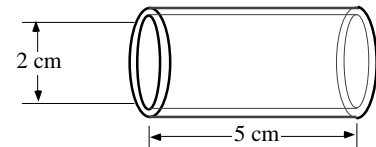


ELE 588 Biomedical Engineering Exam #3 Sample Name:

Open book/note. There are 10 questions; each is worth 10 points.

1. () According to the paper entitled “Automated identification of vessels contours in coronary arteriograms by an adaptive tracking algorithm” (IEEE Trans. Med. Imaging 8: 78-88, 1989), the tracking path for a single vessel segment is guided by a matched filter. What happens when the tracking algorithm reaches a bifurcation point where one vessel forks into two branches? (A) The tracking path follows the larger branch and continues. (B) The tracking terminates prematurely. (C) The tracking path splits into two, following both branches. (D) The tracking pauses; user’s input is required to continue. (E) none of the above.
2. () What’s an appropriate rule of thumb for dealing with “magic numbers” (empirical parameters) in the development of an image analysis algorithm? (A) Magic numbers are simply not allowed. (B) More magic numbers make the algorithm more reliable. (C) The use of magic numbers should be limited and their sensitivity be tested. (D) It is not necessary to make magic numbers adaptive to image resolution because they are supposed to be set arbitrarily. (E) none of the above.
3. () According to the paper entitled “Recursive tracking of vascular networks in angiograms based on the detection-deletion scheme” (IEEE Trans. Med. Imaging 12: 334-341, 1993), what is the purpose of deleting a vessel segment from the image immediately after it is detected? (A) to conserve the usage of memory, (B) to graphically show the process of tracking every vessel, (C) to improve the speed of the tracking algorithm, (D) to prevent re-entry of the tracking path, (E) none of the above.
4. () According to the paper entitled “Directional low-pass filtering for improved accuracy and reproducibility of stenosis quantification in coronary arteriograms” (IEEE Trans. Med. Imaging 14: 242-248, 1995), what is the main purpose of the directional low-pass filter? (A) to track vessel segments, (B) to eliminate noise while preserving vessel edges, (C) to detect vessel branch points, (D) to determine the direction of a vessel, (E) none of the above.

1. () The geometry and dimensions for a section of the blood vessel are shown on the right. Based on the Poiseuille's law the viscous resistance against blood flow through this section is determined to be 0.0002 mmHg•s/ml. If the diameter of the vessel decreases from 2 to 1 cm and everything else is the same, the viscous resistance should become (A) 0.0004, (B) 0.0008, (C) 0.0016, (D) 0.0032, (E) none of the above.



2. () The inertance for the section of the blood vessel shown above is determined to be 0.0003 mmHg•s²/ml. If the diameter of the vessel decreases from 2 to 1 cm and everything else is the same, the inertance should become (A) 0.00015, (B) 0.0006, (C) 0.0012, (D) 0.0048, (E) none of the above.
3. () The capacitance for the section of the blood vessel shown above is determined to be 0.2 mmHg/ml. If the diameter of the vessel decreases from 2 to 1 cm and everything else is the same, the capacitance should become (A) 0.025, (B) 0.05, (C) 0.1, (D) 0.4, (E) none of the above.
4. () According to the paper entitled “A comprehensive model for right-left heart interaction under the influence of pericardium and baroreflex” (AJP 272: H1499-H1515, 1997), which statement regarding the interaction between the right heart and the left heart is incorrect? (A) The right heart and the left heart are coupled through the pulmonary circulation, the pericardium, and the septum. (B) The pericardial coupling can affect hemodynamics by up to 20%. (C) The transeptal coupling has a greater effect on hemodynamics than the pericardial coupling does. (D) Left heart failure can cause right heart failure, and vice versa. (E) none of the above.
5. () Which of the following statements concerning the condition of cardiac tamponade is incorrect? (A) The heart is compressed by the pericardium. (B) Pressures in all cardiac chambers are about equal at the end of diastole. (C) Flows in and out of the heart cease during systole. (D) Pulsus paradoxus is often associated with cardiac tamponade. (E) none of the above.
6. () A large “v” wave on the pulmonary capillary wedge pressure measured by right-sided catheterization suggests the possibility of (A) cardiac tamponade, (B) mitral regurgitation, (C) left heart failure, (D) aortic stenosis, (E) none of the above.