1. \[ 2e^{j\pi/3} - \sqrt{6}e^{j\pi/4} = [2 \cos(\pi/3) + j2 \sin(\pi/3)] - [\sqrt{6} \cos(\pi/4) + j\sqrt{6} \sin(\pi/4)] = [1 + j\sqrt{3}] - [\sqrt{3} + j\sqrt{3}] = 1 - \sqrt{3}. \] Add complex numbers in rectangular form.

2. \[ [\sqrt{3} + j] + [-\sqrt{3} + j] - 2j = 0. \] Easier: draw diagram.

3. \[ (1 + j)e^{j\theta} = \sqrt{2}e^{j(\pi/4 + \theta)} \rightarrow \theta = -\pi/4 \text{ or } 3\pi/4. \] Multiply complex in polar form.

4. \[ M(x) = \frac{1}{2} \int_0^2 t \, dt = 1. \]

5. \[ M(x^2) = \frac{1}{2} \int_0^2 t^2 \, dt = 4/3. \]

6. \[ C(x, x^2) = \int_0^2 (t)(t^2) \, dt = 4. \]

7. \( A. \) Shift \([0, 2]\) by 1, then scale by 2. OR: Scale by 2 and shift by 1/2.

8. \( D. \) Least common multiple of 6 and 9 is 18. OR: GCD of \( \frac{1}{6} \) and \( \frac{1}{9} \) is \( \frac{1}{18} \).

**NOTE: Accept E.** since 54 is “a period” according to course lecture notes.

9. \( C. \) 0.075 = 75/1000 = 3/40 lowest terms \( \rightarrow \text{period=denominator=40}. \)

10. \( C. \) Converting to phasors \( \rightarrow 2e^{j\pi/3} - \sqrt{6}e^{j\pi/4} + \sqrt{3}e^{j0} = 1 \) (see #1).

11. \( C. \) Converting to phasors \( \rightarrow 2e^{j\pi/6} + 2e^{j5\pi/6} + 3e^{-j\pi/2} = -j \) (see #2).

12. \( D. \) \( \cos^2(7t) = \frac{1}{2} + \frac{1}{2} \cos(14t) \rightarrow 0, \pm 14. \) Didn’t have to remember trig. id.

13. \( C. \) by definition. Accept B. since course lecture notes wrong (p. 3a.20).

14. \( E. \) Using Parseval’s thm., \( 4^2 + 3^2 + 5^2 + 3^2 + 4^2 = 75. \)

15. \( E. \) Since 1 Hz=2\pi > 2 \text{ RADIUS \textit{SECOND}}, nothing gets removed.

16. \( C. \) \( C(x_i, y_j) = 0 \) for integers \( i, j \) from lab and lecture notes. Only C \((0=0)\) true.

17. \( A. \) \( X[0] = 0 \) by inspection; A and only A is true.

18. \( A. \) \( X[0] = 0 \) by inspection; \( X[19] \neq 0 \) easily found.

19. \( E. \) \( x^*[n] = e^{-j2\pi nk/N}. \) Only E. is true.

20. \( B. \) Also accept D. even though fundamental period is 50.

21. This was supposed to be \( x(t) \) not \( x[n] \). A few bright students noted that \( x[n] = 13! \)

22. \( C(x, y) = \int_0^T e^{j2\pi (k-a)t/T} \, dt = \frac{e^{j2\pi (k-a)}}{j2\pi (k-a)} \frac{T}{T} [e^{j2\pi (k-a)} - 1] = 0 \) only if \( e^{j2\pi (k-a)} = 1 \)

\( \rightarrow (k-a) \) is an integer \( \rightarrow a \) is an integer.

**EXAM SCORES BY LECTURE SECTION—SEE WHERE YOU STAND**

**#1:** 100, 97, 96, 94, 92, 91, 88, 85, 84, 83, 82, 81, 80, 78, 77, 76, 72, 71, 69, 65, 64, 61, 60, 59, 58, 57, 56, 55, 54, 53, 44, 43, 41, 28. **Mean:** 75.1. **#2:** 96, 94, 93, 92, 91, 90, 89, 88, 86, 84, 83, 84, 84, 87, 82, 81, 80, 80, 78, 73, 77, 76, 75, 74, 72, 70, 69, 67, 66, 64, 63, 62, 59, 58, 57, 55, 54, 53, 51, 50, 49, 47, 41. **Mean:** 76.4. **#3:** 92.