The shown ultrasound image is for …
    a. B-mode ultrasound
    b. Color flow mapping
    c. Triplex mode (*)



Part II: True/False Questions

1. The Doppler effect is a simple shift in the frequency of the transmitted wave. (F)
2. The beamforming delay value for focusing is quadratic across the aperture. (T)
3. It is possible to compute the local spatial frequency of an image. (T)
4. The transfer function of a linear system is defined for spatially varying systems. (F)
5. Multiple probe connectors in ultrasound machines allow simultaneous multiple imaging modes such as B/D mode. (F)
6. Variation of sample volume is possible in CW-Doppler. (F)
7. The quality of ultrasound images depends linearly on the number of beamformer channels. (F)
8. It is not possible to compute the Doppler spectrogram from a single excitation. (T)
9. Ultrasound imaging uses electromagnetic waves in the MHz range. (F)
10. Array probes are used to send and receive ultrasound at the same time. (F)

Part III: Miscellaneous Problems

1. Beam computation problem (similar to sheet #1)
2. Fourier transformation problem (similar to bonus question about Doppler spectrogram).
3. Questions on material mentioned and explained in the lectures.
4. Question about your opinion about the choice between two technologies stating reasons (for example, analog vs. digital beamforming).

Sample Exam Solution Sheet:

Ultrasound Bioinstrumentation Term Exam - January 2010

Q1. MCQs

1	A B C	11	A B C	21	A B C
2	A B C	12	A B C	22	A B C
3	A B C	13	A B C	23	A B C
4	A B C	14	A B C	24	A B C
5	A B C	15	A B C	25	A B C
6	A B C	16	A B C		
7	A B C	17	A B C		
8	A B C	18	A B C		
9	A B C	19	A B C		
10	A B C	20	A B C		

Q2. T/F

26	T F	36	T F
27	T F	37	T F
28	T F	38	T F
29	T F	39	T F
30	T F	40	T F
31	T F	41	T F
32	T F	42	T F
33	T F	43	T F
34	T F	44	T F
35	T F	45	T F

Q46

Q47

Q48

Q49