Answers: 101 AAAE DDEB CCCB

(If your test is not 101, match up your questions and answers with this test.)

Serial Number: **101** Name:

ECE 3300 Fall 2016 (Signals, Systems, and Transforms): Exam 1

Record your name on this test; record your name, student ID, and test serial number on the scantron. Enter the test serial number in *COURSE*; you may leave *SECTION* blank. You must show your work on every problem, showing all steps on your test. Do not use scratch paper or write your work anywhere but on the test. Circle your answers on the test and bubble in the corresponding answers on your scantron. The examination lasts 60 minutes and you may use one sheet of notes (front and back); no old test questions can be on your notes. Calculator use is permitted. There is one correct answer per question. In problems asking to find coefficients A, B, C, etc., some of these coefficients may equal zero.

Question 1: Suppose $x[n] = 4(2)^n(u[n+2] - u[n-2]) + \delta[n-2]$. Determine $y[n] = \text{Ev}\{x[n]\}$. What is $y[0]$? $y[1]$? $y[2]$? Determine the sum of these values. Choose the closest answer.
A: 10.
B: 8.
C: 6.
D: 9.
E: 7.

Question 2: Simplify $\int_{t-4}^{t-1}(2-\tau)\delta(\tau-1)d\tau$. The answer can be written in the form $A(u(t-B) - u(t-C))$. What is $A+B+C$? Choose the closest answer.
A: 8.
B: 4.
C: 2.
D: 6.
E: 10.

Question 3: Suppose $\tilde{x}(t)$ is periodic with fundamental period $T_0 = \frac{9}{2}$ and fundamental cycle $x(t) = \sqrt{t+1}(u(t+1)-u(t-2))$. Determine the power $P_{\tilde{x}}$. Choose the closest answer.
A: 1.0.
B: 0.6.
C: 0.8.
D: 0.2.
E: 0.4.

Question 4: Suppose $x[n] = 3\delta[n+3]-\delta[n+2]+2\delta[n+1]-\delta[n]+u[n-1]$. Consider the summation signal $y[n] = \sum_{m=-\infty}^{n} x[m]$. At what time value n does $y[n] = 5$? Choose the closest answer.
A: 5.
B: 4.
C: 3.
D: 1.
E: 2.

Question 5: Consider the sum of two signals with fundamental periods $T_1 = \frac{3}{8}\pi$ and $T_2 = \frac{9}{16}\pi$. If the sum of the signals has fundamental period $T = \text{LCM}(T_1, T_2)$, what is T? Choose the closest answer.
A: 6.5.
B: 5.5.
C: 7.5.
D: 3.5.
E: 4.5.

Question 6: Suppose $x[n] = u[n+3] - u[n+2] + n^2(u[n] - u[n-3])$. Determine the time duration. Choose the closest answer.
A: 4.
B: Infinite.
C: 7.
D: 6.
E: 5.

Question 7: Suppose $x[n] = (5-n)(u[n-1] - u[n-5])$ and $y[n] = x[n-1]$. Determine the mean-squared error $\text{MSE}_{x,y}$. Choose the closest answer.
A: 25.
B: 10.
C: 30.
D: 15.
E: 20.

Question 8: Suppose $x(t) = 2\delta(t) - 2(u(t-2) - u(t-5)) + \delta(t-3)$ and suppose $y(t) = \int_{-\infty}^{t} x(\tau)d\tau$. What is $y(1)$? $y(2)$? $y(4)$? Determine the sum of these three values. Choose the closest answer.
A: 1.
B: 3.
C: 5.
D: 2.
E: 4.

Question 9: Consider the complex-valued signal $x[n] = (n+1)(u[n] - u[n-3]) - 4j(u[n-2] - u[n-4])$. Determine $|x[n]|$. The answer can be written in the form $A\delta[n] + B\delta[n-1] + C\delta[n-2] + D\delta[n-3] + E\delta[n-4]$. What is $A+B+C+D+E$? Choose the closest answer.
A: 14.
B: 13.
C: 12.
D: 11.
E: 10.

Question 10: Suppose $x[n] = (\cos(\frac{\pi}{2}n) + \sin(\frac{\pi}{2}n)(u[n] - u[n-5])$. Determine the difference signal $y[n] = x[n] - x[n-1]$. What is $y[3]$? $y[4]$? Determine the sum of these values. Choose the closest answer.
A: 0.
B: -2.
C: 2.
D: -1.
E: 1.

Question 11: Consider the periodic signal $\tilde{x}(t)$ with fundamental period $T_0 = 4$ and fundamental cycle $x(t) = (t+1)(u(t+2) - u(t)) + 2(u(t) - u(t-2))$. Suppose $\tilde{y}(t) = \frac{d}{dt}\tilde{x}(t)$. Determine the fundamental cycle $y(t)$. The answer has the form $A\delta(t+2) + B(u(t+2) - u(t)) + C\delta(t) + D(u(t) - u(t-2))$. What is $A + B + C + D$? Choose the closest answer.
A: 2.
B: 1.
C: -1.
D: 0.
E: -2.

Question 12: Suppose $x(t) = (t+1)(u(t-1) - u(t-3)) + (6-t)(u(t-4) - u(t-6))$ and $y(t) = x(4-2t)$. At what time does $y(t)$ equal 3? At what time does $y(t) = 1$? Determine the sum of these time values. Choose the closest answer.
A: 1.5.
B: 0.5.
C: 4.5.
D: 3.5.
E: 2.5.