

Test 101 Answers: BEAB ABAA CAEC

Serial Number: **101**

Name:

ECE 3300 SPRING 2017 (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 $x(t) = t(u(t) - u(t - 4))$ and $y(t) = (u(t - 2) - u(t - 6))$. Determine the correlation coefficient $\rho_{x,y}$. Choose the closest answer.

A: 0.55.

B: 0.65.

C: 0.75.

D: 0.85.

E: 0.95.

Question 2: Consider the periodic signal $\tilde{x}[n]$ with fundamental period $N_0 = 8$ and fundamental cycle $x[n] = n(-1)^n$ if $-3 \leq n \leq 0$ and 0 otherwise. Determine the corresponding periodic summation signal $\tilde{y}[n]$. What is $\tilde{y}[2]$? Choose the closest answer.

A: 0.

B: -2.

C: 1.

D: -1.

E: 2.

Question 3: Let N_1 be the fundamental period of $\tilde{x}[n] = \cos(\frac{5\pi}{12}n)$ and N_2 the fundamental period of $\tilde{y}[n] = \cos(\frac{5\pi}{9}n)$. The sum $x[n] + y[n]$ has fundamental period $N = \text{LCM}\{N_1, N_2\}$. Determine N . Choose the closest answer.

- A: 72.
- B: 18.
- C: 90.
- D: 54.
- E: 36.

Question 4: Suppose $x[n] = (2^n - n)(u[n] - u[n - 4])$. Determine the difference signal $y[n] = x[n] - x[n - 1]$. What is $y[0]$? $y[1]$? $y[3]$? Determine the sum of these values. Choose the closest answer.

- A: 5.
- B: 4.
- C: 1.
- D: 3.
- E: 2.

Question 5: Consider the complex-valued signal $x(t) = (2 + jt)e^{jt}$. Determine $\text{Re}\{x(t)\}$. The answer can be written in the form $(A + Bt)\cos(t) + (C + Dt)\sin(t)$. Determine $A + B + C + D$. Choose the closest answer.

- A: 1.
- B: 5.
- C: 4.
- D: 2.
- E: 3.

Question 6: Suppose $x[n] = (-1 - n)(u[n - 1] - u[n - 3]) + (n - 2)(u[n - 4] - u[n - 6])$ and $y[n] = |x[n]|$. Determine the maximum value of $y[n]$. Choose the closest answer.

- A: 4.
- B: 3.
- C: 1.
- D: 2.
- E: 5.

Question 7: Simplify $\int_{-1}^2 \tau \delta(\tau - t - 1) d\tau$. The answer can be written in the form $(t + A)(u(t - B) - u(t - C))$. What is $A + B + C$? Choose the closest answer.

- A: 0.
- B: 2.
- C: -2.
- D: 1.
- E: -1.

Question 8: Suppose $x(t) = 2t(u(t) - u(t - 1)) + t(u(t - 1) - u(t - 2)) + u(t - 2)$. The derivative signal $y(t) = \frac{d}{dt}x(t)$ has the form $A(u(t) - u(t - 1)) + B(u(t - 1) - u(t - 2)) + C\delta(t) + D\delta(t - 1) + E\delta(t - 2)$. Determine $A + B + C + D + E$. Choose the closest answer.

- A: 1.
- B: 3.
- C: 4.
- D: 5.
- E: 2.

Question 9: Suppose $\tilde{x}[n]$ is periodic with fundamental period $N_0 = 7$ and fundamental cycle $x[n] = n/3$, $-3 \leq n \leq 3$ and 0 otherwise. Determine the power $P_{\tilde{x}}$. Choose the closest answer.

- A: 0.15.
- B: 0.55.
- C: 0.45.
- D: 0.25.
- E: 0.35.

Question 10: Suppose $x(t) = t(u(t) - u(t - 2)) - \delta(t + 1) + \delta(t - 1)$ and suppose $y(t) = \int_{-\infty}^t x(\tau) d\tau$. What is $y(0)$? $y(2)$? $y(4)$? Determine the sum of these three values. Choose the closest answer.

- A: 3.
- B: 2.
- C: 5.
- D: 1.
- E: 4.

Question 11: Suppose $x[n] = 4\delta[n+3] - 2\delta[n+2] + \delta[n] + 2\delta[n-2] - 2\delta[n-3]$. Determine $y[n] = \text{Od}\{x[n]\}$. What is $y[0]$? $y[2]$? $y[-3]$? Determine the sum of these values. Choose the closest answer.

A: 4.

B: 1.

C: 3.

D: 2.

E: 5.

Question 12: Suppose $x(t) = (u(t+2) - u(t+1)) + (u(t-1) - u(t-4))$ and $y(t) = x(2-2t)$. Let t_{on} and t_{off} be the turn-on and turn-off times for $y(t)$. What is the sum of these two values? Choose the closest answer.

A: 2.

B: 3.

C: 1.

D: 5.

E: 4.
