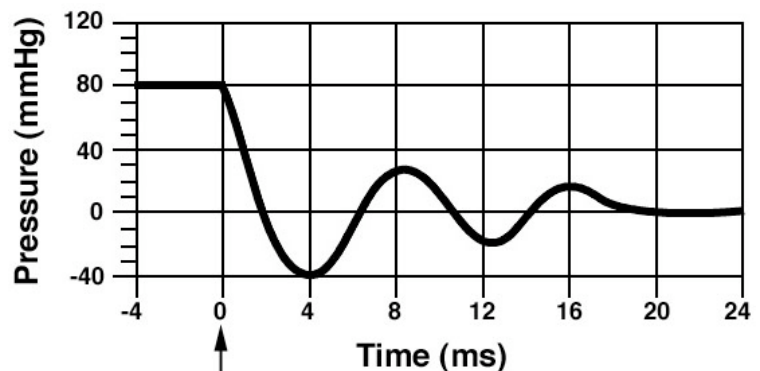


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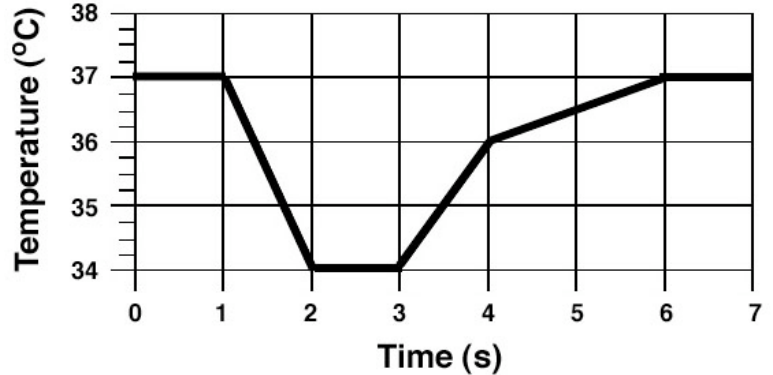
Open book/notes (10 questions, 10 points each)

1. () For the PIC18F452 microcontroller what is the size of the on-chip RAM? (A) 256 bytes, (B) 1536 bytes, (C) 2K bytes, (D) 32K bytes, (E) none of the above.
2. () We measured the oxygen saturation in the index finger and the second toe of six people. The mean \pm SD (in % saturation) is 97.3 ± 1.0 for finger and 96.2 ± 1.0 for toe. The correlation coefficient (r) between the two sets of data is 0.72. The paired t-statistic should be (A) 0.63, (B) 1.29, (C) 3.8, (D) 5.7, (E) none of the above.
3. () For the above problem, the null hypothesis (H_0) is that the oxygen saturation in the finger is the same as that in the toe. The alternative hypothesis (H_a) is that the oxygen saturation in the finger is higher than that in the toe. What conclusion should we draw based on the t-test? (A) accept H_0 with $0.20 < P < 0.10$, (B) accept H_0 with $0.10 < P < 0.05$, (C) accept H_a with $0.05 < P < 0.01$, (D) accept H_a with $0.01 < P < 0.005$, (E) none of the above.
4. () In heart-failure patients the secretion of the atrial natriuretic peptide (ANP) by the cardiac muscles in the atria inhibits the renin-angiotensin regulation of the renal function. Which of the following circulatory parameters is mostly affected by the secretion of ANP? (A) heart rate, (B) contractility, (C) preload, (D) afterload, (E) none of the above.
5. () An indirect blood-pressure measurement system uses a sphygmomanometer cuff to compress on an upper arm. A stethoscope is placed over a downstream artery. The diastolic arterial pressure is determined when (A) the first Korotkoff sound is detected, (B) the sound reaches its maximum level, (C) the sound changes from muffling to silence, (D) the sound reappears after the silencing, (E) none of the above.
6. () A "pop test" was conducted to evaluate the frequency response of a pressure catheter/transducer system. The following waveform shows the step response of the system as the "pop" was introduced at time 0. Assume that the system is a 2nd-order one. What is the damping factor α ? (A) 85, (B) 173, (C) 192, (D) 214, (E) none of the above.
7. () For the above problem determine the damped frequency (ω_d), but express it in Hz. (A) 54 Hz, (B) 75 Hz, (C) 125 Hz, (D) 163 Hz, (E) none of the above.



MORE QUESTIONS ON THE BACK

8. () The cardiac output was determined by use of the thermodilution method. A bolus of 50 cc saline at room temperature (20°C) was rapidly injected into the right atrium. The temperature was measured in the pulmonary artery as shown on the right. Assume a heat loss factor of 0.90. Determine the cardiac output in terms of liters per minute. (A) 3 l/min, (B) 4 l/min, (C) 5 l/min, (D) 6 l/min, (E) none of the above.



9. () The Fick oxygen method was used to determine the cardiac output of a patient. The rate of oxygen consumption measured by the spirometer was 160 ml/min. The arterial and venous O_2 concentrations measured by the oximeter were 0.18 ml/ml and 0.14 ml/ml, respectively. Determine the cardiac output in terms of liter per minute. (A) 3 l/min, (B) 4 l/min, (C) 5 l/min, (D) 6 l/min, (E) none of the above.
10. () An implant artificial cardiac pacemaker has a catheter for sensing and stimulating the right atrium. When a spontaneous heartbeat is detected, the pacemaker inhibits the stimulation. What is the appropriate code for this pacemaker? (A) AOI, (B) AAI, (C) AOT, (D) DDD, (E) none of the above.